Price Liberalization in a Retail Setting: Short-Run Effects and Long Run Effects

Authors:
Roger R. Betancourt is Professor of Economics, Emeritus, Economics Department, University of Maryland, College Park, 301 405 3479, betancou@econ.umd.edu.

Raquel Chocarro is Assistant Professor of Marketing, Universidad Publica de Navarra, Campus de Arrosadia, Pamplona, 34 948 166077, raquel.chocarro@unavarra.es.

Monica Cortiñas is Associate Professor of Marketing, Universidad Publica de Navarra, Campus de Arrosadia,Pamplona, 34 948 169895, mcortinas@unavarra.es.

Margarita Elorz is Professor of Marketing, Universidad Publica de Navarra, Campus de Arrosadia, Pamplona, 34 948 169374, melorz@unavarra.es.

Jose Miguel Mugica is Professor of Marketing, Universidad Publica de Navarra, Campus de Arrosadia, Pamplona, 34 976 467370, mmugica@unavarra.es.

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Abstract:

This paper 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 uniqueness lies in that during the 1998 survey prices of gasoline products were fixed by the government and during the 2007 survey prices of gasoline products were set by market participants. Our analysis provides evidence on two broad questions. 1) Which of the main determinants of customer satisfaction are affected by price liberalization in the short-run and in the long-run? 2) Which of the main determinants of future patronage intentions are affected by price liberalization in the short-run and in the long-run? We identify service characteristics, customer characteristics and establishment characteristics that matter for these two outcomes before and after the price liberalization in both the short-run and the long-run as well as some that matter in one setting but not the other one. These results provide unusual empirical evidence on the inter-temporal stability of two important relationships stressed in the marketing literature. It also reveals unexpected consequences of price liberalization in retail markets when accompanied by entry of new establishments into the market.

KEYWORDS: Retailing; Customer Satisfaction; Gas Stations; Future Patronage Intentions;

Price Liberalization; Short-Run and Long-Run.

INTRODUCTION

When economies in transition, developing countries and even developed ones engage in price liberalizations consumers are expected to be among the main beneficiaries of these processes (Boycko 1992; Li 1999; Kostova and Johnson 2004). In this paper we take advantage of a unique opportunity to provide empirical evidence on how this process actually affects consumers in terms of two important outcome variables marketing scholars have focused on: namely, customer satisfaction and future patronage intentions. Our analysis focuses on gas stations where the price of gasoline is fixed, e.g., by the government, but the prices of other products or services at the station are determined by market participants. This focus makes our results especially relevant to the multi-product setting that is typical of retailing environments (e.g., Betancourt 2004, Ch.5).

One difficulty in analyzing price liberalizations and their effects, or any other one time event, is that they are usually accompanied by other changes at the same time. These one time events generate two possible outcomes. Either one observes no changes in the characteristics or relationships of interest after the event or one observes changes in these characteristics. In the former case, it is very unlikely that the event had an effect on these characteristics or relationships and that everything else changed in just the right way to offset the change induced by the event. Thus, the argument that the event had no effect is usually convincing in and of itself. In the latter case, however, any observed change may also be due to the other things that were changing at the same time. Hence, it is impossible to conclude solely based on this evidence that the change was due to the event. While evidence of inter-temporal stability or no change in a relationship is of significance in any scientific endeavor, similarly convincing evidence of change generates more excitement and interest due to its novelty.

One characteristic of our particular retail industry controls for one of the important features that can change after price liberalization, namely the nature of the physical product subject to the price control. The gasoline products subject to price control remain the same before and after the price liberalization. Having the same physical products before and after the event makes the argument that this event had no effect more convincing. Furthermore, it eliminates an important factor that could have changed from having an effect on any changes observed after the price liberalization.

We also control for two other important aspects that can change after the price liberalization, i.e., the location and capital stock of the establishment, trough the design of our first study. There we compare the impact of price liberalization on customer satisfaction and future patronage intentions for exactly the same subset of establishments and we check for major changes in their physical characteristics. This subset of establishments was limited in the adjustments they could make to the price liberalization by their prior choices of location and physical facilities. We view the results of these comparisons as short-run effects, i.e., when location and the capital stock are fixed. In economics the general definition of the short-run is a "period" when at least one input is fixed (e.g., Varian 1987). In the context of retailing, however, it makes sense to insist on location as one of the inputs that has to be fixed given the importance of this variable in determining outcomes (e.g., Jones and Simmons 1993 and Gonzalez-Benito, Muñoz-Gallego and Kopalle 2005).

Our first study yields convincing results for aspects of the relationships that are stable and less convincing but perhaps more interesting or unusual findings for aspects of the relationships that change. The latter are subjected to further scrutiny in our second study. There we compare the impact of price liberalization on the same two outcome variables for two different sets of establishments in the same year after the price liberalization. That year we observe establishments that existed before the price liberalization and survived as well as those that were built after the price liberalization. Whereas the former set of establishments was limited in the adjustments made to the price liberalization by their prior choices of location and physical facilities, the latter set of establishments faced no such limitations. Thus, the results of these comparisons indicate similarities and differences between short-run and long-run effects.

Our objective in the second study is threefold. First, we seek evidence on whether any differences identified in the first study also hold in the long-run, after market entry. If they do, this provides convincing evidence that they were due either to the price liberalization alone or to a combination of the price liberalization and market entry and not to everything else that was changing after the price liberalization. Second, we want to establish whether or not the aspects of the results found to be stable in the short-run setting are also stable in a long-run setting. If so, the inter-temporal stability of these aspects of the relationship is strengthened by this additional evidence. Finally, we seek to identify any differences between the short-run and the long-run setting with respect to the two outcome variables. If any, it may be possible to relate them to the price liberalization or they may be of intrinsic interest for what they reveal about the operation of customer satisfaction and future patronage intentions when price liberalization and market entry interact.

Customer satisfaction is usually viewed as a means to an end and the end can be an economic performance variable other than future patronage intentions. These have included, for example, the rate of return on investment (Anderson, Fornell and Lehman 1994) and Tobin's q (Anderson, Fornell and Mazvancheryl 2004). More recent literature has extended the possibilities even more by considering its effect on other outcomes viewed as intervening variables, for example advertising or efficiency (Luo and Homburg 2007). This enhances the importance of our results for this outcome variable, since they can be relevant for many settings. On the other hand, it generates a wide array of potential specifications on how product price liberalization affects outcomes of interest to retailers.

Our investigation is pertinent for all model specifications that include a direct effect for product price on customer satisfaction (e.g., Huddleston, Whipple, Nye Mattick and Jung Lee 2009) whether or not there is an additional separate effect on the performance or intervening variable of interest. Fortunately, specifications that include only a direct effect of price on performance, or on intervening variables, with no effect through satisfaction are few (e.g., van Doorn and Verhoef 2008). In any included model specification a fundamental question addressed is whether or not product price liberalization affects customer satisfaction directly or only indirectly through changes in its other main determinants. In the case of retailing, pricing and its competitive effects are sufficiently important to warrant a survey defining research opportunities (Kopalle et al. 2009). In this survey specific mention is made of the difficulty faced by researchers in measuring store price level. Our approach provides an alternative measurement mechanism by using surveys to indicate perceived store price level.

In the case of future patronage intention a fundamental question addressed is also the same. Does product price liberalization affect future patronage intentions directly or only indirectly through changes in its other main determinants? The implications of the results for this outcome variable, however, are more limited, since they need not apply to other performance variables such as profits or market share. Thus, we present the results for this variable more succinctly.

We discuss prior literature on both outcome variables, the conceptual framework adopted and the specific research questions addressed in the next section. Subsequently, we discuss the specific setting and the two data sets relied upon in our study. The latter section sets the stage for a discussion of the empirical implementation of the concepts used and the estimation procedure. To keep the paper of manageable length an appendix available on the web provides additional details on the data. For simplicity of exposition we present the results of the two studies as follows: first, we discuss results for customer satisfaction in both studies; and, secondly we do the same for future patronage intentions. We conclude with a brief summary of contributions, implications and limitations.

LITERATURE, FRAMEWORK AND RESEARCH QUESTIONS

In marketing a standard framework for the analysis of customer satisfaction has developed from a frequently cited paper (Anderson and Sullivan 1993). Within the context of manufacturing this framework has been extended in a number of directions (e.g., Kopalle and Lehmann 2006). Contributions in the context of the service sector have proceeded by treating "…service quality and customer satisfaction almost interchangeably" (Rust and Zahorik 1993, 193), or by using attributes to identify service quality and customer satisfaction (Gomez, McLaughlin, and Wittink 2004; Malthouse et al. 2004). Recently, an approach that integrates the framework previously applied to manufacturing with attributes of the distribution sector, i.e., distribution services, stressed in economics and marketing (Bucklin 1978; Betancourt and Gautschi 1988; Oi 1992; Berry, Seiders, and Grewal 2002) has been developed (Betancourt et al. 2007).

Relaxing the assumption that the demand for these services equals the supply of these services allows application of the same conceptual approach to customer satisfaction in manufacturing to firms or establishments in the retail sector. Furthermore, under the same assumptions made in previous empirical analyses of the retail sector (i.e., the use of a standard of pleasure or displeasure as argued by Oliver 1999), this integration is suitable for empirical implementation with typically available survey data.

In this approach customer satisfaction is inversely related to the gap between the demand for distribution services by customer i and his/her perception of the supply of distribution services provided by establishment k. That is, $D^d(i) - D^s(i, k)$, where D is a vector of distribution services that corresponds to various attributes of the establishment or firm. These distribution services will be indexed by j. Characteristics of customers that patronize an establishment other than their perceptions of attributes or distribution services (X (i, k)), but including their perceptions of price, and objective characteristics of establishments (X (k, k)) can also affect customer satisfaction. They correspond to the three types of variables used in the retail literature as the main determinants of customer satisfaction.

Following the empirical literature on customer satisfaction in retailing, we will assume that customers´ demand for a distribution service, j, is never satisfied and is always at its maximum, M, which is the same for all consumers. Thus, consumer i satisfaction with a gas station, k, can be described by a relation of the following form

$$S_i(k) = f\{[M - D^s(i, k)]_j, X(i, k), X(k, k)\} \quad \textbf{(1)}$$

where $S_i(k)$ is a measure of customer satisfaction. In (1) satisfaction is viewed as a decreasing function, $f_j' < 0$, of the distance between each of the j distribution services actually provided by station k, $D^s(i, k)$, as perceived by the consumer, and the maximum level of each of the j distribution services demanded by consumer i, M. This specification allows us to address our basic questions. Does price liberalization change the relationship between customer satisfaction and its determinants directly or through its effect on its other main determinants? Does it do so in the short-run as well as in the long-run?

The literature on the impact of customer satisfaction on economic performance variables stresses the links between attributes or distribution services, customer satisfaction and economic performance variables. Initially profitability was used as the relevant performance variable (e.g., Anderson and Mittal 2000; Kamakura et al. 2002), but future patronage intentions has also been used as a relevant performance variable (e.g., Grace and O'Cass 2005; Betancourt et al. 2007). The latter is the relevant performance variable for our purposes since it is the one available in our data. Nonetheless we draw from both strands of literature in specifying the second link given by equation (2) below. The first link is, of course, given by equation (1).

Future patronage intentions, P (i, k), by a consumer, i, with respect to an establishment, k, are determined as a function of customer satisfaction, S_i (k), and a set of controls capturing characteristics of consumers that patronize an establishment (Z (i, k)), including perceptions of prices charged by the establishment, and objective characteristics of the establishments (Z (k, k)). These capture the main type of variables used in the retail literature as determinants of or direct effects on future patronage intentions. Thus we address the same basic questions about future patronage intentions as we do for customer satisfaction with the following specification

$$P (i, k) = h [S_i (k), Z (i, k), Z (k, k)] \qquad (\mathbf{2})$$

A recent overview paper on retailer pricing and competitive effects (Kopalle et al. 2009) states "…a key component of the output of retailing is a set of services,…". It goes on to add that the latter provide benefits to consumers and affect their willingness to pay for the explicit products sold by retailers. Thus, the first and perhaps most important research question that we will address is with respect to the stability of these services in determining customer satisfaction with gas stations. For this first question and every one of the others below, there is a version, based on study 1, that identifies short-run effects (A) and a version, based on study 2, which identifies long-run effects (B).

RQ1: A) Is the impact of the set of services on customer satisfaction the same before and after the price liberalization? B) Is the impact of these services on customer satisfaction the same for existing establishments as for new establishments?

A standard practice in the literature on customer satisfaction is to control for characteristics of consumers, including their perception of prices of a product or set of products, that may affect customer satisfaction with an establishment. Thus a second research question we will address is the stability of customer characteristics in determining customer satisfaction for this particular industry.

RQ2: A) Is the impact of customer characteristics, including perceived store price level, on customer satisfaction the same before and after the price liberalization? B) Is the impact of these characteristics on customer satisfaction the same for existing and new establishments?

Finally, an issue that has not been pursued as systematically in the literature on customer satisfaction in retailing is the extent to which objective characteristics of the establishment, for example its competitive environment, have a direct effect on customer satisfaction. Thus, the final research question addressed is the stability of these objective characteristics of the establishment in determining customer satisfaction.

RQ3: A) Is the impact of establishment characteristics on customer satisfaction the same before and after the price liberalization? B) Is the impact of establishment characteristics on customer satisfaction the same for existing and new establishments?

With respect to future patronage intentions, the first and perhaps most important research question to be addressed also relies on a relationship widely accepted in the literature. Namely customer satisfaction is expected to have a direct positive effect on future patronage intentions. Thus, we have

RQ4: A) Is the relationship between customer satisfaction and future patronage intentions the same before and after the price liberalization? B) Is the impact of price liberalization on the relationship between customer satisfaction and future patronage intentions the same for existing establishments as for new establishments?

Just as in the case of customer satisfaction the literature on future patronage intentions includes a number of consumer characteristics, but in contrast to that case objective characteristics of establishments have received attention in this literature (e.g., Sirohi et al, 1998, Seiders et al 2005). Thus, we will also investigate research questions corresponding to RQ2 (RQ5) and RQ3 (RQ6) with respect to this variable.

SETTING AND DATA

A somewhat fortuitous element providing the opportunity for the analysis in this paper is a survey of consumers in Pamplona, Spain, regarding their satisfaction with gas stations and future patronage intentions. This survey was undertaken in the Spring of 1998 for reasons unrelated to price liberalization. The attractiveness of these data lies in the constancy of prices of gasoline across gas stations in Pamplona that year.

The price liberalization process at the retail level is part of the evolution of the petroleum industry in Spain. The Spanish gasoline market was highly regulated for many years (Correljé 1990). Various aspects of an opening transition process started as early as the mid 1980's and accelerated in the 1990's (Contín, Correljé, and Huerta 1999), at about the same time as in some other countries (Clements, Jung, and Gupta 2007). Small regional differences in retail prices (less than 1% at the province level), however, only begin to appear in 1998. Nevertheless, at this time there are no differences in gasoline retail prices at gas stations within the city of Pamplona. 1998 is the date of the price liberalization law that affects gas stations (Bello and Cavero 2008).

Since 1998 noticeable differences in prices have appeared within the city. For instance, in the Spring of 2007 observed differences in prices at gas stations within Pamplona's beltway ranged from 5% for unleaded premium to 7% for diesel. We undertook a survey of gas stations in Pamplona in the Spring of 2007 to ascertain consumer satisfaction with gas stations as well as its effect on future patronage intentions in this new liberalized environment. This survey, in combination with the earlier one, provides a unique opportunity to ascertain some effects of price liberalization in a retail setting.

Many changes were taking place in Spain between 1998 and 2007. In particular, this period was one of great prosperity for the Spanish economy and Pamplona shared in this prosperity. For instance the Spanish Central Bank, in a recent annual report (Banco de España 2008), identifies the period 1995 to 2006 as the expansion phase of the business cycle. Unemployment in Spain decreased from 22% in 1995 to 8% in 2006 (Bentolila, Dolabo and Jimeno 2008). This nine year gap has two effects on our analysis: it accentuates the asymmetry of interpretation of results of one time events stressed in the introduction, since many things can change in nine years; and it allows plenty of time for market entry to take place. In fact, eight of the 24 stations within Pamplona's beltway were built during these nine years.

Our first data set consists of surveys of customers at eight gasoline stations in Pamplona. Consumers were selected for interviews upon arrival 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. Five interviewers were assigned to each station, spaced over the day, each day of the week. These surveys generated a total of 280 observations with a maximum number of 41 interviews at one station and a minimum number of 21 at another. Eliminating the station that went out of business by 2007 reduces the overall sample of observations in 1998 by 29 observations, leaving us with 251 observations.

Our second data set consists of surveys of customers at the seven gasoline stations from 1998 that survived the price liberalization as well as eight additional ones that were surveyed only in 2007. At the time of the 1998 survey the seven surviving stations were 41.2% of the universe of gas stations within Pamplona's beltway. The total of 15 stations surveyed in 2007 represent 62.5% of the universe of gas stations within Pamplona´s beltway.

Consumers were selected for interviews upon arrival at the gas station during the Spring of 2007. The surveys took place also during the Spring of 2007. This survey was designed as a slightly modified version of the one used in 1998. In terms of the questionnaire: we added two entirely new questions; we split two old questions into two components; and we eliminated an earlier one completely. See the data appendix available on the web for details. Just as before, 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. In contrast to the 1998 survey, however, two interviewers were assigned to each station and the interviews were spaced over the day but over two weeks. The interview process was designed to generate 40 interviews for each station over the two weeks period. There is a maximum number of interviews of 40 at five stations and a minimum number of 33 at one station.

Two factors led to differences in the interview process between the two survey years.

First, in 1998 the interviewers were not asked to keep an explicit record of the response rate but to give an overall assessment. The latter were reported to be between 40% and 50%. Survey experts at our institution in Pamplona view this response rate as typical for surveys of this nature. They are well within the range of those reported in the literature for comparable surveys (Baruch 1999; Yu and Cooper 1983). Nevertheless, in 2007 we decided to try to have an explicit record. Interviewers were asked to indicate the number of refusals between interviews in order to obtain a more accurate estimate of the response rate. We also had fewer different interviewers per station than in 1998 to reduce possible variability in responses due to variations in interviewer characteristics.

In 2007 there were 289 refusals between interviews over the 15 stations. The estimated response rate for these stations was 67.5%. These percentages are upper bounds on the response rate. After eliminating those that failed to answer more than three questions we had 265 observations over the seven stations also sampled in the 1998 survey and 570 observations over the 15 stations sampled in 2007.

In addition to the survey data we also gathered information on objective characteristics of the gas stations. One set of these measures tried to capture competitive conditions facing each establishment. A second set of these measures tried to capture objective conditions of the gas stations that could affect customer satisfaction or future patronage intentions. They are also described in detail in the data appendix. Most of the information on these variables was gathered in both 1998 and 2007 since interviewers were asked to record objective characteristics of the station in both years.

EMPIRICAL IMPLEMENTATION

From the data described above we constructed two different data sets to use in our empirical analysis. For use in study 1 we put together the data gathered for the seven stations that existed in 1998 and that were also surveyed in 2007. Thus, we had the same seven gas stations in the same location in both years. We also examined the data gathered on the objective characteristics of these stations to see if there had been major changes that would lead these stations to be substantially different in both years. While there were some changes in two cases, we would not call them major. For instance, in one case the change allowed an increase in the number of cars that could be handled by the station simultaneously from 8 to 9 and in another case, it allowed a decrease in the number of cars that could be handled by the station simultaneously from 10 to 8.

For use in study 2 we put together the data for all of the 15 gasoline stations that were surveyed in 2007. Among these 15 stations there were 4 that did not exist in 1998. They were new and were able to choose their location, layout and equipment after the price liberalization of 1998. Thus, the data set used in study 2 consisted of 11 stations existing in 1998 and four new stations built after the price liberalization in 1998.

Both outcome variables of interest were measured on the same scale in the 1998 and the 2007 surveys. S_i (k) represents consumer's i satisfaction with station k or the dependent variable in equation (1). 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 at this station? P (i, k) represents future patronage intentions or the dependent variable in equation (2). It was measured as the answer to the following question, also on a scale zero to10. - Will you put gas in this station in the future? These measurements were the same in study 1 and in study 2.

In the analysis of customer satisfaction, there are three types of variables used as explanatory variables or direct effects. One type is referred to as distribution services or simply services or attributes of establishments as perceived by consumers. A second type is consumer characteristics in which we will include their perception of the prices of the products offered by the establishment. A final one is objective characteristics of the establishment. In the analysis of future patronage intentions we can also classify the explanatory variables into three types: customer satisfaction; customer characteristics (other than satisfaction of course), and objective characteristics of the establishment. Thus, we will discuss below distribution services, customer characteristics and objective characteristics of the establishment. Customer satisfaction has already been defined above in the context of its use as a dependent variable.

Distribution services have been assigned to one of the following five broad categories by the sources cited earlier (e.g., Kopalle et al. 2009). These categories are: accessibility of location, information, assortment (breadth or depth), assurance of product delivery (in the desired form or at the desired time), and ambience. Measurement of these five services at the level of the establishment has been undertaken for supermarkets (Betancourt et al. 2007). We followed their procedures with minor changes in language to adapt them to the context of gas stations. The details of the adaptation are available in the Data Appendix available on the web.

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 identified above. They coincide with the measures used for supermarkets and are similar to the ones developed for hardware stores (Barber and Tietje 2004). Given that the maximum in the measurement scale for these services was a 10, we introduced these services in the customer satisfaction equation as $[10 - D(i, k)_j]$. 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. That is, we expect a negative or at least non-positive sign for each of these five variables in equation (1). In general these variables are subject to managerial control.

By contrast the next set of variables refers to customer characteristics that are not subject to managerial control with one important exception. That is demographics and customer buying habits are not generally viewed as subject to managerial control. Customers perceptions of prices of products are (e.g., Briesch, Krishnamurthi, Mazumdar and Raj 1997). We have included them in this second type for two reasons. First, given our focus on price liberalization, they merited special attention and it facilitated the exposition to treat them in this group. Second, prices and their perceptions are frequently viewed as distinct from services because the latter are not explicitly priced in most circumstances.

General demographic characteristics of consumers were included as controls, although we had no expectations as to how or if they would affect customer satisfaction or patronage intentions in terms of their signs. In particular we obtained and used information on: gender, X_7; age, X_8; position in the life cycle, X_9; and extent of work outside the home, X_{10}. We also included a variable that captured on a scale of 0-10 whether consumer perceptions of prices at the establishment relative to other establishments were high, X_6.

Similarly, four objective and three subjective characteristics of customers buying habits were used in various versions of the empirical analysis. The four objective ones were: the length of stay at the station, X_{11}, the size of the average purchase at the station, X_{12}, the frequency of gasoline purchases at the station, X_{13B}, and the infrequency of gasoline purchases in days, X_{13A}. The three subjective ones reflect attitudes toward purchasing gasoline products. They were: preferences toward pumping your own gasoline, X_{14}; the importance of reducing time spent on this activity, X_{15}; and, inclination to search for alternative stations when making this type of purchase, X_{16}.

The third type of variables included resulted from our gathering data on a variety of objective characteristics of gas stations that could help identify important changes between 1998 and 2007 as well as differences between stations more generally. The main one relating to competitive aspects was, for example, the number of gas stations within 5 kilometers of each of the gas stations in the sample (O_6). With respect to objective conditions of the gas station itself we considered, for example, whether or not self-service was available (O_1), the number of cars that could be serviced simultaneously by the combination of hoses, pumps and aisles available at the station (O_2), displays of information on prices (O_3), number of aisles (O_4), and the price of diesel (O_5). Note that these variables only vary across stations (at most 14 in study 1 and 15 in study 2).

In the Data Appendix available on the web these objective variables are described in greater detail. There we also describe the procedure used to convert the two variables measured in monetary terms (X_{12} and O_5) into the same units, 2007 euros. In the paper itself we include a Statistical Appendix with two tables of descriptive statistics that provide means, standard deviations, maxima and minima for all the variables mentioned in this section. These tables also include differences in the means between years for study 1 and between existing and new stations for study 2 as well as the t-ratio of a test of these differences for all these variables.

For estimation purposes we want to ascertain the effects of liberalizing gasoline retail prices on the relationship between the explanatory variables (which we will label X* to capture the ones used in either equation (1) or equation (2)) and the dependent variable (which we will label Y to capture the dependent variable in either one of the two equations to be estimated). A simple exposition of the basic considerations underlying the procedure we will follow in both study 1 and study 2 is available (e.g.,Gujarati 1970).

We can write our estimation equation as

$$Y = \beta X^* + \delta D X^* + U \quad (\mathbf{3})$$

where Y is a column vector of all i observations on a dependent variable. In study 1 the 1998 ones are `stacked up´ below the 2007 ones. In study 2 the existing ones are stacked up below the new ones. X* is a matrix of independent variables with K + 1 columns of explanatory variables `stacked´ up in the same fashion as Y. By convention we will assume the first column to be a vector of 1´s, which yields the standard intercept in a regression. D is a dummy variable that takes on the value of 1 if an observation belongs to the 2007 sample (study 1) or to a new station (study 2) and zero otherwise. U is a column vector of disturbance terms associated with each observation similarly `stacked up´. Greek letters indicate parameters to be estimated. Given our formulation of the dummy variable, the standard parameters (β) in study 1 correspond to 1998 whereas the parameters associated with the dummy (δ) are the difference between any parameter in 2007 and 1998. That is, $\delta = \beta$ (2007) - β (1998). Similarly, the standard parameters (β) in study 2 correspond to the existing stations whereas the parameters associated with the dummy (δ) are the difference between any parameters for the new ones and the existing ones. That is, $\delta = \beta$ (new) - β (existing).

In general the liberalization of gasoline retail prices and the other changes associated with these nine years can have at least two consequences on both of these relationships. They can affect the relationship by changing the values of the parameters or by changing the value of the conditioning variables. Thus, the impact on the average values of the variables of interest, customer satisfaction and future patronage intentions, can be interpreted as the sum of two sets of possible effects: those due to the change in the parameters and those due to the change in the means of the conditioning variables. Our analysis emphasizes the possible changes in the parameters, but notes important changes in the means of the conditioning variables at relevant points in the discussion. For any subset of conditioning variables if the parameters are stable in study 1 ($\delta = 0$), it suggests convincingly that the price liberalization had no effect on this aspect of the structural relationship. If the parameters are not stable ($\delta \neq 0$) this is an interesting result to be explored further in study 2. If for the same subset of conditioning variables that we find a stable relation in study 1 we also find a stable relationship in study 2 ($\delta = 0$), for example, it means that the short-run effects on existing establishments is the same as the long-run effect on new ones. Thus, indicating a very stable feature of the structural relationship with respect to price liberalization and any other changes occurring during these nine years. Of course there are other possibilities, which we will be indicated as they arise in the sections that follow.

Finally, we note that all of the results presented in the paper are based on robust standard errors that adjust for the clustering of observations by gas stations in both study 1 (14 clusters, 7 in 1998 and 7 in 2007) and study 2 (11 existing stations and 4 new ones). The rationale for the correction is to adjust for the fact that the assumption of identically and independently distributed disturbance terms for observations across clusters is unlikely to hold (e.g., Deaton 1997). Intuitively, common events that affect a particular cluster (gas station in a sample year in our case) can impact all respondents in that cluster in a similar manner affecting either the variance or the correlation of the disturbance terms within the cluster. For instance, the common event may lead to responses that are not independent of each other but exhibit some correlation within the cluster.

CUSTOMER SATISFACTION

In this section we present the results of our analysis of the effects of price liberalization for customer satisfaction. We will analyze first the results from comparing the surveys in 1998 and 2007 for the same seven stations. We estimated a variety of specifications of equation 3 in the previous section with our first constructed data set. Table 1 contains the results from the most general specification in abbreviated form. This specification included all five distribution services, all demographic variables and consumer characteristics and two objective variables at the same time.

INSERT TABLE 1 ABOUT HERE

The top half of the table presents the parameter estimates (and their t-ratios) for 1998 that were statistically significant at least at the .05 level for each of the three types of variables as well as any that would have a statistically significant change in 2007, regardless of their statistical significance in 1998. The second half of the table presents the corresponding estimates of changes in these parameters between 2007 and 1998. In order to prevent clutter we don´t present the purely demographic variables in Table 1 even if statistically significant. For, they were used as controls and have no particular interpretative value in the present context.

With respect to distribution services the main result emerging from Table 1 is that prior to the liberalization consumer’s perceptions of two distribution services, assurance of product delivery at the desired time and ambience, had a substantial positive effect on customer satisfaction in terms of both statistical significance and magnitude of impact and this impact was not affected by the price liberalization. The hypothesis of a change in these two parameters between the two sample years is rejected at levels of significance considerably higher than .05. The price liberalization is unlikely to have had any effect on the impact of distributions services on customer satisfaction, regardless of whatever else was changing during this nine year period. Incidentally, these results also show that different distribution services matter for different industries. In the case of supermarkets a similar analysis (Betancourt et al. 2007) indicated that all five distribution services contributed positively to customer satisfaction with supermarkets.

These results are robust to the dropping of other type of variables at the same time. For instance, if we dropped all other consumer characteristics and their changes from the regression (including the demographic variables), the estimates for these two distribution services would be - .44 and –.27, respectively, they would both be statistically significant at well beyond the .05 level and their changes would be statistically insignificant with t-ratios well below 1. Not surprisingly, since the two objective variables included in the general regression (the level of competition and the number of cars that can be handled simultaneously by a station) are statistically insignificant, dropping the objective variables from the regression has no effect on the other results.

With respect to consumer characteristics the main result emerging from Table 1 is that a perception of high prices had a negative impact on satisfaction before the price liberalization, but that this impact changed to a positive one after the price liberalization. One point to be made about this result is that these gas stations sold items other than gas, for example car washes, simple repair services and some convenience store items. The prices of these other products were not fixed by the government. Another one is that it is an interesting result worthy of further exploration, which we will do in study 2, but not necessarily a convincing one at this point. This result is also robust to the exclusion of other type of variables from the regression. In particular if we drop all distribution services from the regression we find the same result with respect to the impact of prices in both years.

Incidentally, a change of impact from negative to positive is consistent with the view that gas prices played no role in perceived store price level before the price liberalization, since they were constant, but did so afterwards. Consumers' dissatisfaction with high prices before the liberalization referred to the prices of other products. After the price liberalization consumers may not have liked the higher prices overall, but had a wider choice of stations and chose the one they were sampled at because other dimensions predominated in the station choice. Thus, the positive effect on satisfaction in 2007 reflects the additional choices in terms of stations in 2007 and that the choice could now incorporate all margins, including gas prices.

One customer characteristic worth highlighting is frequency of purchases at the gas station. For, it plays the role of a control mechanism for possible selection effects since the consumers were sampled at the station. It has a positive impact on customer satisfaction that does not change after the price liberalization. This result continues to hold if we drop the objective variables from the analysis. It also continues to hold if we drop distribution services from the analysis. Furthermore we note that other results remain the same if we drop this variable from the specification. This indicates that selection is not an issue in our context of customer satisfaction with a transaction.

Putting these results in perspective we note that dropping the objective variables from the regression reported in Table 1 drops the R^2 to .46. Dropping the consumer characteristics, including demographic variables, drops the R^2 to .41. But, dropping distribution services reduces the R^2 to .18. Table 1A in the Statistical Appendix shows that customer satisfaction with the seven gas stations surveyed in both years increased by .61 or 8.64%. This average increase was statistically significant at the 1% level. The change in the means of the two distribution services that are statistically significant accounts for 41% of this increase.

A tangential but interesting aspect of our results in study 1 is that they provide empirical evidence for the literature on psychological implications of customer participation in co-production. Our empirical results indicate that pleasure in pumping gas has no effect on customer satisfaction before or after the price liberalization. This evidence casts doubts on the suggestion (Van Raaij and Pruyn 1998) that the greater the sense of control the greater the satisfaction with the service. This same evidence supports an alternative hypothesis (Bendapudi and Leone 2003). Namely, when an outcome is as expected a customer who participates in production will be as satisfied with the firm as will a customer who does not participate in production. Since the activity of pumping gas is likely to result in an outcome as expected, our results support this hypothesis and its underlying explanation of self serving bias in participation and its impact on satisfaction. This is more noticeable because there are no price differences between self service and other stations in 1998 and the possible factor of a lower price for co-production is irrelevant in 1998.

One can think of the previous changes as reflecting short-run effects of price liberalization in that both location and by and large the capital stock of these establishments was fixed. In study 2 we use the same methodology to compare customer satisfaction with existing stations after the price liberalization with customer satisfaction with new stations after the price liberalization. Just as in the case of differences over time, the lack of differences between the two types of stations can be viewed as convincing evidence that the short-run and long-run effects of the price liberalization were the same, regardless of whatever other factors changed for the two types of stations. Changes in the impacts of parameters between existing and new stations, however, need to be viewed more cautiously. They represent possible differences between short-run and long-run effects of the price liberalization worthy of further scrutiny.

This sample consists of 15 stations. Of these, 11 existed in 1998 and 4 were built since that time. The 11 existing since 1998 include the 7 used previously and the results for existing stations in study 2 provide an additional check on the robustness of our earlier results. We estimated the same most general specification as in study 1 and we present the results in the same abbreviated form in Table 2.

INSERT TABLE 2 ABOUT HERE

Just as in study 1, the top half of the table presents the parameter estimates (and their t-ratios) for the existing stations that were statistically significant at least at the .05 level for each of the three types of variables as well as any that would experience a statistically significant change in 2007. Similarly, the bottom half presents the corresponding estimates of changes in these parameters between existing and new stations. Incidentally, no purely demographic variable had a statistically significant effect in 2007 for either the new or the existing stations. This suggests that the few effects of these variables in study 1 were due to sampling variability.

With respect to distribution services Table 2 confirms the main result of study 1. First, the same two distribution services, assurance and ambiance, that determined customer satisfaction in 1998 and 2007 for the stations surveyed in both years also determine customer satisfaction for all 11 stations existing in 1998. Second, the impact of these two distribution services on customer satisfaction is the same in the short-run as in the long-run. Thus, the conclusion that price liberalization had no effect on this aspect of the structural relationship between distribution services and customer satisfaction is as convincing as one can get in empirical work.

A novel and interesting result on distribution services is that for new stations the provision of information about products, services and prices has a positive impact on customer satisfaction even though it has no effect for existing ones. A plausible explanation is that the new stations serve a different clientele base, which is more demanding of this type of service. We will provide evidence on this explanation below.

With respect to customer characteristics the main result in Table 2 is that perception of high prices increases customer satisfaction for existing stations while decreasing it for new stations. Once again the first part of the result confirms what we found in study 1 and it makes the interpretation of a positive perception between the level of prices and customer satisfaction as a result of the price liberalization more convincing. The second part of the result, namely a negative relation between perceptions of high prices and customer satisfaction for new stations, is again suggestive of the new stations catering to a different client base than the existing ones.

With respect to other characteristics of consumer buying habits we find that the infrequency of purchases of gas has a negative effect on satisfaction which is the same for existing and new stations. While this may seem a contradiction with study 1, since no effect was found there, the contradiction is the result of sampling variability. The result that this variable mattered for the seven firms in 2007 in study 1 had a p value of .056, and was thus excluded, whereas in study 2 it had a p value of .034, and was thus included. Similarly, frequency of purchases at the gas station had a positive impact on customer satisfaction in study 1 and does not appear here for existing or new establishments. Sampling variability is again the culprit. The impact of this variable on customer satisfaction at existing establishments has a p value of .068 in study 2, and was thus excluded. Finally, given this variable's role as a control for selection we dropped it from the analysis to see if it affected the other results. It did not.

A somewhat different situation arises with respect to the size of purchases. This variable did not matter in study 1 and it does not matter for existing establishments in study 2. On the other hand, it does have a statistically significant impact on customer satisfaction for new establishments. Once again this suggests that the client bases of the two types of establishments are different. Customers that on average make large purchases are less satisfied at new stations.

Turning to the objective characteristics of gas stations, our main result in Table 2 is that increases in competition increase satisfaction for existing establishments but decrease satisfaction for new establishments. Thus, we have another result that suggests two different client bases for existing establishments and for new establishments. It also turns out that the number of cars that can be handled simultaneously has no effect on existing establishments but increases satisfaction for new establishments. Once again this suggests two different client bases for the two types of establishments. The reader may recall that neither one of these two variables had an impact in study 1. We suspected that the lack of variability in the objective variables may have been a reason for this in study 1. We only had seven different stations whereas here we have fifteen different ones. As a check we re-estimated our most general specification with the seven stations used in study 1 and the four new ones. We find that the t-ratios for these two variables in existing establishments are well above the .05 cut off value.

Just as in the case of study 1 we dropped each of the three types of variables from the analysis to see the impact on the results. Dropping all distribution services reduced the R^2 in Table 2 to .24; dropping all customer characteristics, including demographic ones, reduced the R^2 to .40; and dropping the objective variables reduced the R^2 to .43. In each case the main results were not affected. Table 2A of the Statistical Appendix shows that there is a statistically significant drop in customer satisfaction between the existing stations and the new ones of about 5 %. The drop in the average perceived levels of a distribution service that is statistically significant and that has a statistically significant impact on satisfaction (assurance of product delivery at the desired time) alone accounts for 60% of this drop in customer satisfaction with the new stations.

Earlier we highlighted possible differences in the client bases for both types of establishments as an explanation for many of our results in this second study. By relying on the descriptive statistics in the Statistical Appendix we can identify these differences as well as indicate what the objective differences in the two types of stations may be. The new stations on average provide an opportunity to handle more cars simultaneously, face a higher number of competitors and provide higher levels of self service than existing ones. The average level of the price of diesel in the new stations is lower than in existing ones. Not surprisingly the customers of new stations expressed a higher average level of pleasure in pumping gas and a higher average willingness to search for other gas stations. The average level of perceived accessibility of location is also lower for the new stations than for the existing ones as is the average level of assurance of product delivery at the desired time. All these differences were statistically significant at the 1 % level. At the 5% level of significance, we can also conclude that customers of new stations on average attach more importance to the amount of time spent at the station and perceive slightly lower levels of prices.

Having a systematic description of the differences between the two types of stations and their client bases allows us to provide a broader interpretation of the long-run effects of the price liberalization on customer satisfaction. Since the existing stations had a “first mover advantage” in terms of location, the new stations that come in after the price liberalization compete on price, provision of self-service, and handling of more cars at the same time. The customers that choose to frequent these stations on average are more likely to pump their own gas, search for other stations more often, and face somewhat lower prices. Nonetheless, they are less satisfied with the accessibility of these new stations and with the timeliness of the service they get so that overall they are less satisfied with these stations than the customers of the existing ones even though the latter face less competition from other stations.

To conclude, once we allow for one factor closely related to the price liberalization to change, namely the entry of new establishments into the market, price liberalization results on average in increased customer satisfaction for existing stations and decreased customer satisfaction in new ones relative to the levels prevailing prior to the liberalization. This is the case despite average lower prices of diesel for the new stations and that on average prices in these establishments are also perceived as lower than in others.

FUTURE PATRONAGE INTENTIONS

If customer satisfaction is part of a system with future patronage intentions, which is implied by the literature that postulates links from attributes or services to satisfaction and then from satisfaction to performance as captured in equation (2), the error or disturbance terms in both equations could be correlated. Since many of the same unobservable events between 1998 and 2007 (or affecting existing and new firms) would affect both customer satisfaction and future patronage intentions, this is a likely situation. Ignoring this correlation in the estimation of the relation between satisfaction and performance would in general yield biased estimates due to their being part of a simultaneous system (e.g., Wooldridge, 2003).

A simple solution is to use the estimated values of customer satisfaction in implementing equation (2) rather than the observed ones. This is the procedure followed in estimating equation (3) for future patronage intentions. That is, we used estimated customer satisfaction from the previous section rather than actual customer satisfaction in all the regressions reported in Table

3. This table shows in abbreviated form the results from the most general specification estimated with the data for study 1. Just as in Table 1 the top half represents parameter estimates for 1998 that were statistically significant at least at the .05 level for each of the three types of variables as well as any that would have a statistically significant change in 2007. Similarly, the bottom half presents the corresponding estimates of changes in these parameters between 1998 and 2007 and we don´t include the demographic variables in the text tables regardless of statistical significance.

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INSERT TABLE 3 ABOUT HERE

Substantively a very important result to emerge from Table 3 is the stability of customer satisfaction as a determinant of future patronage intentions. Estimated customer satisfaction has a positive and statistically significant impact (p = .001). It is substantial in magnitude and its effect is the same in 1998 as in 2007. Thus, an important aspect of the relationship between customer satisfaction and future patronage intention stressed in the literature is most unlikely to have been affected by the price liberalization.

With respect to customer characteristics, Table 3 reveals that prior to the price liberalization the infrequency of purchases of gas decreases future patronage intentions while, not surprisingly, the frequency of purchases of gas at the station increases future patronage intentions. Both of these effects change after the price liberalization. While the impact of infrequency of purchases of gas becomes positive, it is quite small in magnitude; in contrast, the impact of frequency of purchases of gas at the station remains positive and substantial in magnitude. Perceptions of establishment price level have no effect on future patronage intentions before or after the price liberalization. This provides an example of a very different type of stable result from the one on customer satisfaction.

Finally, the two objective variables included in the most general estimation were the level of competition faced by the station and whether or not self- service was offered by the station. While self–service was not statistically significant when included with the level of competition, it was when included by itself as well as in study 2 and, thus, we chose this one as the most general specification. While the level of competition did not matter before the price liberalization, an increase in this level increases future patronage intentions after the liberalization.

While the results are robust to eliminating estimated customer satisfaction or the objective variables from the regression, they are sensitive to dropping customer characteristics from the regression. More specifically, dropping these characteristics lowers the R^2 in Table 3 to 21% and changes some individual results dramatically. For instance, the magnitudes of coefficients for estimated satisfaction and self-service almost double in size in absolute value. One of the customer characteristics is frequency of purchases at the gas station. Since this variable captures factors that may have led to the selection of the gas station by consumers in the past, its elimination can lead to other variables artificially picking up its effect.

We re-estimated our most general specification dropping frequency of purchases at the gas station from the regression. The results are presented in Table 3A of the Statistical Appendix using the same format as Table 3. A similar dramatic doubling of the above two coefficients shows up in terms of magnitudes. On the other hand, a number of other variables become statistically significant (at the $p < .05$ level) and others become statistically insignificant. Thus, including the frequency of purchases at the gas station is useful and necessary as a mechanism to control for sample selection. It makes a substantial difference for this outcome variable; by contrast, in the case of customer satisfaction this variable had little if any impact on other results.

In study 2 we use the same methodology to compare future patronage intentions for existing stations with future patronage intentions for new stations after the price liberalization. We estimated the same most general specification as in study 1 for future patronage intentions and present the results in the same abbreviated form in Table 4.

INSERT TABLE 4 ABOUT HERE

Estimated customer satisfaction has a positive and statistically significant impact on future patronage intentions for these 11 existing stations. Indeed, if we round off to two decimals the estimated parameter value is the same for the 11 existing stations in study 2 as for the 7 in study 1. The long-run impact is also positive and statistically significant but far greater in magnitude, which implies that this aspect of the relationship is more important for new stations than it is for existing stations. Incidentally, the result for new stations has a p-value of .058, but it is robust to alternative specifications of the regression. Thus, we made an exception and present it in the table.

With respect to customer characteristics, Table 4 shows that those more inclined to search had lower patronage intentions in the short-run as well as in the long-run and those purchasing gas more frequently at the station had higher levels of future patronage intentions in both the short-run and the long-run. With respect to the objective variables, whether or not the station offered self-service decreases future patronage intentions for existing stations and increases these intentions for new ones. This suggests two different client bases for the two types of stations. An increase in competition lowers future patronage intentions for new stations but not for existing ones, which again suggests different client bases.

Evaluating the robustness of these results we find that the R^2 decreases from .31 in Table 4 to .26 if estimated customer satisfaction is eliminated; it decreases to .20 if consumer characteristics, including demographic ones, are eliminated; and, finally, it decreases to .28 if the objective ones are eliminated. A standard F-test rejects the null hypothesis that the eliminated variables do not contribute to the explanation of future patronage intentions at the 1% level in all three cases. Surprisingly, given what we found in study 1, the results for the included variables are similar to the corresponding ones in the most general specification.

For completeness, we dropped the frequency of purchases of gas at the station from the most general specification. The results comparable to Table 4 are presented in Table 4A of the Statistical Appendix. While there are changes as a result, they are far less dramatic in terms of the drop in explanatory power as well as with respect to the increases in magnitude of the estimated impacts of customer satisfaction for existing and new establishments. In terms of changes in t-ratios, the effect of dropping this variable can be described as somewhat marginal. Thus, the sample selection effects controlled by this variable seem far smaller than in study 1.

To conclude, the more salient result of the analysis of future patronage intentions is that the price liberalization together with new entry into the market seems to have led to a very different structural relationship for existing establishments than for new establishments. The impact of customer satisfaction on future patronage intentions is twice as large for new establishments. Moreover, the impact of the objective variables that are the main determinants of the structural relation, intensity of competition and self-service, have a different impact for new establishments than for existing ones. These results also confirm the ones for customer satisfaction in that they provide further evidence of two very different client bases for the two types of establishments.

CONCLUDING REMARKS

We have established rather convincingly that price liberalization in an important product category or item affects the role of perceived high establishment price levels as a direct effect or main determinant of customer satisfaction. More specifically, we have established that the direction of the effect differs between the short-run and the long-run: It is positive for existing stations and negative for new stations. An important feature of this result lies in its association with the location of the establishment. Established firms enjoy a "first mover advantage" that leads new entrants to differentiate themselves. The latter do so by offering lower prices, locating in less accessible places, providing lower levels of assurance of product delivery and higher levels of self-service. Thus, they appeal to a different customer base than incumbents.

In terms of the retailing literature (Kopalle et al 2009), this result implies that one of the seven factors identified as impacting retailer pricing strategies in cross-channel competition, namely store positioning/format, plays an equally important role in impacting retailers pricing strategies through in-channel competition. The main factors viewed as impacting strategy in terms of in-channel competition in the literature are pricing mechanisms such as loss leader strategy. Yet the same interaction between prices and distribution services observed for cross-channel competition and suggested and tested for supermarkets (Lal and Rao 1997 and Richards and Hamilton 2006) arises for in-channel competition for gas stations between incumbents and new entrants. Of course, the relevant distribution services that matter for these interactions are not the same in the two retail industries. This result is obtained despite the acknowledged difficulties for measuring store price levels in the literature. Our survey methodology provides an illustration of how to overcome or by-pass this problem, at least in terms of prices perceived by customers.

By contrast, there is no similar role for store price levels in the case of future patronage intentions. They have no direct effect as a determinant of future patronage intentions, either before or after the price liberalization and neither for existing establishments nor for new ones. While a bit surprising, similar results exist in the literature. For instance, a meta analysis of retail patronage studies (Pan and Zinkhan 2006) finds 5 out of 19 studies where store price levels don´t have a statistically significant effect. An implication of this result is that the differences between behavior and intentions emphasized in the literature for moderating effects (Seiders et al 2005) may also apply to some direct effects. This topic is worthy of future research.

In terms of our specific research questions, we have answered the first one on distribution services (RQ1) convincingly in the affirmative with respect to assurance of product delivery and ambience. The positive impact of these two distribution services on customer satisfaction is the same before and after the price liberalization. Furthermore, their effect is the same for existing and new establishments. On the other hand, the provision of information only matters after price liberalization and only for new establishments. This implies that it is the ability to enter the market and cater to a different customer base together with price liberalization that leads to this service having an impact.

With respect to customer characteristics (RQ2), as noted above, high store price levels increase customer satisfaction before and after the price liberalization in the short-run, but they decrease satisfaction in the long-run. Customers that purchase gas infrequently have lower levels of satisfaction before and after the price liberalization and this is the case in both the short-run (existing establishments) and in the long-run (new ones). Finally, customers that have large average purchases have lower levels of satisfaction at new stations than at existing ones.

With respect to the objective variables (RQ3), the results on the effects of these variables on customer satisfaction in the short-run are too weak to generate a convincing answer on effects of the price liberalization. Nevertheless, they do generate a convincing answer with respect to the long-run effects. Both the number of cars that can be handled simultaneously and the intensity of competition have a different impact on customer satisfaction with new establishments (positive and negative, respectively) than with existing ones (either no effect, or at best a positive effect for intensity of competition).

More generally, in each of the three types of variables there seem to be some that indicate the existence of two different types of markets leading to different or opposite effects of price liberalization in the short-run and in the long-run, when new entry into the market takes place. These differences between the short-run and the long-run effects are even more marked for our other outcome variable. For instance, we find that the effect of customer satisfaction on future patronage intentions (RQ4) is the same before and after the price liberalization but it is far larger in terms of its economic impact for new establishments than for existing ones. Incidentally, this implies that manager of new station need to pay more attention to customer satisfaction than managers of existing ones to secure the same amount of repeat patronage.

With respect to customer characteristics (RQ5), the infrequency of purchases has a substantial negative effect on future patronage intentions before the price liberalization but the effect becomes positive although insubstantial after the price liberalization for both existing and new establishments. Those who search more often have lower future patronage intentions in both the short-run and the long-run. Finally, the frequency of purchases at the station increases future patronage intentions both before and after the price liberalization but the impact, while still substantial, is significantly smaller after the price liberalization and the same for existing and new establishments.

Last but not least, there is no stable impact of the objective variables on future patronage intentions (RQ6). The intensity of competition, however, decreases future patronage intentions for new establishments while self-service decreases future patronage intentions for existing establishments and increases it for new ones.

Our research also has limitations that suggest potentially fruitful areas for further research. We have exploited what is sometimes called a natural experiment. The main difficulty with these experiments is that other things are also changing. In our case this difficulty mattered much less than usual for three reasons. First, the physical product experiencing the price liberalization was the same before and after the event. Second, one of our objectives was to ascertain the stability of two important relationships and for this purpose this difficulty is irrelevant. Third, by differentiating between existing firms and new firms, we were able to control for the most directly relevant one of these potential changes in other things for price liberalization, market entry. This allowed us to identify some additional effects convincingly. Nonetheless, alternative control mechanisms would have been useful and may have allowed us to do more.

Another limitation of the research is that it may be subject to what has been referred to in the psychological literature as common method bias (Podsakoff et al 2003). A potentially important situation for this bias to arise is survey research where the respondent answers questions about both the dependent variables and the ones used to explained them, which is the case here. The fact that some distribution services, measured on the same basis as customer satisfaction, matter statistically and others have no effect suggests that this problem is not a serious one in our data. Similarly the fact that what matters for our two dependent variables, which are measured in the same manner, differs also suggests that this problem is not relevant in our context. The possibility of this source of bias in our context is also substantially diminished by the use of different survey sites, interviewers per site and years as well as by our use of clustering by survey site and year in all of our statistical analyses. Finally, there is also recent research in the psychological literature showing that common method bias as a mechanism for inflating correlations has been substantially overstated (Spector 2006).

Our analysis is able to explain in a convincing manner the changes in customer satisfaction associated with the price liberalization as well as the differences in this relationship between existing and new firms. On the other hand, our ability to explain the changes in future patronage intentions associated with the price liberalization equally well is driven by one variable: namely, the frequency of purchases at the station. Furthermore, our ability to explain the differences in this relationship between existing and new firms is much lower with or without this variable. Whether this is due to the higher volatility of a performance variable measured in terms of intentions rather than in terms of behavior is an attractive area for future research.

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Table 1. Customer Satisfaction: Study 1

	Variable	Regression Coefficient	T- Ratio
Constant	Constant	9.498	15.170
Assurance	[10–D_4]	-.399	-4.880
Ambiance	[10–D_5]	-.264	-4.080
Prices	X_6	-.137	-2.460
Frequency of purchases at the station	X_{13b}	.041	2.240
Prices	DX_6	.201	2.690
N	516	R^2	.4671

Table 2. Customer Satisfaction: Study 2.

	Variable	Regression Coefficient	T- Ratio
Constant	Constant	7.601	14.670
Information	[10–D_2]	.005	.130
Assurance	[10–D_4]	-.426	-7.730
Ambiance	[10–D_5]	-.242	-4.130
Prices	X_6	.078	2.390
Size of purchases	X_{12}	.003	.890
In-frequency of purchases of gas	X_{13A}	-.019	-2.350
Nº of cars	O_2	.002	.140
Nº competitors 5 kms.	O_6	.029	2.380
Information	DD_2	-.165	-2.670
Prices	DX_6	-.180	-2.890
Size of purchases	DX_{12}	-.013	-2.510
Nº of cars	DO_2	.259	2.400
Nº competitors 5 kms.	DO_6	-.097	-4.010
N	570	R^2	.4366

Table 3. Future Patronage Intentions: Study 1

	Variable	*Regression Coefficient*	*T- Ratio*
Estimated customer satisfaction	S^	.514	4.050
In-frequency of purchases of gas	X_{13A}	-.051	-3.600
Frequency of purchases at the station	X_{13B}	.512	12.360
Nº competitors 5 kms.	O_6	-.018	-.570
In-frequency of purchases of gas	DX_{13A}	.068	2.190
Frequency of purchases at the station	DX_{13B}	-.334	-4.440
Nº competitors 5 kms.	DO_6	.090	2.480
N	516	R^2	.4436

Table 4. Future Patronage Intentions: Study 2

	Variable	*Regression Coefficient*	*T- Ratio*
Constant	Constant	2.85	2.62
Estimated customer satisfaction	S^	.51	2.79
Searches for other stores	X_{16}	-.15	-2.81
Frequency of purchases at the station	X_{13B}	.23	4.97
Self-service	O_1	-.55	-2.95
Nº competitors 5 kms.	O_6	.05	1.94
Estimated customer satisfaction	DS^	.55	2.07
Nº competitors 5 kms.	DO_6	-.32	-6.05
Self-service	DO_1	1.08	3.00
N	570	R^2	.3094

Stadistical Appendix

Table 1A. Descriptive statistics. Study 1

Variable name	*Symbol*	*Min*		*Max*		*Mean*		*S.D.*		*Diff M. (07-98)*	*Diff M. (t)**
		98	07	98	07	98	07	98	07		
Customer Satisfaction	S	1.00	.00	10.00	10.00	7.06	7.67	1.80	1.71	.61	3.94
Future Patronage Intentions	P	.00	.00	10.00	10.00	6.54	7.36	2.57	2.71	.82	3.51
Accessibility of Location	D_1	.00	1.00	10.00	10.00	6.66	7.82	2.30	1.96	1.16	6.13
Information	D_2	.00	.00	10.00	10.00	5.69	6.33	2.63	2.62	.64	2.79
Assortment	D_3	.00	.00	10.00	10.00	3.88	4.31	2.93	3.22	.43	1.58
Assurance	D_4	1.33	3.67	10.00	10.00	7.43	7.70	1.51	1.43	.27	2.10
Ambiance	D_5	.00	.00	10.00	10.00	7.23	7.73	1.92	1.68	.50	3.14
Perceived Price	X_6	.00	1.00	10.00	10.00	5.66	6.28	1.73	1.56	.63	4.32
Gender 0 (male)	X_{70}	.00	.00	1.00	1.00	.73	.58	.45	.49	-.14	-3.49
Gender (female)	X_{71}	.00	.00	1.00	1.00	.27	.42	.45	.49	.14	3.49
Age 0 (less than 25 years)	X_{80}	.00	.00	1.00	1.00	.33	.20	.47	.40	-.13	-3.29
Age 1(25 – 40 years)	X_{81}	.00	.00	1.00	1.00	.41	.46	.49	.50	.05	1.06
Age 2 (41 – 60 years)	X_{82}	.00	.00	1.00	1.00	.23	.28	.42	.45	.05	1.26
Age 3 (> than 60 years)	X_{83}	.00	.00	1.00	1.00	.03	.06	.18	.25	.03	1.72
Life cycle 0 (single)	X_{90}	.00	.00	1.00	1.00	.40	.24	.49	.43	-.16	-4.06
Life cycle 1 (no child)	X_{91}	.00	.00	1.00	1.00	.20	.34	.40	.47	.14	3.64
Life cycle 2 (child < 6 yrs.)	X_{92}	.00	.00	1.00	1.00	.13	.13	.34	.34	.00	.02
Life cycle 3(6 <child age <14)	X_{93}	.00	.00	1.00	1.00	.08	.14	.27	.34	.06	2.23
Life cycle 4 (child>14 yrs.)	X_{94}	.00	.00	1.00	1.00	.19	.15	.39	.36	-.04	-1.09

* Robust Student's T-test with unequal variances

Table 1A. Descriptive statistics. Study 1 (continued)

Variable name	*Symbol*	*Min*		*Max*		*Mean*		*S.D.*		*Diff M. (07-98)*	*Diff M. (t)**
		98	07	98	07	98	07	98	07		
Hours worked	X_{10}	.00	.00	15.00	24.00	7.18	7.10	3.39	3.31	-.08	-.27
Mean length of stay (mins.)	X_{11}	1.00	1.50	30.00	15.00	5.48	5.44	3.01	2.65	-.04	-.15
Size of purchases (2007 euros)	X_{12}	2.79	4.00	63.66	72.00	24.87	33.85	10.19	13.36	8.99	8.62
Infrequency of purchases of gas (interpurchase time)	X_{13a}	1.00	1.00	30.00	30.00	7.45	11.21	5.01	6.67	3.75	7.25
Frequency of purchases at the station (out of every ten times)	X_{13b}	.00	.00	10.00	10.00	5.47	6.67	2.99	2.77	1.20	4.73
Pleasure in pumping own gas	X_{14}	.00	.00	10.00	10.00	2.80	2.62	3.35	3.35	-.18	-.59
Importance of time	X_{15}	.00	.00	10.00	10.00	4.07	3.80	3.02	3.39	-.27	-.96
Searches for other stores	X_{16}	.00	.00	10.00	10.00	6.51	3.51	2.84	3.16	-3.00	-11.33
Self Service (Self service=1, Full service= 0)	O_1	.00	.00	1.00	1.00	.31	.27	.46	.44	-.04	-.97
Number of cars	O_2	6.00	6.00	22.00	22.00	9.74	9.29	5.39	4.91	-.44	-.97
Display of prices	O_3	.00	.00	.00	1.00	.00	.56	.00	.50	.56	18.41
Number of aisles	O_4	2.00	2.00	10.00	10.00	3.71	4.49	2.82	2.85	.77	3.09
Price (2007 euros)	O_5	.927	.920	.927	.972	.927	.939	.000	.016	.012	12.628
Nº competitors 5 kms.	O_6	3.00	3.00	12.00	18.00	9.09	13.47	2.97	4.88	4.38	12.40

* Robust Student's T-test with unequal variances

Table 2A. Descriptive statistics. Study 2

Variable name	*Symbol*	*Min*		*Max*		*Mean*		*S.D.*		*Diff M. (new-old)*	*Diff M. (t)**
		Old	New	Old	New	Old	New	Old	New		
Customer Satisfaction	S	.00	.00	10.00	10.00	7.42	7.05	1.77	1.72	-.37	-2.28
Future Patronage Intentions	P	.00	.00	10.00	10.00	7.22	6.80	2.60	2.41	-.42	-1.80
Accessibility of Location	D_1	.00	.00	10.00	10.00	7.38	6.73	2.35	2.53	-.65	-2.74
Information	D_2	.00	.00	10.00	10.00	6.40	6.10	2.48	2.29	-.30	-1.34
Assortment	D_3	.00	.00	10.00	10.00	4.54	4.74	3.29	2.93	.20	.70
Assurance	D_4	3.00	3.00	10.00	10.00	7.57	7.05	1.43	1.53	-.52	-3.66
Ambiance	D_5	.00	3.50	10.00	10.00	7.44	7.18	1.84	1.52	-.25	-1.67
Perceived Price	X_6	.00	.00	10.00	10.00	5.90	5.46	2.02	2.29	-.44	-2.11
Gender 0 (male)	X_{70}	.00	.00	1.00	1.00	.62	.61	.49	.49	-.01	-.18
Gender (female)	X_{71}	.00	.00	1.00	1.00	.38	.39	.49	.49	.01	.18
Age 0 (less than 25 years)	X_{80}	.00	.00	1.00	1.00	.21	.27	.41	.45	.07	1.59
Age 1(25 – 40 years)	X_{81}	.00	.00	1.00	1.00	.47	.36	.50	.48	-.11	-2.30
Age 2 (41 – 60 years)	X_{82}	.00	.00	1.00	1.00	.26	.31	.44	.46	.05	1.12
Age 3 (> than 60 years)	X_{83}	.00	.00	1.00	1.00	.07	.06	.25	.24	-.01	-.37
Life cycle 0 (single)	X_{90}	.00	.00	1.00	1.00	.25	.38	.43	.49	.13	2.96
Life cycle 1 (no child)	X_{91}	.00	.00	1.00	1.00	.34	.24	.47	.43	-.09	-2.25
Life cycle 2 (child < 6 yrs.)	X_{92}	.00	.00	1.00	1.00	.13	.07	.33	.25	-.06	-2.39
Life cycle 3(6 <child age <14)	X_{93}	.00	.00	1.00	1.00	.12	.15	.32	.36	.03	.99
Life cycle 4 (child>14 yrs.)	X_{94}	.00	.00	1.00	1.00	.17	.16	.38	.37	-.01	-.26

* Robust Student's T-test with unequal variances

Table 2A. Descriptive statistics. Study 2 (continued)

Variable name	*Symbol*	*Min*		*Max*		*Mean*		*S.D*		*Diff M. (news-old)*	*Diff M. (t)**
		Old	New	Old	New	Old	New	Old	New		
Hours worked	X_{10}	.00	.00	24.00	16.00	7.16	6.98	3.29	3.22	-.18	-.59
Mean length of stay (mins.)	X_{11}	1.50	2.00	20.00	30.00	5.76	6.04	2.93	3.22	.28	.95
Size of purchases (2007 euros)	X_{12}	4.00	2.00	100.00	100.00	34.23	32.81	14.61	13.34	-1.42	-1.10
Infrequency of purchases of gas (interpurchase time)	X_{13a}	.50	1.00	35.00	50.00	10.95	11.27	7.08	7.12	.32	.48
Frequency of purchases at the station (out of every ten times)	X_{13b}	.00	.00	10.00	10.00	6.52	6.05	2.82	2.66	-.47	-1.84
Pleasure in pumping own gas	X_{14}	.00	.00	10.00	10.00	2.67	3.74	3.31	3.52	1.07	3.27
Importance of time	X_{15}	.00	.00	10.00	10.00	3.94	4.54	3.26	2.93	.60	2.09
Searches for other stores	X_{16}	.00	.00	10.00	10.00	3.33	4.29	3.16	3.01	.96	3.32
Self Service (Self service=1,Full service= 0)	O_1	.00	.00	1.00	1.00	.27	.49	.44	.50	.22	4.87
Number of cars	O_2	4.00	8.00	22.00	12.00	8.57	9.49	.85	1.83	.92	3.75
Display of prices	O_3	.00	.00	1.00	1.00	.45	.49	.50	.50	.04	.83
Number of aisles	O_4	2.00	6.00	10.00	10.00	4.62	8.00	2.63	1.41	3.38	19.64
Price (2007 euros)	O_5	.919	.909	.972	.939	.937	.924	.014	.011	-.013	-10.284
Nº competitors 5 kms.	O_6	3.00	9.00	18.00	15.00	10.99	12.44	5.27	2.32	1.45	4.55

* Robust Student's T-test with unequal variances

Table 3A. Without X13B

	Variable	*Regression Coefficient*	*T- Ratio*
Constant	Constant	-2.272	-1.920
Estimated customer satisfaction	S^	.938	6.530
Prices	X_6	.215	3.440
Pleasure in pumping gas	X_{14}	.094	2.730
Searches for other stores	X_{16}	.158	1.700
In-frequency of purchases of gas	X_{13A}	-.070	-2.940
Self-service	O_1	-1.599	-3.060
07Dummy	07Dummy	5.038	2.440
Searches for other stores	DX_{16}	-.405	-3.520
In-frequency of purchases of gas	DX_{13A}	.090	2.610
N	516	R^2	.3161

Table 4A. Without X13B

	Variable	*Regression Coefficient*	*T- Ratio*
Constant	Constant	3.44	2.97
Estimated customer satisfaction	S^	.68	3.88
Searches for other stores	X_{16}	-.21	-4.89
Self-service	O_1	-.63	-2.97
Nº competitors 5 kms.	O_6	.05	2.14
Estimated customer satisfaction	DS^	.59	2.69
Searches for other stores	DX_{16}	.13	2.72
Self-service	DO_1	1.11	3.23
Nº competitors 5 kms.	DO_6	-.38	-10.20
N	570	R^2	.2562