Data Appendix Available on the Web: Gas Stations (1998, 2007).

In this Appendix we describe in a more systematic and thorough manner the variables used in the analysis. We also provide a discussion of some differences between the two surveys that were mentioned but not described in detail in the text. Finally, we also describe here variables that we constructed to identify objective characteristics of gas stations.

Both surveys measure customer satisfaction (S) as the answer to the same question on a scale of 0-10, – What is your degree of satisfaction with the services provided and the purchases made at this gas station? All the distribution services were measured on the same 0-10 scale as customer satisfaction in both surveys. Furthermore, three of the five distribution services were measured in exactly the same way in both surveys. Two of them are measured as answers to a single question: information (D_2) was measured in terms of – To what extent the employees and the signs in this establishment facilitate your information needs with respect to gasoline, other products and services, their location in the station, prices, sales, etc.? ; and assortment (D_3) was measured in terms of –To what extent the assortment of other products and services of this station facilitates your solving other demands you usually have at this station?

A third distribution service, assurance of product delivery (D_4), was measured in both surveys as the simple average of the answers to the following three questions: To what extent is it quick and convenient to pay for your purchases at the station?; To what extent the hours and the days the station is open facilitate making your purchases when you need to do so?; To what extent access to the pumps and their utilization make the services you derive from the station quick and convenient?

With respect to the other two distribution services, there was a difference between the 1998 and the 2007 survey in that the 1998 question was split in two to capture different

dimensions of the service. For instance, ambiance (D_5) was measured in 1998 in terms of – To what extent your treatment by employees, and the cleanliness and orderliness of the station allow your purchases to be an agreeable experience? In 2007 we asked two similar questions separating the treatment of employees from the cleanliness and orderliness of the station. For comparability purposes, however, we took the simple average of the answers to each question as our single measure of ambiance in 2007. Similarly, accessibility of location (D_1) was measured in 1998 in terms of – To what extent this station's location makes your access, including jointly distance and ease of entry and exit, convenient? In 2007 we asked two similar questions separating distance from ease of entry and exit. Once again we took the simple average of the answers as our measure of accessibility in 2007.

Variables D_1 - D_5 can be characterized as eliciting consumer's perceptions of how well the station was providing a distribution service or a selected aspect or dimension of a distribution service. The information on descriptive statistics in rows 3 through 7 of Table 1[1] shows substantial variations in the average of these perceptions across consumers between 1998 and 2007. The mean score is the same or higher for 2007 than for 1998 and, except for assurance and ambiance, the difference in means between the two years is statistically significant at the 1% level. It can also be seen from the first two rows of this table that the mean is also higher for the level of customer satisfaction and future patronage intentions.

In addition to the above variables, the two surveys gathered the same information on general characteristics of consumers, of their buying habits, as well as on attitudes toward the gas station where they were interviewed.

[1] This table compares the results for the 7 stations sample in 1998 and the 15 stations sample in 2007. Thus, it differs from both Tables1A and 2A of the Statistical Appendix.

Variables X_6 - X_{10} measure price perceptions, demographic characteristics and working habits of consumers. X_6 identifies the perceived price level of the station as the answer on a 0-10 scale to the following question - To what extent the prices at this station relative to others are too low or too high? 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 old. (X_{94}) is one if the consumer has children over 14 years of age. The last of these variables, X_{10}, measures the average number of hours worked outside the home daily by the consumer. Table 1 shows the changes in the mean of these variables.

Among the characteristics of their buying habits consumers were asked about the following: The amount of money spent each time they put in gasoline, on average, X_{12}[2].; How often do you put in gas in terms of days out of the month?, X_{13A}; To what extent do you prefer pumping your own gasoline?, X_{14}; To what extent is it important for you to reduce the amount of time spent on this activity?, X_{15}; To what extent do you search for alternative establishments when doing this type of purchasing?, X_{16}. Table 1 also shows the changes in the means of these variables between 1998 and 2007.

With respect to their attitudes toward purchases at the station consumers were asked the

[2] This variable was originally measured in terms of the units prevailing at the time in each survey (pesetas in 1998 and euros in 2007). The 1998 value was converted to 2007 euros. The conversion procedure is described in the text of this appendix when discussing the objective variables..

following: average length of their stay at the gas stations in minutes, X_{11}; out of every ten times that you put in gas at a station how often do you do it at this one?, X_{13B}; To what extent do you plan to patronize this gas station in the future?, P; This last variable is our other dependent variable. The means of these variables for both years are also available in Table 1. The variables discussed, thus far, are based on the responses of consumers interviewed at the station.

In addition we gathered information on what may be described as objective characteristic of the gas stations. Objective characteristics of gas stations were used to construct these types of variables for both 1998 and 2007: competition variables, prices and concepts representing objective, as opposed to perceived by customers, versions of the distribution services identified in the text. We constructed two sets of competition variables for each year: one set was based on features of competitors within 5 kilometers of a gas station; another was based on features of competitors within the branch to which the gas station belonged after constructing an additive tree (Sattath and Tversky 1980) of all the gas stations within Pamplona's beltway in each of the two sample years. Since the former constructs consistently dominated the latter ones in preliminary tests, we limit our attention to the former constructs.

We considered two features for each gas station: the number of competitors within 5 kilometers of a gas station, which is a direct measure of competition faced by each station each year, and the distance to the nearest competitor within 5 kilometers of a gas station, which is an inverse measure of competition faced by each station each year. The distances were calculated using the GPS system for Spain which indicates the actual distance to go from one gas station to the others allowing for the configuration of city streets. Table 1 shows that competition increased between the two years when measured by the average number of competitors. The distance variable did not have an impact in any specification, was dropped from consideration and is not

reported in Table 1.

It was attractive given our topic to attempt construction of an objective measure of prices. We chose the price of diesel. This type of gas is the one with the highest share of the Spanish market according to the Ministry of Industry Tourism and Commerce (Libro de la Energía, 2007). The 1998 peseta price was converted to April, 2007 euros. First, the pesetas were converted to euros using the exchange rate at that time (1 € = 166.386 pesetas). While the euro was not circulating at that time, it already existed officially. For instance, before its introduction into circulation bank accounts would provide customers of euro countries with their balances in the local currency and the euro. Second, this April 1998 value was converted to prices of April of 2007 using the official Spanish Consumer Price Index. We used the same procedure to convert the size of purchases variable into comparable units.

We considered a number of characteristics of the services provided by the gas stations based on the reports of the interviewers and our own observations. All but one of the measures discussed below capture some dimension of assurance of product delivery, D_4. We tried others but preliminary tests indicated that they did not matter at all. The ones reported below were the ones that mattered in some contexts. Nonetheless, the only ones actually employed in the Tables reporting regressions in the text are the presence or absence of self service (O_1) and the number of cars that could be handled simultaneously at the station (O_2). Table 1 indicates that between 1998 and 2007 the mean proportion of stations offering self-service as an option remained about the same. On the other hand, the average number of cars handled simultaneously experienced a statistically significant decrease.

We considered three other objective variables that did not merit inclusion in our final specification. One of them is hours of operation, which corresponds to another dimensions of

assurance of product delivery, but this variable did not vary enough across stations to have an impact. Another is the number of aisles but it proved much inferior to the one using the number of cars. The latter was estimated taking into account the number of aisles, pumps and hoses available. Finally, the last one considered was a measure of information (O_3) that took on the value of unity if there were clear displays of information on prices at the station. This variable had no variation across stations in 1998.

References

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Tables

Table 1. Descriptive statistics. Both samples

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	7.32	1.80	1.76	.26	1.92
Future Patronage Intentions	P	.00	.00	10.00	10.00	6.54	7.11	2.57	2.56	.57	2.91
Accessibility of Location	D_1	.00	.00	10.00	10.00	6.66	7.20	2.30	2.42	.54	3.01
Information	D_2	.00	.00	10.00	10.00	5.69	6.32	2.63	2.43	.63	3.23
Assortment	D_3	.00	.00	10.00	10.00	3.88	4.60	2.93	3.20	.72	3.14
Assurance	D_4	1.33	3.00	10.00	10.00	7.43	7.43	1.51	1.48	.00	.02
Ambiance	D_5	.00	.00	10.00	10.00	7.23	7.37	1.92	1.76	.14	.96
Perceived Price	X_6	.00	.00	10.00	10.00	5.66	5.78	1.73	2.10	.12	.88
Gender 0 (male)	X_{70}	.00	.00	1.00	1.00	.73	.61	.45	.49	-.12	-3.31
Gender (female)	X_{71}	.00	.00	1.00	1.00	.27	.39	.45	.49	.12	3.31
Age 0 (less than 25 years)	X_{80}	.00	.00	1.00	1.00	.33	.23	.47	.42	-.10	-2.91
Age 1(25 – 40 years)	X_{81}	.00	.00	1.00	1.00	.41	.44	.49	.50	.03	.71
Age 2 (41 – 60 years)	X_{82}	.00	.00	1.00	1.00	.23	.27	.42	.45	.04	1.26
Age 3 (> than 60 years)	X_{83}	.00	.00	1.00	1.00	.03	.06	.18	.25	.03	2.18
Life cycle 0 (single)	X_{90}	.00	.00	1.00	1.00	.40	.28	.49	.45	-.12	-3.30
Life cycle 1 (no child)	X_{91}	.00	.00	1.00	1.00	.20	.31	.40	.46	.11	3.50
Life cycle 2 (child < 6 yrs.)	X_{92}	.00	.00	1.00	1.00	.13	.11	.34	.31	-.02	-.84
Life cycle 3(6 <child age <14)	X_{93}	.00	.00	1.00	1.00	.08	.13	.27	.33	.05	2.33
Life cycle 4 (child>14 yrs.)	X_{94}	.00	.00	1.00	1.00	.19	.17	.39	.38	-.02	-.72

* Robust Student's T-test with unequal variances

Table 1. Descriptive statistics. Both samples (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	7.12	3.39	3.27	-.06	-.27
Mean length of stay (mins.)	X_{11}	1.00	1.50	30.00	30.00	5.48	5.84	3.01	3.01	.36	1.57
Size of purchases (2007 euros)	X_{12}	2.79	2.00	63.66	100.00	24.87	33.85	10.19	14.28	8.98	10.22
Infrequency of purchases of gas (interpurchase time)	X_{13a}	1.00	0.5	30.00	50.00	7.45	11.03	5.01	7.09	3.58	8.26
Frequency of purchases at the station (out of every ten times)	X_{13b}	.00	.00	10.00	10.00	5.47	6.40	2.99	2.78	.93	4.19
Pleasure in pumping own gas	X_{14}	.00	.00	10.00	10.00	2.80	2.96	3.35	3.40	.16	.63
Importance of time	X_{15}	.00	.00	10.00	10.00	4.07	4.10	3.02	3.19	.03	.13
Searches for other stores	X_{16}	.00	.00	10.00	10.00	6.51	3.59	2.84	3.15	-2.92	-13.11
Self Service (Self service=1,Full service= 0)	O_1	.00	.00	1.00	1.00	.31	.33	.46	.47	.02	.56
Number of cars	O_2	6.00	4.00	22.00	22.00	9.74	8.82	5.39	3.71	-.92	-2.46
Display of prices	O_3	.00	.00	.00	1.00	.00	.46	.00	.50	.46	22.01
Number of aisles	O_4	2.00	2.00	10.00	10.00	3.71	5.53	2.82	2.80	1.82	8.50
Price (2007 euros)	O_5	.927	.909	.927	.972	.927	.933	.000	.014	.006	10.757
Nº competitors 5 kms.	O_6	3.00	3.00	12.00	18.00	9.09	11.38	2.97	4.71	2.29	8.43

* Robust Student's T-test with unequal variances