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Modeling Customer Satisfaction and Future Patronage in Retail Services with Low Levels of Product Differentiation: Gas Stations.

Keywords: Retailing; Customer Satisfaction; Distribution Services; Gas Stations; Satisfaction/ Purchase Intentions Link.

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ABSTRACT:

This paper addresses two related issues. First, it adapts a framework developed for the analysis of customer satisfaction in retailing to the case of gas stations, and implements this framework with unique survey data. The results show that the determinants of customer satisfaction are different for self service and full service stations. Second, it looks at the effects of attributes that determine satisfaction on economic performance in two different ways: directly, through their effect on future purchase intentions, and indirectly, through the attribute /satisfaction / purchase intentions links. Our most striking result is that the indirect approach breaks down because the second link in the relation fails to exist for service stations.

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JEL Code: M3; L8; M31; L81.

% 1. INTRODUCTION %

In this paper, we adapt a model that captures a proper specification of the demand for and the supply of distribution services to investigate customer satisfaction with one retail service which provides a low level of product differentiation, namely gas stations. We also consider the impact of customer satisfaction on repurchase intentions in this setting. Our interest in these two research questions stems from several sources. For instance, the standard framework for the analysis of customer satisfaction, for example as illustrated by Anderson and Sullivan's (1993) frequently cited paper, does not seem to fit retail services in general or gas stations in particular. In essence this framework focuses on the manufacturer's point of view and the manufacturing firm as the unit of analysis, stresses the quality of products relative to expectations about that quality as the main determinant of customer satisfaction, and focuses on repeat purchase intentions as the relevant economic performance variable affected by satisfaction. Gasoline is not a product for which one would expect a gap between product quality and quality expectations. Hence this approach or subsequent literature following or extending this approach, e.g., Anderson, Fornell and Mazvancheryl (2004) or Kopalle and Lehmann (2006), does not seem applicable to this setting without substantial modification.

A related literature has proceeded by extending the concept of customer satisfaction to the service sector in various ways. This has been done treating "... service quality and customer satisfaction almost interchangeably..." (Rust and Zahorik 1993, p.193), or using attributes to identify service quality and customer satisfaction (Gomez, McLaughlin and Wittink 2004). Most recently, Betancourt et al. (2007) have introduced an approach suitable for retailing environments and applied it to the analysis of customer satisfaction with supermarkets. In this approach

customer satisfaction is determined conceptually by the gap between the distribution services supplied by a retailer and the distribution services demanded by consumers. Thus, it preserves the intent of the original literature focused on manufacturing while modifying it for the service setting associated with retailing. Gas stations, however, have much lower levels of product differentiation than supermarkets. Thus, one of the two specific questions we seek to answer here is – To what extent can this approach be adapted and applied successfully to retail services with low levels of product differentiation?

One strand of literature on customer satisfaction has stressed possible non-linearities in the links between attributes, satisfaction and economic performance variables, for example Anderson and Mittal (2000). If the links were linear the direct impact of attributes on economic performance variables would be the same as the indirect impact of attributes through satisfaction and of satisfaction on economic performance. If the links are non-linear the results can differ. An example of the direct approach is Rust and Zahorik (1993); an example of the indirect approach, or attribute/satisfaction /profitability chain, is Kamakura, et al. (2002). Distribution services can be viewed as attributes and in the analysis of supermarkets the two approaches generated different results. That is, while all distribution services explained customer satisfaction and customer satisfaction explained future patronage intentions as suggested by the indirect approach, some distribution services explained future purchase intentions while other distribution services had no effect on future purchase intentions in the direct approach. But, the demand for distribution services can be affected by the level of product differentiation of the core retail service. Hence, this enhances our interest in a second specific question we seek to answer here – Does a phenomenon similar to the one found for supermarkets with respect to the two approaches arises

for gas stations?

Some circumstances of our data are unique in ways that facilitate empirical analysis. For instance, Iyer and Seetharaman (2003) show that gasoline stations have an economic incentive to price discriminate by becoming multi-product stations that offer full and self service bays relative to staying as single product service stations of either kind. Nevertheless, the gas stations in Pamplona at the time of our survey (1998) were single product stations. Since both self service stations and full service stations were charging the same prices for gasoline, this feature of the Pamplona market while unusual in general is consistent with the analysis in Iyer and Seetharam's paper.

An important factor leading to this pricing pattern is the evolution of the petroleum industry in Spain. The Spanish gasoline market was highly regulated for many years. Various aspects of an opening transition process started as early as the mid 1980's and accelerated in the 1990's. Even small regional differences in prices (less than 1%), however, only begin to appear in 1998. This is the date of the price liberalization law, Bello (2006, Ch. 1). In any event, we can abstract from the issues associated with multi-product stations when we investigate an issue subsidiary to our first research question -- Are the determinants of customer satisfaction with gas stations the same for self service stations as they are for full service stations?

Of course, some may wonder why anyone would patronize the self-service station without a price incentive. Bateson (1985) shows that saving time and maintaining control are important dimensions perceived by those who engage in the participatory behavior associated with what has become known as labor based self service activity a high percentage of time. Incidentally one of the six self service activities included in his analysis was pumping your own gas at a service

station given the same prices as for full service. Meuter et al. (2000) find a similar result for what they call technology based self service (self service activities relying on technologies such as the Internet, for example). Since gas stations in Pamplona that allow for pumping your own gas require you to pay inside the store, they are a labor based self service activity rather than a technology based one or a mixture of the two types.

Our main answers to these research questions are the following. With respect to the first specific question, we are able to adapt successfully the approach to customer satisfaction developed for supermarkets to the case of gas stations. Not surprisingly, we find in doing so that the determinants of customer satisfaction differ between self service and full service stations as well as between both types of service stations and supermarkets. Similarly, with respect to the second specific question we find that there are differences between the direct approach and the indirect approach for gas stations. In the case of gas stations, however, the differences between the two approaches are far more dramatic than in the case of supermarkets. For, the link between customer satisfaction and repeat purchase intentions breakdowns for gas stations whereas it is very strong for supermarkets.

In the next section of the paper, we present an adaptation of the conceptual framework in Betancourt et al. (2007) to the setting of gas stations. Subsequently, in Section 3, we discuss details of our data set, the measurement of distribution services relevant for gas stations and econometric issues that arise in estimating the determinants of customer satisfaction in this context. In Section 4, we present the results of this estimation for both types of gas stations and note the relation of these new results to the broader literature on the determinants of customer satisfaction. We continue presenting results in Section 5, where we focus on the relation between

distribution services, customer satisfaction and future patronage intentions. In Section 6 we discuss the implications of the previous results and highlight connections to prior literature. Finally, we conclude by providing a brief perspective on our results.

% 2. CONCEPTUAL FRAMEWORK AND MODELING %

Distribution services have been identified as outputs in the retail literature by various authors, starting with Bucklin (1973) and continuing with Betancourt and Gautschi (1988) and Oi (1992) among others. Usually they can be assigned to one of the following five broad categories: accessibility of location, information, assortment (breadth or depth), assurance of product delivery (in the desired form or at the desired time), and ambiance. Attempts at measurement of these services at the level of the establishment have been undertaken for hardware stores, e.g., Barber and Tietje (2004), and for supermarkets, e.g., Betancourt et al. (2007). Here we extend this measurement to gas stations. How this is done is discussed explicitly in the next section.

The role of distribution services as outputs of gas stations is captured through the specification of the cost function of the gas station as

$$C = C(v, Q^s, D^s) \qquad (1),$$

where v are the prices of the inputs of the station other than the costs of gods sold, Q^s is a vector of the levels of actual output supplied at the station, D^s is a vector of the levels of distribution services supplied by the station and C are the costs of retailing net of the costs of goods sold.

Similarly, the role of distribution services as fixed inputs into the household production functions of consumers is captured through the specification of the demand function for gasoline and other retail items as

$Q^d = f\ (p, D^s, W)$ (2),

where Q^d is a vector of the quantities demanded by consumers , p is a vector of the prices of gasoline and other retail items, D^s is a vector of the levels of distribution services supplied to consumers at the station and W is the level of wealth.

The higher the level of distribution services supplied by the station (D^s), the less the consumer has to work in her purchase activities and, consequently, the higher will be the demand by the consumer, Q^d , when she patronizes the station. The specification of the cost function in (1) captures two different dimensions of output supplied by the station: the level of turnover of actual goods and services (Q^s) and the level of distribution services (D^s). Provision of higher levels of either of these two types of outputs by a gas station increases its costs.[1]

If one measures customer satisfaction as the gap between the demand for distribution services and the supply of distribution services, then the economically relevant case to analyze is one where a customer is unsatisfied, thus $D^d > D^s$, and increasing satisfaction can lead to an increase in revenues, thus $Q^d < Q^s$.[2] Since this case is the basis for our empirical analysis, it is useful to add precision to the discussion as follows: consumer i satisfaction with a station, k, is going to be given by a relation of the following form

$S_i\ (k) = f\{\ [D^d\ (i) - D^s\ (k)]_j\ ,\ p(k),\ X(i,\ k)\}$, (3)

where $S_i\ (k)$ is a measure of customer satisfaction, i.e., of consumer i satisfaction with station k. This satisfaction is going to be a decreasing function, $f_j' < 0$, of the distance between each of the j distribution services actually provided by station k, $D^s\ (k)$, and the level of each of the j distribution services demanded by consumer i, $D^d\ (\ i\ )$. Thus, the distance between the demand and supply of distribution services for each jth service, $[D^d\ (i) - D^s\ (i)]_j$, suggests itself as a natural

measure of the components of the lack of customer satisfaction with a station.

The specification in (3) captures the emphasis on product quality in the customer satisfaction literature in manufacturing. It does so, however, by identifying the distribution services provided by the retailer at the k th station, D^s (k), as the relevant measure of product quality in gasoline retailing. It relies on the view that one of the two basic 'outputs' of retailing is the vector of distribution services supplied by the retailers. Incidentally, most distribution services would be usually common to all or a subset of the explicit products of the gas station. For instance, having longer extended hours of operation can increase the demand for gasoline as well as for all or a subset of the items sold at a convenience section of the gas station.

One would also expect the function in (3) to be a decreasing function of the average prices charged by station k. In addition, consumer characteristics or other station characteristics may affect the consumer's satisfaction with a station and are captured by the vector X (i , k). In sum, equation (3) adapts the original concepts of the literature on customer satisfaction in manufacturing to incorporate important features relevant for retailing. It also incorporates the main aspects of the literature on customer satisfaction in retailing that have been implemented empirically.

% 3. EMPIRICAL IMPLEMENTATION: DATA AND ESTIMATION. %

Equation (3) can be viewed as a stand alone relation or as the customer satisfaction module in a more general setting where the aim is to implement the service profit chain framework or the return to quality framework or any variant of these frameworks. Our main data set consists of surveys of customers from 8 gasoline stations in the city of Pamplona, Spain[3]. This

feature means that, in principle, one can estimate the stand alone relation but not many of the variants that require a module linked directly to economic performance variables, which usually refer to firms. While we have some supplementary information on these retail establishments, about the firms that own them we know mainly their identity. 3 firms own two establishments each in the full service category and one of these firms owns another establishment in the self-service category, a fourth firm owns a single establishment in the self service category. Thus we can estimate only one variant as a module directly linked to economic performance: namely the impact of customer satisfaction on future patronage intentions. We will discuss this topic in Section 5. In this section we focus on the data and estimation of equation (3) as a stand alone relation.

Consumers were selected randomly to fill the survey while at the gas station during one week in the spring of 1998. The survey was designed over a period of a month. The interviewers were trained in one meeting; their instructions were printed in the first page of the survey and they were asked to fill the surveys themselves. 5 interviewers were assigned to each station, spaced over the day, each day of the week. These surveys generated a total of 280 observations (203 full service stations and 77 self service ones) with a maximum number of 41 interviews at one station and a minimum number of 21 at another.

A unique feature of these data is the measurement of distribution services as attributes associated with a gas station directly. Consumers were asked to rate on a scale of 0-10 a number of attributes that corresponded to (or at least correspond to an explicit dimension of) the five distributions services emphasized by Betancourt and Gautschi (1988). With respect to four of them, one can credibly argue that there is a close relation between the distribution service and the

measured attribute. With modifications due to differences in the fundamental offerings of gas stations, they coincide in spirit and intent with the measures used for supermarkets by Betancourt et al. (2007) or for hardware stores by Barber and Tietje (2004). We highlight important differences in the discussion below.

That is, accessibility of location, $D_i(k)_1$, is measured from the answer to the question – To what extent this station´s location makes your access, *including jointly distance and ease of entry and exit* , convenient? Information, $D_i(k)_2$, is measured from the answer to the question – To what extent the employees and the signs in this establishment facilitate your information needs with respect to gasoline, other products and services, their location in the station, prices, sales, etc.? Assortment, $D_i(k)_3$, is measured from the answer to the question – To what extent the assortment of other products and services of this station facilitates your *solving other demands you usually have* at this station?[4] Finally, ambiance, $D_i(k)_5$, is measured from the answer to the question – To what extent your treatment by employees, and the cleanliness and orderliness of the station allow your purchases to be an agreeable experience?

With respect to the last distribution service, assurance of product delivery ($D_i(k)_4$), the situation differs as follows. Just as was the case for supermarkets, for example, this concept has two dimensions, desired form and desired time. In contrast to the case for supermarkets, however, in the data *there were three rather than two* questions that picked up different aspects of assurance of product delivery at the desired time. Our approach was to use the simple average of the answers to the following three questions – To what extent is it quick and convenient to pay for your purchases at the station?; To what extent the hours and the days the station is open facilitate making your purchases when you need to do so?; *To what extent access to the pumps and their*

utilization make the services you derive from the station quick and convenient?

$D_i\,(k)_j$, j = 1,...5, represents the consumer's perception of the level of the jth distribution service provided by the kth station. It is a measure of the realized performance of the station in supplying these services as perceived by the consumer. Thus, we replace the objective levels in (3), $D^s\,(k)_j$, with the levels of supply of distribution services perceived by the consumer , $D_i\,(\,k)_j$, for purposes of estimation.

In general one does not observe the level of distribution services demanded by consumers, D^d (i). In principle, however, the demand for these distribution services could be obtained trough the use of willingness to pay surveys to estimate an inverse demand system. Here we pursue a much simpler alternative. Namely, we assume consumers are never satisfied and that they always demand the maximum level they can expect with respect to any distribution service. This expectation leads to the demand for each of the j distribution services to be at its maximum, D^d (i) = M. When the maximum (M) is assumed the same for all consumers and distribution services, and equal to the maximum value that can be perceived to be provided by the retailer, we have D^d (i) = M = 10.

An appealing aspect of this approach, besides its feasibility of empirical implementation, is that every study of customer satisfaction in retailing that measures attributes on the basis of surveys makes this assumption implicitly, if their concept is to be related to the original idea of quality relative to expectations about quality. This is true of earlier constructs, for example Servqual, or of their modern replacements (customer service, quality and value) as used in, for example, Gomez, McLaughlin and Wittink (2004). One interpretation of this assumption is consistent with the literature focused on manufacturing. Namely, the consumption of (demand

for) distribution services should be measured against a standard of pleasure or displeasure, Oliver (1999, p.34). We (and the retailing literature) are simply using the maximum as the standard.

For estimation purposes, equation (3) then becomes

$$S_i(k) = f\{[10 - D_i(k)]_j, p_i(k), X(i,k)\} + u_{ik} \qquad (4)$$

The dependent variable, $S_i(k)$, represents consumer's i satisfaction with station k and it can be represented by any of the typical measures of customer satisfaction used in the literature. In our case it was measured as the answer to the following question, also on a scale of 0-10. – What is your degree of satisfaction with the services provided and the purchases made at this station?

Notice that an increase in $[10 - D_i(k)_j]$ implies a lowering of the level of the jth distribution service as perceived by the consumer. Hence, it should result in a lower level of customer satisfaction because the distance between the quality or level of service offered and the one expected has increased. Also note that there was a similarly rated question on station prices, $p_i(k)$, which allowed us to introduce this perception of prices as an explanatory variable, $X_i(k)_6$. Namely, – To what extent the prices at this station are high relative to other similar stations?

In implementing equation (4) empirically we selected a number of other variables for inclusion as explanatory variables for various reasons. For instance, general demographic characteristics of consumers were included as controls, but we had no expectations as to how gender (X_{i7}), age (X_{i8}), position in the life cycle (X_{i9}) or extent of work outside the home (X_{i10}) would affect customer satisfaction.[5] Two objective characteristics of customers buying habits were also included as controls. These were the length of stay at the station (X_{i11}) and the size of the average purchase at the station (X_{i12}).

Attitudes toward purchasing gasoline products were also included. These were: To what extent do you prefer to pump your own gasoline?, (X_{i14}); how important is the time you spent on this activity? (X_{i15}); and do you search for alternative establishments to make this type of purchase? (X_{i16}).

One econometric problem that arises in estimating equation (4) is that our dependent variable can be interpreted as censored, especially at the top since there are no observations at the bottom.[6] The standard procedure to address censoring is Tobit analysis. According to Maddala (1983), however, if there is a true maximum the censoring interpretation does not apply. The discussion leading to our estimating equation suggests that 10 is a true maximum. In any event, we estimated equation (4) with Tobit analysis as well as with regression analysis and the results were almost the same in terms of statistical and economic significance.[7] Hence, we will present only the regression results to conserve space.

A couple of other econometric problems arise due to the nature of our data. That is, the customers were interviewed during their patronizing a particular station. This feature raises two issues. First, the standard assumption that the disturbances are uncorrelated with each other is unlikely to hold if there are events that affect all the customers of one station and their satisfaction with that station. This problem is addressed by correcting for clustering by the establishment so that the standard errors are robust to the possibility of correlation among the error terms for consumers of that establishment. Use of establishment fixed effects in a pooled OLS regression corrects for clustering by the establishment, Wooldridge (2002, pp. 328-331). We employed this procedure to address this issue but it also controls for unobserved factors associated with each establishment.

Second, the effect of any variable, for example the distribution services, that appears both in a gas station selection equation and in the customer satisfaction equation on customer satisfaction could be biased if equation (4) is estimated ignoring the selection problem. We have a variable that is very close to a selection variable. This variable is the frequency of purchases at this gas station within a month [X_{i13} (k)], which is defined as a dummy variable that takes on the value of 1 if the customer patronizes the establishment more than 2 times within a month and zero otherwise. Hence, we added this variable as an explanatory variable in equation (4) to correct for the possibility of selection bias.

An objection that can be raised to this procedure is that frequency of purchases introduces an endogeneity problem into the regression. We have three pieces of evidence that this is unlikely to be a problem in our analysis. First, whether or not this variable is included has no effect on our main results, which can be seen in Tables 2A and 2B and is discussed in the next section. Second, we performed the following experiment. We defined the variable somewhat differently: namely, as taking on the value of 1 if the consumer patronizes the establishment more than 3 times within a month and zero otherwise. Use of this new variable in the analysis leads to exactly the same results as use of the old one, which is unlikely if the variable was truly endogenous. Finally, and perhaps most importantly, we ran regressions explaining frequency of purchases in terms of customer satisfaction and the explanatory variables used in our analysis other than distribution services. Customer satisfaction was statistically insignificant at the 1 % level using both probit and OLS as estimation methods.

% 4. THE DETERMINANTS OF CUSTOMER SATISFACTION WITH GAS STATIONS. %

Tables 1A and 1B present summary statistics on all the variables used in the paper, including one appearing in the next section but not in this one, for full service and self service stations, respectively. It also gives a descriptive name as well as the corresponding symbol for each variable used in the analysis in this section and the next one. An interesting aspect of these descriptive statistics is that the average level of customer satisfaction is essentially the same for customers of self service and full service stations. Bendapudi and Leone (2003) find that the level of customer satisfaction for those who participate in the production process is the same as for those who don't participate when the outcome turns out as expected. Since the expectations of customers of each type of station are likely to differ, we will carry out our empirical analyses in this section and the next one separately for each type of station.

Just as mentioned earlier, estimation with Tobit analysis generates almost the same results statistically and substantively as the OLS results in Tables 2A (full service) and 2B (self service). One small difference is that in the customer satisfaction regressions a couple of control variables with t-ratios lower than 2 but higher than 1.7 in OLS take on values higher than 2 but less than 2.3 with Tobit analysis. This is the case for X_{16} and X_{14} in the full service sample and for X_{82} and X_{94} in the self service sample. There are no differences with respect to the distribution services.

Whether or not the frequency of purchases at this station, $X_{13}(k)$, is included has no effects on the results. This can be seen by comparing columns 2-3 of Table 2A and 2B, where this variable is included, with the corresponding columns (4-5) in these tables, where it is not included. Since this variable is the basis of our correction for self–selection, we chose to include both sets of results.

Our empirical analysis shows that the determinants of customer satisfaction differ between gas stations and supermarkets. In the case of supermarkets all five distribution services were statistically significant determinants of customer satisfaction with the expected sign, e.g. Betancourt et al. (2007) (Table 2); In the case of gas stations, however, only two of the five distribution services are statistically significant determinants of customer satisfaction (and they have the expected sign), which can be seen in Tables 2A and 2B. Thus, the approach developed earlier for the analysis of the determinants of customer satisfaction in retailing is applicable to gas stations. Not surprisingly, however, the importance of different determinants of customer satisfaction varies substantially between supermarkets and gas stations.

Perhaps more importantly, the determinants of customer satisfaction differ between full service and self service stations. This is evident based on the individual results presented in Tables 2A and 2B. While only two distribution services matter for gas stations, they are not the same for full service and self service. Assurance of product delivery at the desired time (D_4) matters for both types statistically and substantively. Information provision (D_2), however, is relevant for self service stations but not for full service ones. By contrast, ambiance (D_5) in the form of treatment by employees and orderliness and cleanliness of the station matters for full service ones but not for self service ones.

These results are intuitively appealing in that lack of information provision affects the self-service experience more fundamentally than the full service one. For instance, Meuter et al. (2005) find that role clarity, defined as the knowledge by consumers of what is expected of them, is a critical factor in the trial of self service technologies. Similarly, treatment by employees is, by definition, a more fundamental feature of full service provision than of self-service ones.

Furthermore, the larger substantive impact of assurance of product delivery at the desired time on customer satisfaction for self service stations than for full service ones is consistent with the finding in the literature, noted in the introduction, that time or control have a higher premium for those who select self service.

Only one other variable has a t-ratio higher than 2 for full service stations. That is, the perception of prices charged by the station relative to others. Not surprisingly, a perception of higher prices relative to other stations reduces satisfaction. Recall that the prices of gasoline are the same across stations; these perceptions refer to the prices of other products in the assortment. In the case of self-service ones, the only other variable with a t-ratio greater than 2 is position in the life cycle. Those married without children (X_{91}) have higher levels of satisfaction with gas stations than single ones.

% 5. RESULTS ON FUTURE PATRONAGE INTENTIONS %

In this section we consider the impact of customer satisfaction on future patronage intentions. One of the survey questions asks the customers to indicate on a scale of 0-10, – To what extent do you plan to continue to pump gas at this station? Thus, we are in a position to answer the question of what is the effect of increasing the level of a distribution service perceived by the consumer (D_i (k)) on future patronage intentions (FP_i) in two different ways. The first one is a direct procedure where distribution services become explanatory factors in a regression explaining future patronage intentions, for example as in the equation below,

$$FP_i (k) = f [D_i (k), p_i (k), X(i, k)] \qquad (5)$$

When the effect of the attribute or distribution service in (4) is linear and the link between

customer satisfaction (S) and future patronage intentions is also linear, then the coefficient of the service or attribute in a linear specification of (5) gives the same answer as the following two step procedure. In the first step one estimates the impact of the service on customer satisfaction as in (5). That is $-b_j = \partial S/\partial D_j$ is the negative of the estimate of the jth distribution service, for example the ones in the second column of Table 2A or B. In the second step one estimates the impact of customer satisfaction on future patronage intentions. That is $a = \partial FP/\partial S$ is the impact of a one unit increase in customer satisfaction on future patronage intentions, which is estimated from the following specification,

$$FP_i(k) = f[S_i(k), p_i(k), X(i, k)] \qquad (6)$$

The results of OLS estimation of both specifications are presented in Tables 3A and 3B for full service and self service stations, respectively. Using the direct approach (column 2) accessibility of location (D_1) matters statistically in determining future patronage intentions for self service stations whereas assurance of product delivery (D_4) plays this role for full service. No other distribution service has a discernible effect statistically on future patronage intentions. This result is similar to what Betancourt et al. (2007) found for supermarkets in that it implies that the direct approach and the indirect approach yield different results.

Perhaps more importantly, customer satisfaction (S) measured in a form typical of the literature on manufacturing and retailing is not a statistically significant determinant of future patronage intentions at any reasonable level of significance in Tables 3A and 3B. This result differs dramatically from what Betancourt et al. (2007) found for supermarkets, where customer satisfaction by itself explained as much of the variation in future patronage intentions as the five distribution services together.[10]

If we look at the impact of the control variables we see that their effect on future patronage intentions is similar under the indirect and the direct approach. Using a t-ratio greater than 2 as a criterion, the importance of time in this activity (X_{15}) and the frequency of purchases (X_{13}) matter statistically, and of course with the same sign in both approaches, for full service stations. Nothing else but one of the establishment dummies matters. Incidentally, willingness to search (X_{16}) would also matter in both approaches if we were to use 10% as our criterion for the significance level. In the case of self service, preference for pumping your own gas (X_{14}) matters for both approaches when using a 10% level of significance as the criterion and frequency of purchases (X_{13}) matters even using a t-ratio of 2 as a criterion. The one exception in the self service sample is that for the indirect approach the length of stay at the station (X_{11}) increases future patronage intentions, but with the direct approach the result becomes statistically insignificant at any reasonable level.[11]

% 6. IMPLICATIONS %

A most striking economic and managerial implication of our results is the breakdown of the service/satisfaction/intentions chain (the indirect approach) in the case of gas stations. In order to evaluate the effect of a service on economic performance through the service /satisfaction /intentions chain, the manager of a station needs to know the answer to two questions: First, – What is the impact on customer satisfaction of increasing the level of a distribution service per unit cost? Second, – What is the impact of increasing customer satisfaction by one unit on future patronage intentions in terms of economic performance variables? The statistical analysis in Section 5 implies that overall customer satisfaction has no effect on future patronage intentions

and, thus, the indirect approach can not be implemented in the case of gas stations.

An implication of this magnitude in importance immediately raises questions and needs to be put in perspective. For instance, is there evidence of a similar result in earlier literature? Evidence of overall satisfaction having no impact on future purchase intentions is hard to find but there is some. Szymanski and Henard (2001) note that out of the 517 correlations in their meta-analysis only 29 (5.6 %) pertain to a variable that is a consequence of satisfaction (and not necessarily future purchase intentions). In the 9 studies they found that correlate satisfaction with repeat purchases, all 17 correlations are positive and only 2 are statistically insignificant at the 5% level. One other study addressing this issue finds a similar result. Garbarino and Johnson (1999) find that for 'consistent subscribers' trust and commitment rather than customer satisfaction explain purchase intentions. Since 65% of the full service sample and 47% of the self service sample patronize the station more than twice a month, our two samples can be viewed as consisting of mainly 'consistent subscribers'.

One strand of literature on customer satisfaction stresses the need to account for asymmetries and non-linearities in functional form, e.g., Mittal, Ross and Baldasare (1998) and Mittal and Kamakura (2001). Hence, we re-estimated the relation between satisfaction and future purchase intentions two different ways to ascertain if asymmetries or non-linearities were generating our result. First, we split the satisfaction variable into three categories: satisfied, indifferent and unsatisfied using either 5 (the middle of the scale) or 7 (the median in both samples) as the center of the indifference values. The results were the same as before. Second, we re-estimated the relation between satisfaction and purchase intentions using a quadratic form in satisfaction and introducing satisfaction as a logarithmic variable. In both cases we obtained the

same results as before. In sum no relation between satisfaction and purchase intentions is a robust result with respect to asymmetries and non-linearities for gas stations.

We also note here, however, that the direct approach provides a mechanism for ascertaining the impact of distribution services on economic performance variables. Our results allow managers of gas stations to evaluate the impact of a particular distribution service on future patronage intentions. That is, managers of self service stations should concentrate on improving ease of entry and exit (distance to customers is not subject to managerial control in the short-run) while managers of full service stations should concentrate on improving access to pumps and their utilization, the extent of hours and days of operation and the speed and flexibility of payments.

To conclude with a simple illustration, a one unit increase in accessibility for a self-service station increases future patronage intentions by 0.58 units, which can be interpreted as an increase of 5.8% in the probability of a visit. In our data average expenditure per visit is 18 euros. If there are 20 visits a day over a six day week for a 50 week yearly period, there will be 6000 visits in the 'year'. Thus, a one unit increase in accessibility for a station with 6000 visits over a year generates an expected yearly increase in revenues of 6,264 euros [18*0.058*6000]. If net profits are 5% of revenues, which was typical for gas station in Spain at this time, then expenses of 313 euros or less for a one unit increase in accessibility increase the net profits of the establishment.

% 7. CONCLUDING REMARKS %

Our main contributions in this paper are the following. First, we adapt the framework for the use of distribution services as the basis for the analysis of customer satisfaction in retailing to

the setting of gas stations. This adaptation entailed the measurement of distribution services at the station level for the first time in a manner that can be easily replicated. Second, we have implemented this framework empirically using a unique data set to estimate the determinants of customer satisfaction. The results indicate that these differ between self service and full service stations as well as between gas stations in general and supermarkets. Finally, and more dramatically, our results indicate that the attribute/satisfaction/performance chain breaks down in the case of gas stations. Nonetheless we show that an approach based directly on distribution services provides a feasible alternative to look at effects on economic performance.

Clearly our last result suggests a need for future research to ascertain its generality in various dimensions. One dimension, of course, is the one emphasized in the title of the paper. Namely, is this result to be expected in other service sectors similar to gas stations in their low levels of product differentiation with respect to the core product? Furthermore, a more immediately attractive area for future research is to determine the extent to which the break downs in the satisfaction/performance link are a general occurrence for gas stations in other settings, e.g., other cities or other countries. Similarly, a comparison with a more recent period in Pamplona would be interesting. For, there have been dramatic changes in several relevant aspects of gas stations in this city in the last nine years, e.g., numbers, explicit services and products offered, and nature of the competitive environment. Finally, an unexplored area of research in the retail setting is the connection between customer satisfaction with an establishment and customer satisfaction with the firm that owns the establishment.

% NOTES %

1. For additional details on the properties of the demand function and the cost function see Betancourt (2004) Chapters 3 and 4, respectively.

2. Except for well publicized and rare periods of shortages, gas stations are usually stocked with enough gasoline to meet customer demand.

3. 2 of the gas stations were self-service, 6 of the gas stations were full service. At the time of the survey these 8 gas stations were almost the universe of gas stations in Pamplona proper. Furthermore, a regulation system was in place that fixed maximum prices at which gasoline could be sold. At that time, the prices charged were the same at both types of stations in Pamplona and all stations and the firms owning the stations were being investigated for possible price collusion during this period. Prices have subsequently diverged between both types of stations and the universe of stations has increased considerably.

4. Assortment is by definition very different for supermarkets and gas stations with respect to both depth and breadth. Gas stations have much shallower and narrower assortments than supermarkets.

5. For a more detailed description of all variables see the data Appendix.

6. It turns out there are no observations for this variable that take on the value of 0 for either type of station and 3 out of 77 and 21 out of 203 that take on the value of 10 for self-service and full service ones, respectively.

7. Betancourt et al. (2007) found the same result for supermarkets. That is, the results of the two estimation techniques were the same for all practical purposes.

8. Joint tests of significance on the parameters of the full model or of the subset of parameters that

are statistically significant reject the null hypothesis of equality of coefficients determining customer satisfaction in the two samples at the 5% level.

9. The impact of assurance of product delivery at the desired time on customer satisfaction is over 30% larger for self-service stations.

10. We performed a non-nested test to choose between the direct and the indirect approach. The non-nested test led to the rejection of the indirect approach and the acceptance of the direct one for each sample. This was the case whether we considered all five distribution services together or we considered only the statistically significant ones individually.

11. For future patronage intentions the results reported here are the same with Tobit analysis for both full and self service stations.

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% TABLES %

Table 1A. Descriptive Statistics. Full Service Stations

Variable Name	Symbol	Mean	Standard Deviation	Maximum	Minimum
Customer Satisfaction	S	7.12	1.84	10	1
Accessibility of Location	D_1	6.87	2.30	10	0
Information	D_2	5.30	2.66	10	0
Assortment	D_3	3.66	2.86	10	0
Assurance	D_4	7.42	1.60	10	1.33
Ambiance	D_5	7.26	1.98	10	1
Price	X_6	5.52	1.70	10	0
Gender 0 (male)	X_{70}	0.72	0.45	1	0
Gender (female)	X_{71}	0.28	0.45	1	0
Age 0 (less than 25)	X_{80}	0.30	0.46	1	0
Age 1(25 - 40)	X_{81}	0.43	0.50	1	0
Age 2 (41 - 60)	X_{82}	0.24	0.43	1	0
Age 3 (> than 60)	X_{83}	0.03	0.18	1	0
Life cycle 0 (single)	X_{90}	0.34	0.47	1	0
Life cycle 1 (no child)	X_{91}	0.22	0.42	1	0
Life cycle 2 (child < 6 yrs.)	X_{92}	0.12	0.33	1	0

Table 1A. Descriptive Statistics. Full Service Stations (continued)

Life cycle 3(6 <child age <14)	X_{93}	0.08	0.28	1	0
Life cycle 4 (child>14 yrs.)	X_{94}	0.23	0.42	1	0
Hours worked	X_{10}	7.26	3.52	15	0
Mean length of stay (mins.)	X_{11}	5.19	2.81	15	1
Size of purchases (24€ or more)	X_{12}	0.33	0.47	1	0
Frequency of purchases in the station (more than twice a month)	X_{13M2}	0.65	0.48	1	0
Pleasure in purchasing	X_{14}	2.49	3.31	10	0
Importance of time	X_{15}	4.05	3.17	10	0
Searches for other stores	X_{16}	6.82	2.79	10	0
Future Patronage Intentions	X_{20}	6.98	2.46	10	0

Table 1B. Descriptive Statistics. Self Service Stations

Variable Name	Symbol	Mean	Standard Deviation	Maximum	Minimum
Customer Satisfaction	S	7.07	1.67	10	2
Accessibility of Location	D_1	6.21	2.20	10	0
Information	D_2	6.36	2.43	10	0
Assortment	D_3	4.02	3.07	10	0
Assurance	D_4	7.58	1.19	10	4
Ambiance	D_5	7.31	1.90	10	0
Price	X_6	5.90	1.71	10	0
Gender 0 (male)	X_{70}	0.78	0.42	1	0
Gender (female)	X_{71}	0.22	0.42	1	0
Age 0 (less than 25)	X_{80}	0.34	0.48	1	0
Age 1(25 - 40)	X_{81}	0.43	0.50	1	0
Age 2 (41 - 60)	X_{82}	0.21	0.41	1	0
Age 3 (> than 60)	X_{83}	0.03	0.16	1	0
Life cycle 0 (single)	X_{90}	0.47	0.50	1	0
Life cycle 1 (no child)	X_{91}	0.14	0.35	1	0

Table 1B. Descriptive Statistics. Self Service Stations (continued)

Life cycle 2 (child < 6 yrs.)	X_{92}	0.18	0.39	1	0
Life cycle 3(6 <child age <14)	X_{93}	0.08	0.27	1	0
Life cycle 4 (child>14 yrs.)	X_{94}	0.13	0.34	1	0
Hours worked	X_{10}	7.31	3.17	13	0
Mean length of stay (mins.)	X_{11}	5.26	3.71	30	1
Size of purchases (24€ or more)	X_{12}	0.40	0.49	1	0
Frequency of purchases in the station (more than twice a month)	X_{13M2}	0.47	0.50	1	0
Pleasure in purchasing	X_{14}	3.57	3.40	10	0
Importance of time	X_{15}	4.00	2.70	10	0
Searches for other stores	X_{16}	5.73	2.87	10	0
Future Patronage Intentions	X_{20}	5.55	2.67	10	0

Table 2A. Customer Satisfaction and Its Determinants: Full Service Stations.

Variable	Regression Coefficient	T- Ratio	Regression Coefficient	T- Ratio
Constant	9.31	12.39*	9.06	12.31*
$[10 - D_1]$	-0.04	-0.77	-0.07	-1.19
$[10 - D_2]$	-0.02	-0.49	-0.01	-0.16
$[10 - D_3]$	0.02	0.67	0.02	0.45
$[10 - D_4]$	-0.38	-4.61*	-0.38	-4.57*
$[10 - D_5]$	-0.33	-5.80*	-0.33	-5.80*
X_6	-0.12	-2.07*	-0.12	-2.03*
X_{71}	0.06	0.25	0.11	0.46
X_{81}	0.11	0.38	0.09	0.30
X_{82}	-0.25	-0.55	-0.31	-0.68
X_{83}	0.70	1.00	0.62	0.89
X_{91}	-0.28	-0.99	-0.23	-0.82
X_{92}	-0.16	-0.42	-0.12	-0.31
X_{93}	0.34	0.75	0.39	0.87
X_{94}	0.07	0.15	0.15	0.33
X_{10}	0.05	1.50	0.06	1.77

Table 2A. Customer Satisfaction and Its Determinants: Full Service Stations (continued)

X_{11}	-0.05	-1.19	-0.05	-1.30
X_{12}	-0.03	-0.13	-0.04	-0.16
X_{14}	0.06	1.70	0.06	1.81
X_{15}	-0.05	-1.56	-0.05	-1.53
X_{16}	0.07	1.71	0.07	1.86
X_{13}	0.34	1.51	--	--
E1	0.11	0.29	0.19	0.49
E2	0.46	1.18	0.54	1.40
E3	-0.21	-0.58	- 0.14	-0.37
E4	0.37	0.85	0.41	0.93
E5	-0.14	-0.39	-0.07	-0.19
R^2	0.53	--	0.53	--

* t-ratio greater than 2.

Table 2B. Customer Satisfaction and Its Determinants: Self Service Stations.

Variable	Regression Coefficient	T- Ratio	Regression Coefficient	T- Ratio
Constant	9.81	7.19*	10.03	7.67*
[10 - D_1]	0.08	0.84	0.08	0.89
[10 - D_2]	-0.20	-2.10*	-0.21	-2.21*
[10 - D_3]	-0.11	-1.59	-0.10	-1.51
[10 - D_4]	-0.54	-3.09*	-0.54	-3.11*
[10 - D_5]	-0.03	-0.25	-0.02	-0.14
X_6	0.01	0.09	-0.00	-0.37
X_{71}	-0.17	-0.36	-0.11	-0.24
X_{81}	0.20	0.40	0.15	0.30
X_{82}	-1.36	-1.82	-1.46	-1.99
X_{83}	-1.69	-1.09	-1.81	-1.19
X_{91}	1.30	2.27*	1.23	2.20*
X_{92}	0.04	0.07	-0.03	-0.05
X_{93}	1.04	1.33	1.01	1.30
X_{94}	1.50	1.71	1.58	1.84
X_{10}	-0.05	-0.75	-0.05	-0.75

Table 2B. Customer Satisfaction and Its Determinants: Self Service Stations (continued)

X_{11}	-0.01	-0.15	-0.01	-0.17
X_{12}	-0.61	-1.51	-0.58	-1.45
X_{14}	-0.04	-0.57	-0.03	-0.50
X_{15}	0.05	0.62	0.54	0.70
X_{16}	-0.05	-0.61	-0.07	-0.93
X_{13}	-0.27	-0.62	--	--
E1	0.34	0.68	0.44	0.97
R^2	0.47	--	0.47	--

* t-ratio greater than 2.

Table 3A. Future Patronage Intentions: Full Service Stations.

	Direct Approach		Indirect Approach	
Variable	Coefficient	T- Ratio	Coefficient	T- Ratio
Constant	3.19	2.62*	5.62	4.91*
S	--	--	0.09	1.08
D_1	0.10	1.27	--	--
D_2	-0.01	-0.22	--	--
D_3	-0.05	-1.00	--	--
D_4	0.31	2.59*	--	--
D_5	0.04	0.49	--	--
X_6	0.11	1.31	0.12	1.41
X_{71}	-0.19	-0.57	-0.07	-0.19
X_{81}	0.66	1.61	0.61	1.45
X_{82}	0.35	0.53	0.19	0.29
X_{83}	0.59	0.59	0.15	0.15
X_{91}	-0.23	-0.57	-0.20	-0.48
X_{92}	-0.44	-0.83	-0.34	-0.64
X_{93}	0.61	0.94	0.77	1.16
X_{94}	0.63	0.97	0.90	1.36
X_{10}	-0.01	-0.19	-0.01	-0.12
X_{11}	-0.02	-0.38	-0.06	-0.97

Table 3A. Future Patronage Intentions: Full Service Stations.(continued)

X_{12}	0.01	0.05	0.01	0.02
X_{14}	0.04	0.77	0.04	0.85
X_{15}	-0.10	-2.10*	-0.13	-2.62*
X_{16}	0.10	1.83	0.13	2.16*
X_{13}	1.82	5.78*	1.95	6.25*
E1	1.17	2.18*	1.10	2.01*
E2	-0.40	-0.73	-0.77	-1.38
E3	0.06	0.11	0.33	0.62
E4	-0.19	-0.31	-0.31	-0.49
E5	0.25	0.50	0.06	0.11
R^2	0.472	--	0.417	--

* t-ratio greater than 2.

Table 3B. Future Patronage Intentions: Self Service Stations.

	Direct Approach		Indirect Approach	
Variable	Coefficient	T- Ratio	Coefficient	T- Ratio
Constant	2.19	0.88	5.51	2.50*
S	--	--	0.10	0.56
D_1	0.58	4.73*	--	--
D_2	-0.03	-0.22	--	--
D_3	0.02	0.23	--	--
D_4	0.28	1.23	--	--
D_5	-0.14	-0.97	--	--
X_6	-0.14	-0.92	-0.20	-1.12
X_{71}	-0.83	-1.31	-1.05	-1.40
X_{81}	0.68	1.03	1.12	1.47
X_{82}	-0.13	-0.13	0.64	0.56
X_{83}	1.66	0.83	2.84	1.21
X_{91}	-0.23	-0.31	-0.18	-0.20
X_{92}	-0.20	-0.26	0.63	0.72
X_{93}	0.33	0.32	0.59	0.49
X_{94}	0.08	0.07	-0.13	-0.09
X_{10}	-0.08	-1.01	-0.06	-0.60
X_{11}	0.10	1.32	0.17	2.03*

Table 3B. Future Patronage Intentions: Self Service Stations. (continued)

X_{12}	0.57	1.09	0.04	0.07
X_{14}	0.16	1.91	0.23	2.40*
X_{15}	-0.02	-0.15	-0.08	-0.66
X_{16}	0.08	0.74	0.09	0.73
X_{13}	1.95	3.50*	2.07	3.19*
E1	-1.05	-1.66	-1.05	-1.50
R^2	0.656	--	0.466	--

* t-ratio greater than 2.

% DATA APPENDIX: GAS STATIONS. %

In this Appendix we describe in greater detail explanatory variables that were succinctly identified in the text, that is other than customer satisfaction (S), distribution services, (D_1 - D_5), and perceptions of prices relative to other stations (X_6). Variables D_1 - D_5 can be characterized as eliciting consumer's perceptions of how well the station was providing a distribution service or a selected aspect or dimension of a distribution service. The information in Tables 1A and 1B shows substantial variations in these perceptions across consumers for both self service and full service stations. In addition to the above variables, essential for our purposes, the survey gathered information on general characteristics of consumers and specific characteristics of their buying habits at gas stations.

Variables X_7 - X_{10} measure general characteristics of consumers. X_7 identifies gender (one if the consumer is female). Age, X_8 , is captured through dummy variables where the omitted category is that the consumer is less than 25. (X_{81}) is one if the consumer is between 25 and 40 years of age. (X_{82}) is one if she is between 41 and 60. Finally (X_{83}) is one if the consumer is greater than 60 years old. Position in the life cycle, X_9, was captured in terms of dummy variables where the omitted category was single without children. (X_{91}) is one if the consumer is part of a couple without children. (X_{92}) is one if the consumer has children less than 6 years old. (X_{93}) is one if the consumer has children between 6 and 14 years. (X_{94}) is one if the consumer has children over 14 years. The last of these variables, X_{10}, measures the number of hours worked outside the home during the day by the consumer.

Among the specific characteristics of their buying habits consumers were asked about the following: average length of their stay at the gas stations in minutes, X_{11}, the average amount

spent each time they put in gasoline in pesetas, X_{12}, and two questions that we used to construct a measure of frequency of patronage of the gas station, X_{13}. The survey asked customers -- How often during the week do you put in gas? -- Out of every ten times that you put in gas at a station, how often do you do it at this one? The number in the latter answer divided by ten gives the proportion of time that the customer patronizes this station. Multiplied by the answer to the former question it gives us an estimate of the frequency of patronage of this station. X_{13} was defined by us as a dummy variable that took on the value of unity if our constructed variable indicated that the customer patronized the station more than 2 times in a 30 day period and a zero otherwise.

With respect to their attitudes toward purchases at the station consumers were asked the following: To what extent do you prefer pumping your own gasoline?, $X_{14;}$ To what extent is it important for you to reduce the amount of time spent on this activity?, X_{15}; To what extent do you search for alternative establishments when doing this type of purchasing?, X_{16}. A number of questions were asked to capture a consumer's attitude toward the station. One of them,X_{20} , asks – To what extent do you plan to patronize this gas station in the future ? Another one, X_{21} , asks – To what extent would you recommend this establishment to other persons? In addition information was collected on characteristics of the station such as surface area (X_{22}), number of service bays and number of pumps, other services offered, as well number of hours the station was open. This information was not used directly in the analysis because we introduced dummies for each station into the analysis.