WHY ARE SOME PRODUCTS BRANDED AND OTHERS NOT?*

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ABSTRACT

Why do some consumers pay a premium for branded products? According to the consumer information theory, brands signal the quality of experience goods (products whose quality cannot be determined on inspection) to consumers for whom personal search and testing is relatively costly. We find that the product and customer mix in a sample of branded and unbranded service stations is generally consistent with the theory. Branded dealers are more likely to carry products for which cheating on quality is an issue and to serve customers for whom personal search and testing is relatively costly.

I. INTRODUCTION

MARKETING researchers repeatedly emphasize the importance of branding.[1] Notwithstanding these exhortations, in a number of retail categories—furniture and fresh vegetables, for example—brand names are not widely used. In many other categories, national brands coexist with store brands. Raju, Sethuraman, and Dhar find that, empirically, store brands appeal to more price-sensitive consumers.[2] This observation, however, begs the question of what the less price-sensitive consumers perceive they are getting from branded products. Put differently, what are the sources of brand equity?

Klein and Leffler argued that branding is a way by which a seller can commit to product attributes that are difficult for third parties, such as

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[1] See, for instance, Philip Kotler, Marketing Management: Analysis, Planning, Implementation, and Control 441 (7th ed. 1991); and Al Ries & Jack Trout, Positioning: The Battle for Your Mind (1986).

[2] See Jagmohan S. Raju, Raj Sethuraman, & Sanjay K. Dhar, The Introduction and Performance of Store Brands, 41 Mgmt. Sci. (1995, in press).

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courts, to verify.[3] Suppose that a gasoline station advertises fast, reliable, and clean service and sets correspondingly high prices. If it fails to deliver, word would spread quickly and the station would not be able to earn a normal rate of return on its (now sunk) advertising expenditures. When consumers pay a premium price for a branded product, they are paying for an implicit guarantee of superior quality. Accordingly, market forces alone suffice to discipline suppliers who chisel on noncontractable quality.[4]

Despite the wide acceptance of this consumer information theory,[5] there has been scant empirical validation. In this article, we explore the pattern of branding among service stations to consider how much of the observed variation can be explained by the consumer information theory. The service-station industry seems to be an appropriate testing ground as it has long encompassed both branded and unbranded products. Moreover, consistent with the theory, service-station brands spend considerable amounts on advertising.

We must first elaborate the consumer information theory to explain why some products are branded while others are not. Realistically, consumers who face uncertainty about product quality have a choice between two strategies. Recognizing that unbranded products offer relatively lower prices but possibly lower quality, consumers could personally search for reliable, unbranded products.[6] Alternatively, they could buy branded products, accepting the price premium in exchange for the assurance of quality.[7] Given that consumers have this choice, we

[3] See Benjamin Klein & Keith B. Leffler, The Role of Market Forces in Assuring Contractual Performance, 89 J. Pol. Econ. 615 (1981). A seller can use an explicit warranty to guarantee attributes that a court can verify.

[4] In effect, a supplier's implicit promise to provide a particular quality at a corresponding price constitutes a self-enforcing agreement; see L. G. Telser, A Theory of Self-Enforcing Agreements, 53 J. Bus. 27 (1980). See Isaac Ehrlich & Lawrence Fisher, The Derived Demand for Advertising: A Theoretical and Empirical Investigation, 72 Am. Econ. Rev. 366 (1982), for a related analysis of advertising. Investments in reputation are protected by trademark law; see William M. Landes & Richard A. Posner, Trademark Law: An Economic Perspective, 30 J. Law & Econ. 265 (1987).

[5] See, for instance, Franklin Allen, Reputation and Product Quality, 15 RAND J. Econ. 311 (1984); Yuk-Shee Chan & Hayne Leland, Prices and Qualities in Markets with Costly Information, 49 Rev. Econ. Stud. 499 (1982); Russell Cooper & Thomas W. Ross, Monopoly Provision of Product Quality with Uninformed Buyers, 3 Int'l J. Indus. Org. 439 (1985); Michael H. Riordan, Monopolistic Competition with Experience Goods, 101 Q. J. Econ. 265 (1986); William P. Rogerson, Reputation and Product Quality, 14 Bell J. Econ. 508 (1983); Carl Shapiro, Consumer Information, Product Quality, and Seller Reputation, 13 Bell J. Econ. 20 (1982); Carl Shapiro, Premiums for High Quality Products as Returns to Reputations, 98 Q. J. Econ. 659 (1983); and Asher Wolinsky, Prices as Signals of Product Quality, 50 Rev. Econ. Stud. 647 (1983).

[6] See Phillip Nelson, Information and Consumer Behavior, 78 J. Pol. Econ. 311 (1970).

[7] For simplicity, we ignore the possibility that consumers buy information from third parties.

contend that sellers are more likely to brand when consumers find personal search and experimentation relatively unattractive.

The attractiveness of personal search and experimentation depends on the nature of the product. The average driver can easily see that a station's hot dogs are stale or its lavatories dirty. It is much more difficult to detect that a station is substituting regular gasoline for premium.[8] Likewise, it is difficult to distinguish good from substandard repair service. Some products, such as convenience store items, are sufficiently cheap relative to usage that it may be worthwhile for a consumer to experiment among unbranded products. We predict that consumers will be more willing to pay a brand premium for products that are difficult to inspect and too expensive to sample.

The choice between searching and paying a brand premium also depends on the consumer's background. Those with higher incomes and hence higher opportunity costs of time will be relatively less willing to shop around or experiment. The balance between personal search and paying a brand premium also depends on the likelihood of repeat purchase. Drivers passing through an area, for instance, will be more likely to find the cost of searching outweighing the once-only benefit of a good deal.

On the supply side, the service-station industry is quite heterogeneous: stations range from sole proprietorships, offering low prices but possibly lower quality, to outlets of large-scale integrated refiners, such as Mobil and Shell. The owner of a station must decide on marketing variables such as prices, opening hours, and service effort. He must also decide whether to affiliate with a brand and, if so, with which brand. At the same time, the owner of a brand must also determine a position for his brand, encompassing product mix, pricing, advertising, and promotion. Given his position, he must decide which stations to accept into his franchise. This decision will depend on a station's location, appearance, and physical facilities, as well as less tangible factors, such as the station owner's personality. Thus, whether a station will belong to a brand is a joint decision of the station and the brand.[9]

Affiliation with a brand benefits the station by increasing revenues. Skeptical consumers know that the more difficult it is for them to detect poor quality, the greater a station's incentive to chisel. Accordingly, the more difficult it is for consumers to detect poor quality, the greater a

[8] "The . . . Division receives up to 20 complaints a month about the quality of motor fuel sold in West Virginia . . . motorists will take their vehicles to garages because of poor performance only to learn that they have gotten a lower grade product while paying for a higher octane." Fuel Complaints Directed at State Legislature, Charleston Gazette, September 26, 1984.

[9] We are very grateful to an anonymous referee for drawing our attention to this point.

station's need for a credible signal of superior quality. Affiliation with a brand is one such signal. To the extent that it is credible, it supports higher prices.

Joining a brand, however, also means higher costs for the station. The fuel supplied by the franchisor typically will be more expensive than unbranded product. It may also be costly to comply with the franchisor's marketing guidelines on such matters as opening hours. From the brand owner's standpoint, an additional franchisee means staking its reputation at one more point. Poor quality at one branded station affects the reputation of the entire chain, so the franchisor bears additional costs when it accepts another station.

Thus, the relevant question is, When does affiliation with a brand generate sufficient incremental revenue for the brand and the station to outweigh the incremental costs? As indicated above, the consumer information theory points to a number of factors that influence the potential gains from affiliating with a brand. These same factors influence the likelihood that the additional revenues from affiliation with a brand outweigh the incremental costs.

For this empirical study, we are fortunate to have Andrea Shepard's census of eastern Massachusetts service stations in early 1987.[10] The typical service station sells a wide range of products to diverse customers. The station, however, can bear only one name, be it Shell, CITGO, or a sole proprietor's mark. We define "branding" to be the alliance of a substantial number of service stations under a common trademark. In particular, we do not necessarily limit the concept to major refiner marks such as Exxon. For instance, although Getty is not a major refiner, it may have so many stations in an area that its mark is as credible as Exxon. Our definition of branding also encompasses regional and even local trademarks. A local chain of 10 stations may have more at stake in an area than a major refiner, such as Arco, that has only a minor presence.

To study which stations will be branded, we posit the following medium-term model. Given physical facilities, customer demand, and the competitive situation, each station owner must decide on marketing variables, such as prices, opening hours, and service effort and whether to affiliate with a brand.[11,12] At the same time, given its positioning relative

[10] See Andrea Shepard, Price Discrimination and Retail Configuration, 99 J. Pol. Econ. 30 (1991).

[11] These marketing variables are jointly determined; for instance, if a station chooses to join a brand, it can post higher prices. Rather than estimating the structural equations, however, we focus on the reduced form.

[12] The typical supply contract between a station and its fuel source (refiner or distributor) can be terminated with 90 days' notice. We do not consider longer-term issues such as which grades of fuel to sell, whether to offer self- or full service or both, and where to locate.

to other brands, each brand owner must decide which stations to accept into its franchise.

The empirical results were broadly consistent with the consumer information theory. Stations selling premium gasoline, those offering repair service, those located in high-income areas, and those situated near highways were all more likely to be branded. Moreover, these results were robust to several alternative definitions of branding. However, the relation between income and branding was not significantly stronger among dealers selling premium gasolines, as the consumer information theory would predict. We infer that our results provide some, though not conclusive, evidence in favor of the consumer information theory. Given the significance of this theory for both public policy and managerial strategy, it should be subjected to further, more comprehensive tests.

II. Data

Our first source of data is Shepard's cross section of all service stations in four eastern Massachusetts counties collected over 12 weeks in early 1987.[13] For each station, there are records of the types of fuel sold (gasoline/diesel) and grades (regular/premium and leaded/unleaded); service configuration (self/full service); prices; monthly sales volume; number of islands, nozzles, and repair service bays; other products sold (for example, truck fuel); inspection services; and the presence of a convenience store.

Generally, a station can be operated either by employees of a refiner, jobber,[14] or large independent marketer ("employee operated"), by a lessee of some refiner, jobber, or independent marketer ("lessee dealer"), or by the owner of the station ("open dealer"). Shepard's cross section records the method of operation. In this study, we focus on open dealers, that is, those that are owned by their operators. Although it is certainly possible that large independent marketers or even major refiners can switch their stations to other brands or even to unbranded gasoline, such changes rarely occur and typically involve large discrete changes in marketing strategy rather than the incremental shifts that we expect to detect in the data. Accordingly, we limit attention to open dealers. Of 1,523 stations in total, 769 were open dealers.[15]

Our second source of data is the *Sourcebook of Zip Code Demograph-*

[13] Shepard, *supra* note 10.

[14] Jobbers are wholesalers of fuel. Jobber-supplied stations may be operated by employees (of the jobber), lessees, or open dealers.

[15] For a more detailed description of Shepard's data, please refer to Shepard, *supra* note 10, and Andrea Shepard, Contractual Form, Retail Price, and Asset Characteristics in Gasoline Retailing, 24 RAND J. Econ. 58 (1993).

TABLE 1

SUMMARY STATISTICS OF SHEPARD'S GASOLINE STATION SAMPLE

Variable	Mean	Standard Deviation	Minimum	Maximum
REGLEAD	.780	.414	0	1
PREMUNL	.914	.280	0	1
PREMLEAD	.048	.214	0	1
VOLUME	42.493	27.501	1	200
TRUCK	.195	.397	0	1
FULL	.869	.338	0	1
MULTI	.060	.237	0	1
CSTORE	.039	.194	0	1
REPAIR	.893	.309	0	1
INSPECT	.388	.488	0	1
HIWAY	.052	.222	0	1
BRAND10	.904	.295	0	1
BRAND80	.798	.401	0	1
MAJOR	.785	.411	0	1
OLD	.716	.451	0	1
INCOME	15.568	2.456	8.465	23.376
LABOR	64.962	4.736	51.4	78.1

SOURCE.—The source for all data with the exception of INCOME and LABOR is Andrea Shepard, Price Discrimination and Retail Configuration, 99 J. Pol. Econ. 30 (1991). INCOME and LABOR data can be found in the Sourcebook of Zip Code Demographics (1987, 1990).

NOTE.—The sample includes 769 stations, with the exception of OLD, which contains 585 stations. See Section II for a description of Shepard's sample.

ics.[16] This provides information on per capita income and labor force participation. We matched these data to the stations by zip code. Table 1 reports summary statistics of the data.[17]

III. BRANDING AMONG SERVICE STATIONS

Dealers in the sample sold one or more of five types of fuel, namely, regular leaded, premium leaded, regular unleaded, premium unleaded, and diesel. One way that service stations commonly cheat on gasoline is by substituting regular for premium.[18] Premium grades of gasoline include detergents to clean fuel injectors and provide the higher octane levels required by engines with high compression ratios. Drivers tricked into buying regular gasoline will not always notice the deception immediately;

[16] Sourcebook of Zip Code Demographics (1987, 1990).

[17] We explain BRAND10, BRAND80, MAJOR, and OLD below. A description of the variables can be found in the Appendix.

[18] See Thomas F. Hogarty, Perry Lindstrom, & Frances Smith, Analytics of Proposals to Compel Open Supply (Research Study No. 42, Amer. Petroleum Inst. 1987).

even if they do, they might mistakenly blame the drop in performance on their engines. To the extent that consumers cannot detect the fraud or cannot identify the culprit, dealers will have an incentive to substitute cheaper grades of fuel for more expensive ones.

Consumers' demand for quality assurance depends on the degree to which they can detect and identify cheaters and the profit that a dealer can gain by cheating. Since almost all open dealers sold regular unleaded, we set it to be the base grade. As reported in Table 1, 91 percent of dealers sold premium unleaded in addition to regular unleaded. Regular leaded was sold by 78 percent of dealers, and premium leaded was sold by 5 percent of dealers.

If a dealer seeks to sell premium unleaded (PREMUNL) or premium leaded (PREMLEAD) in addition to regular unleaded, he must persuade customers that he will not switch grades. The obvious way is to join a brand.[19] We predict that dealers offering either premium unleaded or premium leaded are more likely to brand. By contrast, no customer need fear that a dealer would substitute regular unleaded for regular leaded (REGLEAD) since the latter is cheaper. Accordingly, a dealer is not more likely to brand if he offers regular leaded in addition to regular unleaded.[20]

Finally, a supplier's incentive to provide high quality also depends on the extent to which the seller *can* control quality. The less able is a supplier to control quality, the greater his incentive to cheat.[21] Just under 90 percent of the sample dealers offered repair service. Even if a mechanic works to the best of his ability, a car may still break down. This performance uncertainty means that it is difficult for a customer to distinguish bad repair service from bad luck. Customers also rely on mechanics for advice on repairs. An unscrupulous mechanic can replace components earlier than necessary or perform superfluous repairs.[22] Further, repair

[19] This view is consistent with recommendations of a leading motorcar insurer: "[I]t's prudent to keep your car's fuel filters clean and to buy your gas from a reputable dealer." Gordon Maltby, Fueling Up, GEICO Direct 18 (Fall 1993). However, Consumers Union maintains that "gasoline is gasoline, whether it bears a well-known brand name or comes from an independent service station." Adding Fuel to the Claim That All Gasoline Is the Same, 50 Consumer Rep. 187 (April 1985).

[20] Tests by New York State found that 15.4 percent of premium samples, but only 8.9 percent of middle grades, were substandard. Group Says Fuel Is Often Misrated, New York Times, August 13, 1992, at D19. These findings support our hypothesis that cheating on gasoline is a problem and is more serious the higher the grade.

[21] See Julia Liebeskind & Richard P. Rumelt, Markets for Experience Goods with Performance Uncertainty, 20 RAND J. Econ 601 (1989).

[22] This is also a case of performance uncertainty: when the car performs well, the customer cannot tell whether the repair was unnecessary or very efficacious.

service is a big-ticket item that the typical customer purchases relatively infrequently. For all these reasons, customers will be more willing to purchase quality assurance. Stations offering repair service (REPAIR) should be more likely to join a brand.[23,24]

Of the sample dealers, 93 percent offered full service, either exclusively (FULL) or in conjunction with self-service (MULTI), and 4 percent include convenience stores (CSTORE) (Table 1). Full-service gasoline bundles the corresponding self-service grade with additional services. It is quite easy, however, for customers to inspect the quality of these additional services. A few visits will reveal this information at relatively low cost. Most convenience store items are themselves branded, so with respect to selling such goods, the dealer's contribution is the service of providing the goods—availability, freshness, and speed of transaction—rather than the goods per se. Like the quality of full service, these attributes are relatively easy to monitor. Accordingly, we predict that the presence of full or multiservice or a convenience store will not have a significant effect on branding.

Next, we consider differences among customers. Customers whose time is relatively more costly will be more willing to buy information than collect it themselves. So dealers catering to such customers are more likely to be branded. We use per capita income (INCOME) in the zip code to measure a station's customers' cost of time.[25] Under the consumer information theory, a higher proportion of dealers in higher-income areas should be branded.

Compare a customer choosing a station for repeat patronage with a visitor to the area: it is relatively more worthwhile for the long-term buyer to shop around for good deals. A dealer can use its individual reputation to reach such customers. By contrast, visitors will find personal search and experimentation too costly. They will demand brand-name information even when buying products, such as full service and

[23] From conversations with the Mobil and Shell district managers for the Boston area, we learned that both pay close attention to quality of fuel and repair service. They inspect each station at least weekly. To monitor fuel quality, they compare meter readings on the pumps with the station's wholesale purchases. If warranted, they will check the station's tanks with a dipstick. As for repair service, they monitor customer feedback and take appropriate action by, for instance, enforcing refunds.

[24] Shepard, *supra* note 15, considers a related question: given that a major refiner owns a wide network of stations and wishes to offer repair service, how can it most economically induce station operators to provide high-quality service? One way is to let out the station: the lessee operator's residual claim to the repair-service income will give him a strong incentive to maintain quality.

[25] This crude measure, of course, ignores considerable customer mobility across zip code boundaries. In particular, some drivers prefer to patronize service stations near their place of work.

convenience store items, whose important attributes are relatively easy to observe. Accordingly, we predict that a larger proportion of dealers along or at interchanges with divided highways (HIWAY) will be branded.[26,27]

Truckers purchase fuel and repair service more frequently and in larger quantities than the average customer. Consequently, they probably are better able to distinguish good from bad fuel, and likewise for repair service. In addition, they also have superior access to word-of-mouth information (for example, through their CB radios) about dealers. But since truckers travel more widely, the "passing through" effect mentioned above applies more strongly to them.[28] Accordingly, we have no hypothesis a priori as to whether a dealer offering truck fuel (TRUCK) is more or less likely to be branded.[29]

We estimate a discrete-choice model with "brand" as the dependent variable. In terms of our analysis, any mark borne by a relatively large number of stations in the area performs the functions of a "brand." When forming beliefs about marketing practices, however, customers probably do not distinguish among stations by their method of operation. Accordingly, in defining which marks were "brands," we considered all 1,523 stations (employee-operated stations, lessee dealers, and open dealers) in the area. We tested our hypotheses using several alternative definitions.

We first defined "brand" to be any mark borne by 10 or more stations in the area (BRAND10) and next to be any mark borne by 80 or more stations (BRAND80). BRAND80 identifies the eight largest brands in the area; 80 was also a natural cutoff as the ninth largest brand marked only 26 stations.[30] Our third and more conventional definition of "brand" was any major (integrated) refiner (MAJOR) as defined by *Oil Daily*. MAJOR

[26] Shepard's records include the street address of each station. See Shepard, *supra* note 10. We matched these to the divided highways as identified by the American Automobile Association maps entitled "Boston and Vicinity" and "Connecticut, Massachusetts, Rhode Island."

[27] The rise of national networks of service stations in the United States coincided with the development of the interstate highway system. See Thomas F. Hogarty, The Origin and Evolution of Gasoline Marketing 34 (Research Study No. 22, Amer. Petroleum Inst. 1981).

[28] We thank an anonymous referee for this observation.

[29] Of 263 stations coded as selling truck fuel, all but 4 are recorded as selling diesel. Of 270 stations recorded as selling diesel, all but 11 are coded as selling truck fuel. These disparities could be recording errors. In any case, our empirical results are essentially the same whether we use truck fuel or diesel.

[30] The distribution of trademarks by number of stations is 1–9 stations, 95 trademarks; 10–19 stations, 9 trademarks; 20–39 stations, 3 trademarks; 30–79 stations, 0 trademarks; 80–119 stations, 3 trademarks; 120–59 stations, 3 trademarks; 160–99 stations, 1 trademark; and 200 or more stations, 1 trademark.

includes seven of the eight brands encompassed by BRAND80, plus several (such as Arco and Chevron) that have only a small presence in the area.[31] Finally, we estimated the model with MAJOR as the dependent variable on a reduced sample. The reduced sample excluded the major refiner brands that had fewer than 10 stations in the area and also omitted Getty dealers (Getty had more than 80 stations in the area, but is not a major refiner). Table 2 reports the means of the independent variables at branded and unbranded stations under the four alternative definitions.[32]

Table 3 reports estimates using a logit specification. The results from the alternative definitions of brand were very similar, so we discuss them together. The first group of explanatory variables was gasoline grades. As predicted, dealers selling premium grades, both unleaded (PREMUNL) and leaded (PREMLEAD), were significantly more likely to brand. With only one exception, stations selling regular unleaded (REGLEAD) were, as predicted, not more likely to be branded.[33] These findings are consistent with our hypothesis that consumers seek brand-name assurance when it is difficult to detect substandard quality.[34]

Dealers offering full service (FULL or MULTI) were more likely to be branded, but only the effect of MULTI was statistically significant. Full-service stations predominate in the sample. The general trend in the United States, however, has been for full service to be replaced by self- or multiservice. Branded dealers would have better access to finance, in

[31] Note that neither BRAND80 nor MAJOR is a subset of the other. Please refer to Table 2 for a complete list of the brands in each definition.

[32] In deciding whether to accept a dealer, a franchisor must consider the impact on the business of its other stations. The extreme view is that an unbranded dealer cannot become branded if all the brands are already represented in the relevant market. (This position is extreme because a franchisor may still find it profitable to add a dealer in such a market.) We used the geographic coordinates developed for this data set by Shepard, *supra* note 10, to test whether this constraint was binding. We found that, under all four definitions of brand, there was no dealer for which a 2-mile-square box centered on the dealer included stations from all the brands.

[33] The lone exception arose when branding was defined as affiliating with a major refiner, in which case the Getty stations were counted as unbranded. Fewer than one-third of the 40 (open dealer) Getty stations carried regular unleaded. To consider the effect of these stations, we ran a fourth model that kept the definition of brand but omitted the Getty stations and major refiners with fewer than 10 stations in the area (Table 3, col. 4). The results in this case were very similar to those in Table 3, cols. 1 and 2, suggesting that consumers treat Getty as a brand.

[34] Severin Borenstein reports panel data showing that a higher proportion of premium gasolines are purchased with credit card than regular grades; see Severin Borenstein, Selling Costs and Switching Costs: Explaining Retail Gasoline Margins, 22 RAND J. Econ. 354 (1991). So, to the extent that branded stations are more likely to accept payment by credit card, there will be an association between branding and selling premium gasoline. This explanation, however, begs the question of why unbranded stations could not accept general-purpose credit cards such as Visa and Mastercard and so sell premium gasolines.

TABLE 2

MEANS OF INDEPENDENT VARIABLES

	BRAND DEFINITION			
	BRAND10	BRAND80	MAJOR	MAJOR (Subsample)
A: Branded stations:				
REGLEAD	.777	.775	.803	.803
PREMUNL	.931	.953	.947	.948
PREMLEAD	.050	.057	.058	.058
VOLUME	43.120	43.880	43.964	43.882
TRUCK	.186	.187	.192	.193
FULL	.879	.875	.874	.873
MULTI	.062	.068	.068	.068
CSTORE	.036	.039	.038	.038
REPAIR	.909	.910	.912	.912
HIWAY	.056	.060	.061	.062
INCOME	15.660	15.690	15.702	15.704
Number of stations	695	614	604	600
B: Unbranded stations:				
REGLEAD	.811	.800	.697	.824
PREMUNL	.757	.761	.794	.752
PREMLEAD	.027	.013	.012	.016
VOLUME	36.608	37.001	37.111	36.790
TRUCK	.284	.226	.206	.232
FULL	.770	.845	.848	.824
MULTI	.041	.026	.030	.032
CSTORE	.068	.039	.042	.048
REPAIR	.743	.826	.824	.808
HIWAY	.014	.019	.018	.008
INCOME	14.702	15.088	15.081	14.993
Number of stations	74	155	165	125

SOURCES.—Andrea Shepard, Price Discrimination and Retail Configuration, 99 J. Pol. Econ. 30 (1991); and Sourcebook of Zip Code Demographics (1987, 1990).

NOTE.—The brands that are included in BRAND80 are Citgo, Exxon, Getty, Gulf, Mobil, Shell, Sunoco, and Texaco. MAJOR includes the BRAND80 brands as well as Amoco, Arco, BP, and Chevron, but omits Getty. BRAND10 includes all brands in MAJOR with the exception of Arco and adds Best, Getty, Global Mutual, and VIP. MAJOR (subsample) omits BP, Arco, and Getty stations from the sample.

particular, support from their franchisors, hence we expect these to renovate more quickly, so explaining the relation between multiservice and branding. As predicted, the presence of a convenience store (CSTORE) had an insignificant effect on branding.

More important for the consumer information theory, dealers offering repair service (REPAIR) were indeed, as predicted, significantly more likely to be branded. The positive effect of repair service on branding

TABLE 3

BRANDING DECISION

	DEPENDENT VARIABLE			
INDEPENDENT VARIABLE	BRAND10 (1)	BRAND80 (2)	MAJOR (3)	MAJOR (Subsample) (4)
INTERCEPT	−3.133	−2.827	−3.523	−3.048
	(.857)	(.741)	(.733)	(.809)
PREMUNL	1.782***	1.896***	1.675***	1.859***
	(.295)	(.284)	(.284)	(.296)
PREMLEAD	1.415*	2.070***	2.697***	1.933**
	(.828)	(.811)	(.796)	(.826)
REGLEAD	.147	.155	1.019***	.244
	(.296)	(.246)	(.222)	(.285)
FULL	.481	.473	.494	.534
	(.388)	(.357)	(.355)	(.373)
MULTI	1.356*	1.569**	1.179*	1.354**
	(.754)	(.662)	(.610)	(.674)
CSTORE	−.005	.633	.508	.481
	(.536)	(.527)	(.502)	(.540)
REPAIR	.694*	.694**	.834***	.831**
	(.360)	(.319)	(.315)	(.345)
TRUCK	−.298	−.134	−.012	−.094
	(.276)	(.240)	(.239)	(.261)
HIWAY	1.880*	1.231*	1.252**	2.258**
	(1.045)	(.641)	(.635)	(1.052)
INCOME	.151***	.079**	.078**	.093**
	(.047)	(.039)	(.038)	(.042)
Observations	769	769	769	725
$-2\ln L$	520.192	691.444	711.749	589.943
χ^2	70.372	81.491	87.922	76.612

NOTE.—Standard errors are in parentheses.
* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

supports our hypothesis that consumers of products subject to performance uncertainty will pay for brand-name assurance.

With regard to differences among customers, the likelihood of a dealer being branded indeed rose with per capita income (INCOME).[35] Further, a dealer located along a highway (HIWAY) was more likely to be

[35] We also tried the test using participation in the labor force (LABOR) replacing income. The coefficient for LABOR was not statistically significant. It is difficult a priori to say whether participation or income is the better measure of the value of time. Note, however, that we are using zip-code-wide demographic information as a proxy for characteristics of individual consumers. Per capita income across residents of a zip code is probably more closely correlated than labor force participation rates.

branded. These findings are consistent with our hypothesis that, even with respect to attributes that may be easy to inspect or determine by trial, customers for whom time is relatively more valuable will purchase brand-name quality assurance. There was no significant relation between branding and sale of truck fuel (TRUCK).

The preceding results held not only when branding was identified with major refiners but also when the concept was extended to any mark borne by 10 or more stations in the area (BRAND10), albeit in slightly weaker form. This suggests that, consistent with the consumer information theory, the credibility of a brand rests, not so much in its national reputation, but in the stakes to which it commits in the relevant market. For the purposes of signaling quality, major refiner brands such as Arco and Chevron, which have only a small local presence, are no more effective than some regional or local brand that marks a larger number of stations in the area.

IV. Alternative Hypotheses

We next consider two alternative explanations of the tendency of dealers selling premium grades to be branded.[36] The first is "differential liquidation." The service-station industry has been evolving toward multiservice stations without repair bays. Massachusetts, however, has lagged behind the rest of the country in this trend. Accordingly, the bulk of our sample stations appear to be outmoded: 87 percent are exclusively full service and 89 percent offer repair service. Many of these outmoded stations are gradually being renovated or replaced. But suppose that customers of branded stations tend to be more loyal than those of unbranded stations. Then branded dealers, although outmoded, will resist change more strongly than unbranded stations. Consequently, if we take a cross-sectional picture of the Massachusetts industry at any one point in time during the process of this gradual evolution, a disproportionate number of the remaining outmoded stations (offering full service and repairs) will be branded.

The Mobil and Shell district managers for the area provided some evidence on this argument. Both emphasized that the Massachusetts market is quite different from the rest of the United States. Local regulations severely restrict renovation of stations and, in particular, installation of self-service pumps. So it is regulation, rather than disinterest on the refiners' part, that tends to explain the outmoded state of their Massachu-

[36] We are indebted to an anonymous referee for these two arguments.

setts stations. In addition, when we asked if major refiners took in independent dealers, the Mobil manager's answer was, "All the time."

To conduct a formal test of the differential liquidation hypothesis, we turned to Shepard's data set.[37] This records the year in which each station was first surveyed. The survey began in 1972 and was conducted at irregular intervals thereafter. However, it did not cover the same towns each time. Accordingly, following Shepard, we drop all towns which first appeared in any survey after 1979. Thus, all remaining open dealers would have been observed had they existed prior to 1980. We categorized any station that existed in the 1970s as OLD, and then ran the BRAND80 model with this additional explanatory variable.

Table 4, column 1, reports the results. The coefficient on OLD is negative, suggesting that it is the relatively newer stations that are more likely to be branded.[38] Although this coefficient was not statistically significant, we believe that, read together with the views of the practitioners whom we interviewed, we can reject the differential liquidation hypothesis.

Another explanation of our empirical findings proceeds from the observation that, on the supply side of the market, premium grades yield higher wholesale margins, hence franchisors prefer their stations to sell premium gasolines. The question is then why, on the demand side, consumers are willing to pay more for branded products. The answer is that brands and premium grades are luxuries—higher-income consumers disproportionately prefer branded products, and they also disproportionately prefer premium gasolines.[39]

To test this "luxury product theory," we reran the BRAND80 model with an additional variable, INC*PREM, to detect whether the relation between per capita income and branding was stronger among dealers that sold premium grades (either unleaded or leaded) than among those who sold only regular grades. Under the luxury product theory, per capita income should have a positive and significant effect on branding among both types of stations. By contrast, the consumer information theory predicts that the tendency for higher-income consumers to prefer branded

[37] Shepard, *supra* note 15.

[38] There are several possible explanations for this relation: brands may prefer dealers with newer stations, branded dealers may have better access to finance, and the marginal cost of converting to multiservice may be lower in conjunction with physical investments required to affiliate with a brand.

[39] Note that this argument applies only to integrated refiners that can capture the wholesale markup on premium grades. Thus, the effect of selling premium on branding should be strongest among integrated refiner marks. As Table 3 shows, however, when brand is defined as BRAND10, which excludes some integrated refiners and includes a number of local nonintegrated brands, the coefficient on premium unleaded is still positive and strongly significant.

TABLE 4

ALTERNATIVE HYPOTHESES
(Dependent Variable: BRAND80)

Independent Variable	(1)	(2)
INTERCEPT	−2.562	−3.802
	(.798)	(1.338)
PREMUNL	1.904**	3.017**
	(.350)	(1.301)
PREMLEAD	1.835**	2.705**
	(.874)	(1.212)
REGLEAD	−.028	.164
	(.277)	(.245)
FULL	.561	.452
	(.394)	(.357)
MULTI	1.635**	1.589**
	(.691)	(.672)
CSTORE	.842	.592
	(.626)	(.526)
REPAIR	.675*	.690**
	(.362)	(.319)
TRUCK	−.190	−.133
	(.269)	(.240)
HIWAY	1.051	1.264**
	(.764)	(.644)
OLD	−.182	. . .
	(.241)	. . .
INCOME	.067*	.147*
	(.040)	(.085)
INC*PREM	. . .	−.076
	. . .	(.086)
Observations	585	769
$-2\ln L$	559.434	690.601
χ^2	60.322	82.334

NOTE.—Standard errors are in parentheses.
* Significant at the 10 percent level.
** Significant at the 5 percent level.

products will be stronger where quality is a bigger issue, that is, for premium grades. As reported in Table 4, column 2, the coefficient of INC*PREM was negative, which is not consistent with the consumer information theory. It was, however, not statistically significant. Thus, we cannot reject the possibility that the propensity for stations in high-income areas to be branded results from branded products being perceived as luxury items. We should note, however, that the luxury products theory cannot explain why a disproportionate number of dealers located near highways are branded.

V. Concluding Remarks

Our empirical results provide some, though not conclusive, evidence to support the consumer information explanation of branding. Given the significance of this theory for both public policy and managerial strategy, it should be further tested using richer sources of data from multiple industries.

Gary Becker emphasized that time is an input into consumption.[40] Our findings regarding the benefits of branding should be viewed in the broader context of studies showing that cross-sectional differences and secular changes in many retailing practices can be best understood in terms of this factor. For instance, Messinger and Narasimhan attribute the rise of supermarkets to consumers' rising cost of time, hence demand for one-stop shopping.[41] Pashigian and Bowen show that the increase in women's cost of time relative to men's since the mid-1970s can explain the growth of nationally advertised brand names relative to retail stores as sources of consumer information.[42]

Our results also bear specifically on public policy toward gasoline retailing. *Consumer Reports* maintains that "gasoline is gasoline, whether it bears a well-known brand name or comes from an independent service station."[43] Indeed, various state legislatures and the U.S. Congress have considered or are considering "open supply" legislation that would compel major refiners to allow their dealers to dispense other brands of fuel from the same pumps.[44]

The proponents of open supply believe that consumers are being hoodwinked into paying higher prices for brand-name gasoline. By contrast, under the consumer information theory, gasoline brands convey socially valuable information about product quality to consumers who are rela-

[40] See Gary S. Becker, A Theory of the Allocation of Time, 75 Econ. J. 493 (1965).

[41] See Paul Messinger & Chakravarthi Narasimhan, A Model of Retail Formats Based on Consumers Economizing on Shopping Time (working paper, Washington Univ., Olin School Bus. 1993).

[42] See B. Peter Pashigian & Brian Bowen, The Rising Cost of Time of Females, the Growth of National Brands, and the Supply of Retail Services, 32 Econ. Inquiry 33 (1994).

[43] See Consumer Reports, *supra* note 19.

[44] See Hogarty, *et al.*, *supra* note 18. The sheer volume of enacted and proposed legislation indicates how contentious is the governance of retail gasoline franchises in the United States. The federal Petroleum Marketing Practices Act of 1978, 15 U.S.C. §§ 2801–6, regulates termination and renewal. California Business & Professional Code, §§ 21140–50.1 (1986), severely limits franchisors' control over franchisees' opening-hours, while Massachusetts Laws Annotated, ch. 93E, §§ 1–9 (1985), simply prohibits franchisors from controlling hours. See, in addition, Stewart Macauley, Long-Term Continuing Relations: The American Experience Regulating Dealerships and Franchises (Working Paper No. 10-1, Univ. Wisconsin—Madison, Law School Disputes Processing Research Program 1990).

tively more concerned about quality when other sources of information are relatively costly. Our empirical findings, while indicating some support for the consumer information theory, suggest that more research is required before the debate over open supply can be resolved.

APPENDIX

Definitions of Variables

REGLEAD	sells regular leaded
PREMUNL	sells premium unleaded
PREMLEAD	sells premium leaded
VOLUME	monthly gasoline sales (thousand gallons)
TRUCK	sells truck fuel
FULL	exclusively full service
MULTI	multiservice (full and self)
CSTORE	convenience store
REPAIR	repair service
INSPECT	Massachusetts inspection station
HIWAY	on or at intersection with a divided highway
BRAND10	brands with 10 or more stations
BRAND80	brands with 80 or more stations
MAJOR	integrated refiner brands
OLD	stations in existence before 1980
INCOME	per capita income by zip code (thousand $)
LABOR	labor force participation rate by zip code

Bibliography

Allen, Franklin. "Reputation and Product Quality." *RAND Journal of Economics* 15 (1984): 311–27.

Becker, Gary S. "A Theory of the Allocation of Time." *Economic Journal* 75 (1965): 493–517.

Borenstein, Severin. "Selling Costs and Switching Costs: Explaining Retail Gasoline Margins." *RAND Journal of Economics* 22 (1991): 345–69.

Chan, Yuk-shee, and Leland, Hayne. "Prices and Qualities in Markets with Costly Information." *Review of Economic Studies* 49 (1982): 499–516.

Cooper, Russell, and Ross, Thomas W. "Monopoly Provision of Product Quality with Uninformed Buyers." *International Journal of Industrial Organization* 3 (1985): 439–49.

Ehrlich, Isaac, and Fisher, Lawrence. "The Derived Demand for Advertising: A Theoretical and Empirical Investigation." *American Economic Review* 72 (1982): 366–88.

Hogarty, Thomas F. "The Origin and Evolution of Gasoline Marketing." Research Study No. 22. Washington, D.C.: American Petroleum Institute, October 1981.

Hogarty, Thomas F.; Lindstrom, Perry; and Smith, Frances. "Analytics of Proposals to Compel Open Supply." Research Study No. 42. Washington, D.C.: American Petroleum Institute, December 1987.

Klein, Benjamin, and Leffler, Keith B. "The Role of Market Forces in Assuring Contractual Performance." *Journal of Political Economy* 89 (1981): 615–41.

Kotler, Philip. *Marketing Management: Analysis, Planning, Implementation, and Control.* 7th ed. Englewood Cliffs, N.J.: Prentice-Hall, 1991.

Landes, William M., and Posner, Richard A. "Trademark Law: An Economic Perspective." *Journal of Law and Economics* 30 (1987): 265–309.

Liebeskind, Julia, and Rumelt, Richard P. "Markets for Experience Goods with Performance Uncertainty." *RAND Journal of Economics* 20 (1989): 601–21.

Macaulay, Stewart. "Long-Term Continuing Relations: The American Experience Regulating Dealerships and Franchises." Working Paper 10-1. Madison: University of Wisconsin Law School, Disputes Processing Research Program, 1990.

Messinger, Paul, and Narasimhan, Chakravarthi. "A Model of Retail Formats Based on Consumers Economizing on Shopping Time." Working paper. St. Louis: Washington University, Olin School of Business, 1993.

Nelson, Phillip. "Information and Consumer Behavior." *Journal of Political Economy* 78 (1970): 311–29.

Pashigian, B. Peter, and Bowen, Brian. "The Rising Cost of Time of Females, the Growth of National Brands, and the Supply of Retail Services." *Economic Inquiry* 32 (1994): 33–65.

Raju, Jagmohan S.; Sethuraman, Raj; and Dhar, Sanjay K. "The Introduction and Performance of Store Brands." *Management Science* 41 (1995): in press.

Ries, Al, and Trout, Jack. *Positioning: The Battle for Your Mind.* New York, Warner Books, 1986.

Riordan, Michael H. "Monopolistic Competition with Experience Goods." *Quarterly Journal of Economics* 101 (1986): 265–79.

Rogerson, William P. "Reputation and Product Quality." *Bell Journal of Economics* 14 (1983): 508–16.

Shapiro, Carl. "Consumer Information, Product Quality, and Seller Reputation." *Bell Journal of Economics* 13 (1982): 20–35.

Shapiro, Carl. "Premiums for High-Quality Products as Returns to Reputations." *Quarterly Journal of Economics* 98 (1983): 659–79.

Shepard, Andrea. "Price Discrimination and Retail Configuration." *Journal of Political Economy* 99 (1991): 30–53.

Shepard, Andrea. "Contractual Form, Retail Price, and Asset Characteristics in Gasoline Retailing." *RAND Journal of Economics* 24 (1993): 58–77.

Sourcebook of Zip Code Demographics. Fairfax, Va.: CACI, 1987, 1990.

Telser, L. G. "A Theory of Self-Enforcing Agreements." *Journal of Business* 53 (1980): 27–44.

Wolinsky, Asher. "Prices as Signals of Product Quality." *Review of Economic Studies* 50 (1983): 647–58.