The Demand for and the Supply of Distribution Services: A Basis for the Analysis of Customer Satisfaction in Retailing

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Abstract:

This paper brings together two bodies of literature. One of them is a literature on the special role of the consumer in retailing. The other one is the literature on customer satisfaction. This joining of literatures is accomplished by identifying distribution services as outputs of retail firms and fixed inputs into the production functions of consumers. The result is a new conceptual framework for the analysis of customer satisfaction in retailing. Implementation of this framework with supermarket data shows that the five main categories of distribution services identified by the conceptual framework are economically important and statistically robust determinants of customer satisfaction with supermarkets. These results are obtained controlling for other variables typical of the customer satisfaction literature and measuring customer satisfaction in a manner consistent with that literature. Perhaps our most interesting result is that the effect of the determinants of customer satisfaction on future purchase intentions in the supermarket case is different when measured directly than when measured indirectly through the attributes/satisfaction/ purchase intentions chain.

Keywords: Retailing; Customer Satisfaction; Distribution Services; Supermarkets.

JEL Code: M3; L8; M31; L81.

1. Introduction

In this paper, we bring together two separate bodies of literature. First, we consider the main strand of literature on customer satisfaction. This strand is best illustrated by Anderson and Sullivan's (1993) frequently cited paper. The latter focuses on the manufacturer's point of view and the 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 emphasizes repurchase intentions as the relevant economic performance variable determined by satisfaction.

Subsequent work has taken a number of directions. One sub-strand has considered the impact of customer satisfaction on other performance variables. For instance, Anderson, Fornell and Lehman (1994) emphasize the rate of return on investment and Anderson, Fornell and Mazvancheryl (2004) emphasize Tobin's q as the relevant performance variable. Given the nature of our data, we can obtain direct results on the relation between attributes and customer satisfaction and between customer satisfaction and repeat patronage intentions but we can only obtain results with respect to other economic performance variables by making extraneous assumptions about behavior.

A related sub-strand of literature has proceeded by extending these ideas to the service sector. In some cases this is done treating "... service quality and customer satisfaction almost interchangeably...", Rust and Zahoric (1993, p.193), and in other cases differentiating between these two concepts. For example Gomez, Mclaughlin and Wittink (2003), who focus on the firm in food retailing, reduce 18 attributes identified by survey questions into three components [customer service, quality and value] through the use of factor analysis. It is these components that are assumed to determine satisfaction. Malthouse, et.al (2004) extend the analysis of customer satisfaction to multiple units of a service sector firm and apply it to the health and

newspaper industries. Our approach provides an explicit and close relationship between service quality and customer satisfaction in retailing in general and focuses on the establishment rather than the firm.

Yet another related sub-strand of this literature emphasizes asymmetries and non-linearities in the links between attributes satisfaction and economic performance variables, for example Anderson and Mittal (2000). With cross-section data we will not be able to say anything about asymmetries, but we are able to address an important non-linearity that affects whether one employs the direct or the indirect approach to evaluate effects on performance. If the links were linear the direct impact of attributes on economic performance variables would be the same as the indirect one and either approach is valid. An example of the use of the direct approach in the case of retention is Rust and Zahoric (1993). The indirect approach is obtained by first estimating the impact of an attribute on customer satisfaction and subsequently estimating the impact of customer satisfaction on the economic performance variable. An example of the use of the indirect approach is Kamakura, et.al (2002). We show that in the context of our data the indirect and the direct approach generate different answers.

We extend these ideas to the retail sector by providing a new conceptual framework for the analysis of customer satisfaction in retailing. This framework provides an answer to two difficult questions not addressed explicitly in the customer satisfaction literature. First, since retailing is a multi-product activity, what is the relevant product quality in retailing? Second, what are the relevant quality expectations in the case of retailing?

A second and separate body of literature on the role of the consumer in retailing exists and is relevant for our purposes. This literature has argued that retailing differs from other

industries in that the consumer plays a different role. For instance, Oi (1992) identifies this difference by arguing that self-service implies that the consumer is an input in the transformation process in retailing. Shaw, Nisbet and Dawson (1989) identified this difference by arguing that demand and marketing forces determine establishment (store) size, instead of economies of scale as in other industries. Ofer (1973) argues that the store has two outputs and identifies the main difference characterizing retailing as the result of the consumer choosing the ratio of the two outputs. Finally, Berne, Mugica and Yague (1999) argue that the difference from other industries is that the store's output is the result of an encounter between the consumer and the retailer.

The new conceptual framework for the analysis of costumer satisfaction put forth here, which is based on Betancourt (2004), incorporates these arguments. Furthermore, it will be shown how the various roles of the consumer in retailing identified in this literature can be captured with a proper of specification of the demand for and the supply of distribution services. This is done in the next section where these distribution services are also described in detail.

In section III we discuss a variety of estimation issues. The latter include the specification of our estimating equation, the choice of estimation method, and unique characteristics of our data and measurement of distribution services. In section IV we present the main results of employing our approach to estimate the determinants of customer satisfaction in supermarkets with a particular body of cross-section data. In Section V we present the results of estimating the effects of distribution services on repeat patronage intentions directly and indirectly through their effect on customer satisfaction. We also draw here the managerial implications of our results. A brief conclusion highlights the main contributions and limitations

that suggest areas for further research. A data appendix, available upon request, provides additional details on the nature of our data.

2. Conceptual Framework

Betancourt (2004) provides the tools to reconcile different views on the role of the consumer in retailing. This can be done by drawing the implications of a proper specification of distribution services as outputs of retail firms and fixed inputs into household production functions of consumers. This is the first task of this section. More importantly, however, this reconciliation provides the conceptual framework for linking customer satisfaction with the store to the demand and supply of turnover and distribution services. This link, which is also explicitly drawn in this section, is one of the main contributions of this paper.

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 store are starting to appear, e.g., Barber and Tietje (2004), and will be explicitly discussed in the next section.

Here, we note the essence of the process whereby the level of distribution services provided by a store is determined. Namely, as a result of how equilibrium in a retail market comes about. The retailer sets a level of services, the consumer responds to that level of services by choosing what quantities to buy and how frequently to patronize the store. In the end stores that don't provide an adequate bundle of services to a segment of a market get no patronage and

go out of business. Since this is a market equilibrium outcome, it is sometimes difficult to visualize.[1]

In order to proceed, it is necessary to capture the role of distribution services as outputs of retailers. This will be done through the specification of the cost function of the retailer as

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

where v are the prices of the inputs of the retailers other than goods sold, Q^s is a vector of the levels of output of retail items supplied by the retailer, D^s is a vector of the levels of distribution services supplied by the retailer and C are the costs of retailing net of the costs of goods sold.[2] Similarly, it is necessary to capture the role of distribution services as fixed inputs into the household production functions of consumers. This is done through the specification of the demand function for retail items as

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

where Q^d is a vector of the quantity of retail items demanded by consumers, p are the prices of these retail items, D^s is a vector of the levels of distribution services provided to consumers at a retailer and W is the level of wealth.[3]

Betancourt (2004, Ch.4) shows that Oi's argument about the consumer as an input into the production function collapses to acknowledging that distribution services are outputs of the retailer, as in (1), and that they influence the demand functions of consumers, as in (2). In a market equilibrium, where turnover demand (Q^d) equals turnover supply (Q^s) = Q, Oi's argument on the special role of the consumer reduces to acknowledging the endogeneity of Q and D^s in any econometric procedure.

Betancourt's specification of the store's outputs (2004, Ch.4) is consistent with Ofer's

argument that the store output has at least two dimensions: the level of turnover (Q^s) and the level of distribution services (D^s). Hence, Ofer's argument is easily captured in this framework. That is, the quantities of retail items demanded by the consumer, Q^d , are specified as a function of retail prices and the actual distribution services provided by the store, D^s. By choosing Q^d, the consumer chooses the ratio between Q^d and D^s as well, which was one of Ofer's assertions.

Shaw, Nisbet and Dawson's argument is not addressed in detail by Betancourt (2004) but can be easily accommodated in this framework. In the short-run store size and the supply of retail items and distribution services [Q^s; D^s] provided by the store is relatively fixed and determined by the retailer; in the long-run, however, demand and marketing forces [Q^d ; D^d] are likely to be more important as emphasized by Shaw, Nisbet and Dawson. That is higher levels of these variables [Q^d (H); D^d (H)] due to demographic, economic or technological changes, for example, will induce the building of larger stores and the provision of higher levels of turnover and distribution services by the retailer [$Q^s = Q^d$ (H); $D^s = D^d$ (H)].

Finally, Berne, Mugica and Yague's argument can be reconciled with this framework as follows: the outcome of the encounter between the retailer and the customer is a relation between the quantities demanded of these two types of output [Q^d ;D^d] and the quantities supplied of these two types of output [Q^s ; D^s]. One would expect this relation normally to satisfy these inequalities, $Q^d \leq Q^s$ and $D^d \geq D^s$. The first inequality rules out consumers facing stock-outs for any one item and the second inequality rules out retailers providing services that are not wanted by consumers for any one service. This conceptualization generates four possible cases.

A relatively simple one assumes that as a result of the encounter both equalities hold. In this case all the analyst has to worry about is the econometric problem of endogeneity of $Q = Q^d$

$= Q^s$ and $D = D^d = D^s$. Another relatively simple case assumes no capacity limitations ($Q^d < Q^s$) and that quantities demanded of distribution services equal quantities supplied, i.e., [$D^d = D^s$], that is the outcome of this encounter is a fully satisfied customer. In this case customer satisfaction is at its maximum and, if this is the case for every customer, its measurement is irrelevant. To our knowledge, this economic interpretation of the limit condition has not been identified in the prior literature on customer satisfaction in retailing.

The third and most interesting case, in our context, is one where there are no capacity limitations ($Q^d < Q^s$) and consumers' demand for at least one distribution service is always greater than the level supplied by the retailer, $D^d > D^s$. It is in this case that the measurement of customer satisfaction becomes intrinsically meaningful, since a consumer may be very close or very far from its desired or demanded level of distribution services. Furthermore, the distance between the demand and supply of distribution services, $D^d - D^s$, suggests itself as a natural measure of the lack of customer satisfaction. This conceptual foundation for the measurement of customer satisfaction in retailing is one of our principal contributions to the literature. Incidentally, the no capacity limitations condition [$Q^d < Q^s$] is necessary for the degree of consumer satisfaction to be economically interesting. Because it allows the retailer a mechanism to satisfy increased demand by customers, which is what generates profits from increasing customer satisfaction.[4]

Since identification of this case is one of the main contributions of this paper to the literature, it is useful to add precision to the discussion as follows: consumer i satisfaction with a store, k, is going to be given by a relation of the following form

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

where S_i (k) is a measure of customer satisfaction, i.e., of consumer i satisfaction with store 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 store k, D^s(k), and the level of each of the j distribution services demanded by consumer i, D^d(i).

Thus, in the context of retailing the emphasis on product quality in the customer satisfaction literature is captured by the emphasis on distribution services provided by the retailer, D^s (k), and the emphasis on expectations is captured by the level of distribution services demanded by consumers, D^d (i). Once again the establishment of these correspondences is absent from the literature on customer satisfaction in retailing. None of the references cited in the introduction addresses these two issues explicitly. Implicitly, Gomez, McLaughlin and Wittink (2003) addressed the first one by labeling a subset of the attributes in one of their three factors quality. But, these attributes leave out a substantial number of products available in the store and include a few but by no means all services. Similar issues arise in the food retailing literature on this topic cited by these authors. The specification of the rest of the items in (3) is less innovative and follows the literature. Namely, one would also expect the function in (3) to be a decreasing function of the average prices charged by store k. In addition, consumer characteristics or other store characteristics may affect the consumer's satisfaction with a store and are captured by the vector Z(i , k). Both of these ideas are expressed, for example, in Gomez, Mclaughlin and Wittink (2003).

In sum, equation (3) incorporates the original ideas of the literature on customer satisfaction and the literature on the role of the consumer in retailing while relying on widely accepted fundamental economic concepts.

3. Empirical Implementation: Estimation and Data Issues

Equation (3) represents the most general statement of the relationship between customer satisfaction and the concepts that correspond to product quality and expectations in the typical retail setting. It can allow for asymmetries and nonlinearities in the relation through the specification of the function f. Furthermore, it 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.

How one proceeds with respect to these issues is determined to some extent by the nature of the data available.[5] For instance, if only cross-section data are available asymmetries can not be captured but non-linearities can be. Similarly, if the data available are on establishments rather than firms 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. In our case we are able to estimate directly the impact of customer satisfaction on repeat patronage intentions, which some may call predictions of future loyalty. We will discuss this issue in Section V.

In general one does not observe the level of distribution services demanded by consumers, $D^d(i)$. Nonetheless, in principle the demand for these distribution services can be estimated. For example, by constructing surveys similar to what already exist but asking different questions.[6] A simpler alternative is to assume consumers are never satisfied and that they always demand the maximum level of demand they can expect with respect to any distribution service. This expectation leads to the demand for each of the j distribution services set at its maximum, $D^d(i) = M$. When the latter is assumed the same for all consumers and distribution services, one can

rewrite (3) as

$S_i(k) = f\{ [M - D^s(k)]_j , p(k), Z(i, k)\}.$ (4)

This relationship provides the starting point for our empirical analysis of customer satisfaction. The maximum value that any of the variables representing distribution services (or customer satisfaction) can take on as measured in our data is 10. Hence, we will replace M in (4) with this maximum value.[7] Our estimating equation for customer satisfaction is the following reformulation of equation (4).

$S_i(k) = f\{ [10 - D_i(k)]_j , p_i(k), X_i , X_k\} + \epsilon_{ik}.$ (5)

The dependent variable, $S_i(k)$, represents consumer's i satisfaction with store 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 on a scale of 0-10. – What is your degree of satisfaction with the services provided and the purchases made in this establishment?

$D_i(k)_j$,j = 1,...5, represents the consumer's perception of the level of the j th distribution service provided by the retailer at the k th establishment. It is as reasonable to assume that consumers base their evaluations on their perceptions of the distribution services provided as it is to assume that they identify without fail the objective level of the service provided by the retailer. Thus, we replace $D^s(k)_j$ in (4) with $D_i(k)_j$ to arrive at (5).

At this point it is useful to stress a unique feature of our data. To our knowledge, no other survey has attempted to measure distribution services as attributes directly. Consumers were asked to rate on a scale of 0-10 a number of attributes that corresponded exactly 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, there seems to be a one to one relation between the distribution service and the measured attribute.[8]

That is, accessibility of location, $D_i(k)_1$, is measured from the answer to the question – To what extent the store's location facilitates your patronizing and accessibility to the retail establishment? 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 items, their location in the store, prices, sales, etc.? Assortment, $D_i(k)_3$, is measured from the answer to the question – To what extent the assortment and variety in the store products facilitate your making all your purchases at this establishment? 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 store 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 in two ways. First, it has at least two dimensions, desired form and desired time. Second, in the data there were 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 two questions – To what extent the number of registers open and the acceptance of different means of payment facilitate the speed and convenience of paying for your purchases?; To what extent the hours and the days the store is open facilitate making your purchases when you need to do so?

Notice that the interpretation of the effects of any of these five variables on customer satisfaction remains the same. That is, an increase in $[10 - D_i(k)_j]$ implies a lowering of the level of the j th distribution service as perceived by the consumer and, thus, it should result in a

lower level of customer satisfaction because the distance between the quality or service offered and the one expected has increased. Just as noted earlier (note 7) this interpretation is at best implicit in the references in the literature. Also note that there was a similarly rated question on store prices, $p_i(k) = X_i(k)_6$. Namely, – To what extent the prices in the store are high relative to other similar establishments?

Before proceeding it is useful to characterize the nature of the data in more general terms. The data base for this study is a survey of consumers at various supermarkets in Pamplona carried out in 1998. Traditional stores or hypermarkets were not included in the survey.[9] Eleven supermarkets were selected to have their customers interviewed. These supermarkets belonged to seven different firms and there were four firms that each had two supermarkets in our selected set.[10] A total of 874 usable customer questionnaires were generated from these interviews: the maximum number of interviews from any one supermarket was 85 and the corresponding minimum number was 79. Thus, the total number of consumers was fairly evenly divided across the eleven supermarkets.[11]

In implementing equation (5) empirically we selected a number of 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 ($X_{i\,7}$),age ($X_{i\,8}$), position in the life cycle ($X_{i\,9}$) or extent of work outside the home ($X_{i\,10}$) would affect customer satisfaction.[12] Two objective characteristics of customers buying habits were also included as controls. These were the length of stay at the store ($X_{i\,11}$) and the size of the market basket ($X_{i\,12}$). On the other hand, a third characteristic of customers buying habits, the frequency of purchases at this establishment within a month ($X_{i\,13}$), was initially excluded given that we

were not focusing on cumulative customer satisfaction.

Attitudes toward purchasing food products were captured in six variables. The first three capture attitudes toward purchasing food products that are relevant for any establishment; the last three capture attitudes relevant for the particular establishment patronized by the consumer. The former were: do you enjoy engaging in this activity by yourself ($X_{i\,14}$); how important is the time you spent on this activity ($X_{i\,15}$); and do you search for alternative establishments while engaged in this activity ($X_{i\,16}$). The latter were: at this establishment do you ask for help from employees ($X_{i\,17}$), for delivery services to your home ($X_{i\,18}$), or for someone to accompany you shopping ($X_{i\,19}$). After some experimentation, which showed they made little difference to the results, we decided to exclude these last three variables from the empirical analysis. Two variables that capture objective characteristics of the environment were included: namely, surface area [$X_{22}(k)$] to capture the effect of store size and dummies for the firm to which the store belongs, $F(k)$, to capture firm effects.

One econometric problem that arises in estimating equation (5) is that our dependent variable can be interpreted as censored at the top and at the bottom.[13] The standard procedure to address censoring is Tobit analysis. In our case, however, it is not clear that the censoring interpretation applies.[14] Indeed the analysis leading to our estimating equation suggests that 10 is a true maximum. If we assume that 0 is a true minimum, there is no censoring. Incidentally the problem is also mitigated in our case by the fact that many of our variables are measured on the same scale as the dependent one. Finally, the assumption of homoskedasticity is likely to be violated in our case (since our observations come from 11 different supermarkets) and this makes Tobit analysis less desirable.[15] In any event we estimated our initial preferred specification of

equation (5) using both Tobit analysis and ordinary least squares, but it is not clear that the former should be viewed as the preferred estimation procedure in our context.

A second econometric problem that arises is a selection problem due to the nature of our data. That is, the customers were interviewed immediately after patronizing a particular supermarket. The effect of any variable, for example the distribution services, that appears both in a supermarket selection equation and in the customer satisfaction equation on customer satisfaction could be biased if equation (5) is estimated ignoring the selection problem. Fortunately, we have a variable that is very close to a selection variable: Namely, the frequency of purchases at this particular supermarket, [X_{i13} (k)]. Hence, we added this variable as an explanatory variable in our final specification of equation (5) to correct for the possibility of selection bias.[16]

4. Results on Customer Satisfaction

Table 1 presents summary statistics on all the variables used in the paper, including some appearing in the next section but not in this one. It also gives a name as well as a symbol for each variable used in the subsequent analysis. The results of estimating our preferred initial specification for customer satisfaction (5), using Tobit analysis as well as ordinary least squares, are presented in Table 2. An interesting aspect of these results is that the signs of the coefficients are exactly the same whether or not one uses Tobit analysis or ordinary least squares as the estimation method. This is true for coefficients that are statistically significant (at whatever level) as well as for those that are not. In addition to the constant term there are seven 'statistically significant' coefficients if we use a t- ratio greater than 2 as a rough guideline under both estimation procedures. Furthermore, even the magnitude of the coefficients are very similar

under both estimation procedures.[17] Thus, both estimation techniques generate similar, if not the same

statistical and economic results.[18]

Our most important result is support for the soundness of the underlying approach described in the paper. The outcome of the shopper's experience is determined basically by the distirbution services provided by the store as perceived by the customer. Every one of the variables involving the distribution services identified in our analysis has the expected sign, and a t-ratio greater than 2. In terms of statistical and economic significance as determinants of customer satisfaction, however, one can say that the assortment, assurance and ambiance provided by the establishment are far more important than the accessibility of location and the information provided by the establishment. Among the last three, ambiance in the form of courteous treatment, cleanliness and orderliness is three times as important from an economic perspective. Moreover its t-ratio is so much greater than the other t-ratios that it is the one most likely to survive a wide barrage of econometric adjustments.

Among the other results, higher prices, as expected, lower customer satisfaction. The same is true of larger establishments. That is, once the level of services is controlled for store size has a negative impact on satisfaction. One example of a mechanism generating this result would be an increase in the amount of time spent by the consumer in gathering information about prices or assortment when size increases given the levels of distirbution services. Another example would be an increase in the amount of time spent at checkout counters when size increases given the levels of distribution services.

Finally, customer characteristics seem to have little or no impact on customer satisfaction.

This is true of general demographic characteristics, general attitudes toward purchase activities and attitudes toward specific features of the establishment. Similarly, objective characteristics of the purchase activity, for example the average size of the basket purchased by the customer, do not matter in explaining customer satisfaction. Incidentally, firm dummies were included in the Tobit analysis and in the OLS regression. None of the firm dummies were statistically significant at the 1% level.

With respect to supermarkets the brand, captured by the firm dummies, adds little differentiation given the levels of distribution services provided. Consumers base their evaluation of satisfaction with the store mainly on the functional elements embedded in the services. Since this shopping experience is characterized by routine, the every-day services performance dominates the consumer's evaluation. Halo attributes such as brand play a minor, if any, role in the formation of satisfaction, especially in our case of transaction specific customer satisfaction.

Since our samples are generated by interviewing customers exiting a particular establishment, as indicated before, one can argue that our coefficient estimates suffer from a selection bias of the following nature. They reflect not only the impact of a variable on customer satisfaction but also the impact of the same variable in attracting these customers to the store. In order to control for this bias, we included as an explanatory variable a dummy, $X_{13,}$ that takes on the value of unity when a customer frequents the store 4 or more times within a month and zero otherwise. The results are presented in Table 3. They are exactly the same as we found in Table 2. Indeed, in the immense majority of cases the magnitudes of the coefficient estimates in Table 2 differ from the corresponding ones in Table 3 only after the second decimal place! The coefficient of the new variable is positive, as expected, but it is not statistically significant at any

reasonable level of significance. Thus, it does not seem that selection is a problem in our analysis

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 patronize this establishment in the future for your food purchases? 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 one where distribution services become explanatory factors in a regression explaining future patronage intentions, for example as in equation (6) below.

FP_i (k) = f[D_i (k), p_i (k), X_i , X_k]. (6)

These results are presented in Table 4.

When the effect of the attribute or distribution service in (5) 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 (6) 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 in Table 2. 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, (7).

FP_i (k) = f[S_i (k), p_i (k), X_i , X_k]. (7)

These results are presented in Table 5.

That the two methods will not give the same results is easy to see in our case. Not all distribution services are statistically significant in Table 4. In particular, information is clearly not and assurance of product delivery is not if we use a t-ratio of 2 as a strict guideline. Yet all distribution services were 'statistically significant' in Table 2 and customer satisfaction (S) is 'statistically significant ' in Table 5. Hence, the two step procedure is valid for all five of them. Given that the results differ, the two step procedure is presumed to be the appropriate one. Because it is more general, for example it does not require linearity.[19] In any event the literature on customer satisfaction, while stressing the service/satisfaction/economic performance chain, has not addressed the possibility of this difference in results from the two approaches.

Incidentally, three other strong results emerge from Tables 4 and 5, using a t-ratio of 2 with both estimation methods as a guide for reliable and robust results. The higher the frequency of purchases, X_{13}, the higher the score on the future patronage intentions variable with both methods. Similarly, the more important is the time spent on this activity the lower is the score on future patronage intentions of the consumer. Finally, the firm dummy variables are significantly different from zero, indicating that intentions of future patronage are affected by different levels of firm loyalty.[20]

To conclude the discussion we note briefly the economic and managerial implications of our results. In order to evaluate the effect of a service on economic performance through the service/satisfaction/intentions chain, the manager of a store 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? Namely,

$\partial S/\partial D_j \ / c_j = -b_j / c_j$. (8)

The piece of information in the numerator is the result of the statistical anlysis in the previous section. The piece of information in the denominator in general should be available to the store manager from knowledge and data on the operations of the store.[21]

Second, – What is the impact of increasing customer satisfaction by one unit on future patronage intentions in terms of economic performance variables? Namely,

$[\partial R/\partial FP][\partial FP/\partial S] = [\partial R/\partial FP]\ [a]$. (9)

One piece of information comes from the statistical analysis in this section (a). Just as before the first piece of information should be available to the store manager from knowledge and data on the operations of the store. It is the expected amount of revenues generated by a unit increase in future patronage intentions. Since a unit increase in FP is a movement of one unit in a scale of 0-10, we can interpret it as an increase of .10 in the probability of a visit . Thus, .10 times the average expenditures on a visit gives an estimate of $[\partial R/\partial FP]$.

To illustrate with an example[22]: the expected revenues from increasing future purchase intentions per customer by a unit $[\partial R/\partial FP]$ are .10 times average yearly expenditures of $500. per customer at the supermarket (= $50.); a one unit increase in customer satisfaction, however, generates only a 0.463 increase in future purchase intentions $[\partial FP/\partial S = a]$ and, thus, the $50. increase becomes $23.15. Furthermore, a one unit increase in ambiance generates a 0.385 ($- b_j$) increase in customer satisfaction. Hence, a one unit increase in ambiance generates an $8.91 (.385* 23.15) increase in revenues per customer. For a supermarket that has 100 customers, this implies that it should undertake the costs of increasing ambiance by one unit as long as the costs of doing so (c_j) are less than $891 per unit per year.[23]

6. Concluding Remarks

Our main contributions in this paper are the following. First, we integrate the literature on the role of the consumer in retailing with the literature on customer satisfaction. We do so by drawing the implications of viewing distribution services as outputs of retail firms and as fixed inputs into the household production functions of consumers. The resulting conceptualization provides a solid foundation for the analysis of customer satisfaction in retailing at the transaction level. Second, we have implemented this framework empirically using a unique data set that identifies distribution services explicitly. The results are sensible, robust and important. Substantively these results imply that distribution services are the main mechanism through which retailers can influence customer satisfaction with transactions at the supermarket level. Third, the effects of distributions services on future purchase intentions are very different empirically when estimated directly than when estimated as part of an attribute/satisfaction/future intentions chain.

All research has limitations and often these limitations are useful as guides to areas of further research. Ours is no exception. First, operational implementation of our approach requires supermarket managers to estimate the costs of increasing effort in the provision of distribution services as well as estimating the expected benefits of an increase in future patronage intentions. We used illustrative numbers here, but there are clear practical benefits to future research that generates reliable estimates of these cosst and benefits . Second, our analysis focuses on transaction specific customer satisfaction but extending the analysis to cumulative customer satisfaction is an attractive area for future academic research. Finally, in our data we have measured distribution services explicitly and this is an asset not a limitation. Nonetheless, Barber and Tietje (2004) have shown how to measure them implicitly, i.e., extracting them from

the service attributes associated with store surveys using principal components. Therefore, a comparison of the two approaches with respect to their effect on customer satisfacion and on future purchase intentions would also be an interesting area for future research.

Notes

1. For a discussion of how distribution services affect retail equilibrium configurations see, for example, Betancourt (2004, Chapter 2, Sections 4 and 5).

2. The primitives from which this cost function follows can be found in Betancourt (2004, Ch. 4).

3. The basis for this demand function can be found, for example, in Betancourt and Gautschi (1990).

4. For instance, the fourth case is not economically interesting (at least in the short-run) because it requires a dissatisfied customer, $D^d > D^s$,and a retailer that can't benefit from improving satisfaction because she is operating at full capacity ($Q^d = Q^s$).

5. A related consideration is whether the focus of the analysis is customer satisfaction with specific transactions or cumulative customer satisfaction. Given the cross-section nature of our data, we focus on the former rather than the latter.

6. For an example of a recent study eliciting estimates of consumer's willingness to pay see Chatterjee, Wang and Venkatesh (2005).

7. Every study of customer satisfaction 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 (2003). One advantage of making the assumption explicit is to provide guidance on how to relax it in the future; the other advantage is in connecting seemingly unconnected strands of literatures.

8. There is a long tradition, with respect to supermarkets and other retail establishments where surveys are undertaken, of asking a number of questions about services provided. These questions can be mapped into the five distribution services stressed here. For instance, Barber and Tietje (2004) look at 20 survey questions, reduce them to 14 in terms of relevance, and collapse these remaining 14 into six categories through principal component analysis: the five distribution services

stressed here and one category that refers to price. What is unique about the Pamplona data is the asking of direct questions in these surveys about four of the aggregate categories stressed here.

9. A supermarket in Pamplona is defined as a self-service establishment, usually between 250 and 2500 squared meters of surface area, with an assortment predominantly oriented toward food products.

10. Of the 18 establishments qualifying as supermarkets in the Pamplona area 14 belong to 5 chains (including one discount chain) and 4 are independent establishments. 3 of the 4 independent establishments were selected together with a large and a small establishment from each of four chains, including the discount chain.

11. Incidentally for one particular week, and evenly distributed through the daily opening hours, consumers were selected to fill the survey upon exiting the supermarket.

12. For a more detailed description of these and subsequent variables see the data Appendix.

13. It turns out there are no observations for this variable that take on the value of zero (and only one that takes on the value of 1), but there are 161 that take on the value of 10.

14. For instance, see the discussion of censoring in Maddala (1983, Chapter 1).

15. For example, see Greene (2003, Chapter 22). Incidentally, other estimation issues in the context of qualitative dependent variables lead Cortiñas (2004) to the use of neural networks as an estimation technique.

16. One could argue that this induces a simultaneity problem if customer satisfaction is a determinant of frequency of purchases. This argument is considerably weaker when one realizes that the simultaneity problem is far more likely to exist with respect to cumulative customer satisfaction than with respect to transaction specific customer satisfaction. The latter is what we are measuring

in our data.

17. For instance, except for the constant term, all the coefficients of ordinary least squares that have a t-ratio greater than 2 are within one and a half standard deviation of the value of the corresponding coefficient under Tobit analysis.

18. Incidentally, the R^2 for the OLS procedure is .497, and the adjusted one is .481.

19. By the way, the unadjusted R^2 in Table 4 is .305 whereas in Table 5 is .300. The adjusted ones are .282 and .280, respectively.

20. None of these three types of variables mattered as determinants of customer satisfaction. For completeness we also considered the variables that represented attitudes toward purchasing at this establishment [X_{17}, X_{18}, X_{19}] in this estimation. When we included these variables the results with respect to signs and statistical significance were the same as those discussed in the text.

21. In our case, since the benefits from increasing ambiance by one unit are almost three times larger in magnitude (0.434/0.153) than the next best alternative (assortment), unit costs would have to be almost three times as large to compensate for the advantage on the benefit side.

22. We use the results from the OLS regressions in this illustration.

23. Judging from the questions the costs of producing an additional unit of ambiance entail the costs of training employees to be courteous and/or to provide cleanliness and orderliness in the store.

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Table 1. Descriptive Statistics

Variable Name	Symbol	Mean	Standard dev.	Maximun	Minimun
Satisfaction	S	7.823	1.665	10	1
Location	D_1	7.857	2.456	10	0
Information	D_2	7.343	2.254	10	0
Assortment	D_3	7.314	2.321	10	0

Assurance	D_4	7.509	1.803	10	2
Ambiance	D_5	7.86	2.004	10	0
Price	X_6	5.67	2.172	10	0
Gender 0 (male)	X_{70}	0.192	0.394	1	0
Gender (female)	X_{71}	0.808	0.394	1	0
Age 0 (less than 25)	X_{80}	0.169	0.375	1	0
Age 1(25 - 40)	X_{81}	0.364	0.481	1	0
Age 2 (41 - 60)	X_{82}	0.335	0.472	1	0
Age 3 (> than 60)	X_{83}	0.132	0.338	1	0
Life cycle 0 (single)	X_{90}	0.252	0.434	1	0
Life cycle 1 (no children)	X_{91}	150	0.357	1	0
Life cycle 2 (children less than 6 years)	X_{92}	0.118	323	1	0
Life cycle 3 (children between 6 and 14 years)	X_{93}	0.118	0.323	1	0
Life cycle 4 (children over 14 years)	X_{94}	0.363	0.481	1	0
Hours worked	X_{10}	3.593	3.801	15	0
Average length of stay (minutes)	X_{11}	17.605	10.844	90	1
Size of purchases	X_{12}	0.271	0.445	1	0
Frequency of purchases	X_{13}	0.661	0.474	1	0
Pleasure in purchasing	X_{14}	7.96	2.235	10	0
Importance of time	X_{15}	6.21	3.301	10	0
Store search	X_{16}	5.295	3.151	10	0
Seeking help in store	X_{17}	5.262	3.755	10	0
Seeking home delivery	X_{18}	0.546	1.851	10	0
Shopping accompanied	X_{19}	2.977	3.282	10	0
Future PurchaseIntention	X_{20}	7.472	2.364	10	0
Store recommmendation	X_{21}	6.805	2.348	10	0
Store Surface (100 m2)	X_{22}	9.686	3.429	14	1.5

Table 2. Customer Satisfaction and Its Determinants: Initial Specification.

	Tobit Analysis		Regression Analysis	
Variable	Coefficient	T- Ratio	Coefficient	T- Ratio
Constant*	10.982	28.445	10.343	31.975

[10 - D_1]*	-0.05	-2.379	-0.047	-2.594
[10 - D_2]*	-0.061	-2.33	-0.045	-2.01
[10 - D_3]*	-0.152	-5.57	-0.13	-5.645
[10 - D_4]*	-0.147	-4.216	-0.118	-3.971
[10 - D_5]*	-0.439	-13.025	-0.388	-13.469
X_6*	-0.067	-2.483	-0.051	-2.228
X_{22}*	-0.039	-2.122	-0.036	-2.269
X_7	0.067	0.505	0.013	0.111
X_{81}	0.218	1.275	0.156	1.069
X_{82}	0.126	0.695	0.109	0.706
X_{83}	0.066	0.31	0.073	0.412
X_{91}	-0.102	-0.616	-0.103	-0.731
X_{92}	-0.247	-1.152	-0.193	-1.058
X_{93}	-0.141	-0.726	-0.074	-0.447
X_{94}	0.108	0.657	0.095	0.687
X_{10}	-0.023	-1.508	-0.018	-1.388
X_{11}	0,005	1.117	0.005	1.149
X_{12}	-0.151	-1.308	-0.14	-1.426
X_{14}	-0.012	-0.517	-0.013	-0.669
X_{15}	-0.02	-1.267	-0.015	-1.095
X_{16}	-0.019	-1.227	-0.008	-0.594
F1	-0.404	-1.913	-0.321	-1.807
F2	0.081	0.377	0.128	0.705
F3	0.029	0.125	0.037	0.191
F4	0.024	0.102	-0.007	-0.037
F5	-0.394	-1.705	-0.29	-1.488
F6	0.188	0.808	0.139	0.717

* t-ratio greater than 2 with both estimation methods

Table 3. Customer Satisfaction and Its Determinants: Selection Correction.

	Tobit Analysis		Regression Analysis	
Variable	Coefficient	T- Ratio	Coefficient	T- Ratio
Constant*	10.897	27.,724	10.269	31.154
[10 - D_1]*	-0.045	-2.103	-0.042	-2.302

[10 - D_2]*	-0.061	-2.347	-0.045	-2.025
[10 - D_3]*	-0.154	-5.639	-0.132	-5.716
[10 - D_4]*	-0.146	-4.193	-0.117	-3.947
[10 - D_5]*	-0.435	-12.846	-0.385	-13.273
X_6*	-0.067	-2.49	-0.051	-2.245
X_{22}*	-0.039	-2.166	-0.036	-2.31
X_7	0.061	0.467	0.007	0.066
X_{81}	0.211	1.237	0.151	1.034
X_{82}	0.12	0.662	0.105	0.679
X_{83}	0.051	0.243	0.062	0.349
X_{91}	-0.106	-0.638	-0.107	-0.757
X_{92}	-0.249	-1.165	-0.196	-1.075
X_{93}	-0.15	-0.77	-0.082	-0.495
X_{94}	0.096	0.584	0.083	0.6
X_{10}	-0.022	-1.425	-0.017	-1.3
X_{11}	0.005	1.1	0.005	1.132
X_{12}	-0.129	-1.099	-0.12	-1.205
X_{14}	-0.01	-0.448	-0.011	-0.597
X_{15}	-0.02	-1.279	-0.015	-1.098
X_{16}	-0.019	-1.219	-0.008	-0.59
X_{13}	0.12	1.101	0.108	1.16
F1	-0.407	-1.929	-0.325	-1.829
F2	0.08	0.371	0.126	0.694
F3	0.02	0.085	0.027	0.14
F4	0.017	0.072	-0.015	-0.075
F5	-0.405	-1.753	-0.299	-1.533
F6	0.181	0.779	0.133	0.687

* t-ratio greater than 2 with both estimation methods

Table 4. Future Patronage Intentions: Direct Approach.

	Tobit Analysis		Regression Analysis	
Variable	Coefficient	T- Ratio	Cofficient	T- Ratio
Constant	0.361	0.457	1.434	2.294
D_1 *	0.193	5.028	0.168	5.467
D_2	0.047	0.993	0.031	0.842

D_3 *	0.147	2.994	0.111	2.882
D_4	0.124	1.984	0.081	1.636
D_5 *	0.23	3.809	0.19	3.936
X_6	-0.057	-1.182	-0.033	-0.859
X_{22}	-0.037	-1.109	-0.037	-1.402
X_7	-0.378	-1.596	-0.318	-1.691
X_{81}	0.214	0.7	0.254	1.043
X_{82}	0.4	1.235	0.308	1.195
X_{83}	0.338	0.896	0.257	0.864
X_{91}	-0.138	-0.462	-0.22	-0.93
X_{92}	-0.29	-0.764	-0.221	-0.727
X_{93}	-0.024	-0.07	-0.056	-0.204
X_{94}	-0.074	-0.254	-0.031	-0.133
X_{10}	-0.002	-0.088	-0.01	-0.437
X_{11}	0.009	1.026	0.009	1.361
X_{12}	0.028	0.132	-0.004	-0.024
X_{14}	0.043	1.075	0.017	0.549
X_{15}*	-0.098	-3.438	-0.061	-2.724
X_{16}	0.023	0.813	0.033	1.477
X_{13}*	1.711	8.864	1.479	9.531
F1*	1.576	4.247	1.192	4.019
F2*	1.28	3.403	1.112	3.668
F3*	1.002	3.569	1.167	3.604
F4*	2.434	5.89	1.893	5.748
F5*	0.921	2.277	0.802	2.462
F6*	1.808	4.436	1.399	4.318

* t-ratio greater than 2 with both estimation methods

Table 5. Future Patronage Intentions: Indirect Approach

	Tobit Analysis		Regression Analysis	
Variable	Coefficient	T- Ratio	Coefficient	T- Ratio
Constant	0.606	0.779	1.657	2.699
S*	0.589	10.123	0.463	10.098

X_6	-0.027	-0.561	-0.013	-0.335
X_{22}	-0.04	-1.24	-0.041	-1.595
X_7	-0.354	-1.488	-0.291	-1.551
X_{81}	0.224	0.729	0.264	1.082
X_{82}	0.365	1.124	0.277	1.078
X_{83}	0.497	1.32	0.382	1.289
X_{91}	-0.152	-0.509	-0.242	-1.024
X_{92}	-0.232	-0.607	-0.178	-0.583
X_{93}	-0.014	-0.041	-0.049	-0.179
X_{94}	-0.143	-0.488	-0.081	-0.35
X_{10}	0.01	0.346	0	1.1
X_{11}	0.005	0.545	0.006	0.84
X_{12}	0.253	1.215	0.162	0.985
X_{14}	0.086	2.173	0.052	1.643
X_{15}*	-0.095	-3.333	-0.059	-2.642
X_{16}	0.04	1.39	0.045	2.048
X_{13}*	1.865	9.89	1.617	10.697
F1*	1.937	5.337	1.485	5.146
F2*	1.271	3.467	1.117	3.787
F3*	1.811	4.595	1.457	4.63
F4*	2.066	5.241	1.623	5.177
F5*	1.117	2.749	0.966	2.961
F6*	1.742	4.273	1.378	4.257

* t-ratio greater than 2 with both estimation methods

Data Appendix (available upon request).

In this Appendix we describe in greater detail explanatory variables that were succinctly identified in the text, that is other than S and D_1 - D_5. Variables D_1 - D_5 can be characterized as eliciting

consumer's perceptions of how well the supermarket was providing a distribution service or a selected aspect or dimension of a distribution service. The information in Table 1 shows substantial variations in these perceptions across consumers despite the fact that all 11 supermarkets considered belonged to the same type or format. In addition to these variables, essential for our purposes, the survey gathered information on general characteristics of consumers and specific characteristics of their buying habits, including attitudes toward purchasing.

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 in the establishment in minutes, X_{11} , average size of their basket in pesetas, X_{12} , and frequency of patronage of the establishment within the month, X_{13} . X_{12} was originally measured as a categorical variable (1 – less than 2000 pesetas (12 euros); 2 – $2000 < x < 5000$; 3 – $5000 < x < 10{,}000$; and 4 greater than 10,000) and we redefined it as a dummy taking on the value of unity for large purchases (categories 3 and 4) and zero otherwise. X_{13} was also redefined by us as a dummy that took on the value of unity if the answer was more than 4 times a month and zero

otherwise.

With respect to their attitudes toward purchasing in supermarkets consumers were asked the following: To what extent do you enjoy doing the purchasing of food products by yourself?, 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}. Finally, consumers were also asked: Out of ten times that you buy fresh products at this establishment, how many of them would you ask for employee help?, X_{17} ; Out of ten times that you patronize the establishment, how many of them do you ask the establishment to deliver products to your home?, X_{18}; Out of ten times that you patronize the establishment, how many of them do you do so in the company of some one?, X_{19}.

A number of questions were asked to capture a consumer's attitude toward the establishment. One of them,X_{20} , asks – To what extent do you plan to patronize this establishment in the future for your food purchases? Another one, X_{21} , asks – To what extent would you recommend this establishment to other persons? In addition information was collected from the managers of the 11 establishments on characteristics of the establishment such as surface area (X_{22}), number of registers, number of employees and number of hours the establishment was open.