

FLORIAN ZETTELMEYER, FIONA SCOTT MORTON, and JORGE SILVA-RISSO\*

Although research has shown that the Internet has lowered the prices in some established industries, little is known about *how* use of the Internet lowers prices. The authors address this issue for the automobile retailing industry with matched survey and transaction data on 1500 car purchases in California. They show that the Internet lowers prices for two distinct reasons: First, the Internet informs consumers about dealers' invoice prices. Second, the referral process of online buying services helps consumers obtain lower prices. The combined information and referral price effects are  $-1.5\%$ , or  $22\%$  of dealers' average gross vehicle profit. The authors also find that the benefits of gathering information differ by consumer type. Buyers who have a high disutility of bargaining but who have collected information on the specific car they eventually purchase pay  $1.5\%$  less than they otherwise would. In contrast, buyers who like the bargaining process do not benefit from such information.

## How the Internet Lowers Prices: Evidence from Matched Survey and Automobile Transaction Data

There is convincing evidence that the Internet has lowered the prices that some consumers pay in established industries. In car retailing, for example, Zettelmeyer, Scott Morton, and Silva-Risso (2005) show that new vehicle buyers who use the Internet pay  $2.2\%$  less for their car than those who do not use it, a savings of \$500 on the average car. In the insurance industry, Brown and Goolsbee (2002) show that the growth of the Internet has reduced the price of term life insurance by  $8\%$ – $15\%$ .

Although these results are convincing that use of the Internet lowers prices, they do not reveal much about *how* use of the Internet lowers prices. In particular, there are sev-

eral things that a buyer can do with the Internet, including researching product characteristics, making price comparisons, communicating with sellers, obtaining recommendations from peers, and so on. In addition, in some markets, the Internet has made possible new institutions (e.g., such as online buying services) that change price negotiations. We want to better understand what aspects of Internet use matter most for the prices paid by consumers.

In this article, we address this issue in the context of price negotiations for new vehicles; we use direct measures of search behavior and consumer characteristics to investigate how the Internet affects negotiated prices in car retailing. We match transaction data on 1500 car purchases in California with the responses to a survey that asks buyers detailed questions about their Internet usage, their attitudes toward information search and bargaining, and their demographics.

We have two specific goals in this article: The first goal is to investigate why the Internet lowers the prices paid by consumers who use it. We consider two basic reasons: First, the Internet could lower prices by decreasing search cost, thus making more purchase-relevant information available to consumers who use the Internet. Information can be relevant in various ways. For example, information about invoice prices enables consumers to better estimate the dealer's reservation price, an important piece of information in negotiations. Lower search cost may also benefit con-

---

\*Florian Zettelmeyer is Associate Professor of Marketing, Haas School of Business, University of California, Berkeley, and NBER (e-mail: florian@haas.berkeley.edu). Fiona Scott Morton is Professor of Economics, School of Management, Yale University, and NBER (e-mail: fiona.scottmorton@yale.edu). Jorge Silva-Risso is Assistant Professor of Marketing, Anderson Graduate School of Management, University of California, Riverside (e-mail: jorge.silva-risso@ucr.edu). The authors thank the two anonymous *JMR* reviewers and the late editor Dick Wittink. They also thank Eric Anderson; Severin Borenstein; Hai Che; Priya Raghuram; Jose Silva; K. Sudhir; and seminar participants at the University of British Columbia, New York University, University of California, Berkeley, the University of Southern California, and Stanford University for helpful comments. The authors are particularly indebted to Meghan Busse for extensive comments and suggestions. They gratefully acknowledge support from the Economics Program of the National Science Foundation (Grant No. SES-0111885).

sumers in their search for low-price dealerships. Because car prices are negotiated and rarely posted, the Internet is unlikely to help consumers find price information from competing dealerships without engaging in direct negotiation. However, the Internet may help consumers find low-price dealerships because it facilitates an information exchange with other consumers about the prices they paid at various dealerships. In addition, consumers may make price inferences from dealer Web sites. To some degree, the Internet may be a substitute for visiting multiple dealers. Second, the Internet could lower prices for some consumers by consolidating their buyer power through online buying services; these institutions have become widely accessible as a result of the Internet. There is evidence that groups of buyers should expect to pay lower prices than individual buyers (Snyder 1998). Therefore, we expect that consumers who use online buying services pay lower prices.

The second goal of this article is to determine whether there is an interaction between customer characteristics (e.g., the disutility of bargaining) and the payoffs from using the Internet. We are interested in this question because there is evidence that consumers who are disadvantaged in the bargaining process are more likely to use the Internet (Zettelmeyer, Scott Morton, and Silva-Risso 2005). The standard economic argument suggests that consumers' propensity to engage in a given behavior should be positively related to their benefit from doing so. In the current context, we therefore expect that consumers with characteristics that disadvantage them in price negotiations benefit more from using the Internet. For example, consumers who dislike the face-to-face bargaining process might benefit more from obtaining information from the Internet than consumers who do not mind bargaining.

We show that the Internet lowers prices for two distinct reasons: First, the Internet informs consumers. The information that seems to be most valuable to consumers is dealers' invoice prices; this information enables consumers to negotiate a low price at a given dealership. Internet information does not seem to help consumers find low-price dealerships. In particular, the Internet does not substitute for searching at multiple dealers. Second, the referral process of online buying services, a novel institution made possible by the Internet, helps consumers obtain lower prices. We believe that online buying services are effective because unlike manufacturers, they can exert pressure on dealers by directing incremental business to affiliated dealerships and away from unaffiliated dealerships.

Our results show combined information and referral price effects of  $-1.5\%$ . This corresponds to 22% of dealers' average gross profit margin per vehicle. There are two important points related to this finding: First, we account for potential selection effects in search and purchasing behavior by directly controlling for individual buyer characteristics, such as disutility of bargaining, willingness to search, and car knowledge. Although these controls cannot fully rule out selection bias, they increase our confidence that the price effects are not an artifact of differences in unobserved characteristics between people who choose to use the Internet and those who do not. Second, this estimate is close to the  $-2.2\%$  estimate in the work of Zettelmeyer, Scott Morton, and Silva-Risso (2005), who use a different data source, a different estimation method, and a different time period.

We also find that the benefit of gathering information differs by consumer type. Whereas buyers with a high disutility of bargaining pay 1.5% less when they use the Internet to collect information on the specific car they eventually purchase, buyers who like the bargaining process do not benefit from such information. This contrasts with the benefits of requesting a referral from an online buying service, which is equal for the two types of buyers ( $-0.7\%$ ). We argue that a referral from an online buying service lowers dealers' prices because of the implicit threat that an online buying service can redirect customers to the dealers' competitors if the referral service's customers are not offered good prices. Consistent with our findings, if this threat operates, it seems reasonable that it should apply uniformly across consumers.

This article is related to prior work that analyzes how consumers search for car information. Ratchford and Srinivasan (1993) use survey data on search and choice behavior from a local automobile market to estimate returns to search time. Moorthy, Ratchford, and Talukdar (1997) present a model of total search effort, emphasizing how prior brand perception affects the search process. By comparing data from 1989 to 1999, Ratchford, Talukdar, and Lee (2003) analyze how the Internet has changed consumer search behavior for automobiles. Furse, Punj, and Stewart (1984) use a survey to identify clusters of consumers with different search patterns and find that a sizable segment of consumers search very little. Klein and Ford (2003) replicate this approach for a sample of Internet users. These articles have been useful in informing our survey design. However, our research represents a substantial extension of these previous studies on Internet search for automobiles because it combines survey data with detailed transaction data on purchase outcomes.

This article is also related to the work of Scott Morton, Zettelmeyer, and Silva-Risso (2001) and Zettelmeyer, Scott Morton, and Silva-Risso (2005), who use a large data set of transaction prices for new cars and then combine it with information on Internet usage from a large online buying service (Autobyte.com). The former work provides an overview of Internet car retailing, and the latter controls for selection and shows that using Autobyte.com reduces price by approximately 2.2%. However, neither work addresses the research questions in the current article. This is because the data used in the prior research contain only a single search- or Internet-related explanatory variable, namely, whether a consumer used the online buying service Autobyte.com. This service both informs consumers and enables them to submit an online referral. Without other explanatory variables that measure, for example, the extent to which consumers were informed from other sources, the research cannot determine the effects of different search and purchasing activities. For the same reason, Scott Morton, Zettelmeyer, and Silva-Risso (2001) and Zettelmeyer, Scott Morton, and Silva-Risso (2005) cannot disentangle whether consumers save money from using the Internet because they become better informed or because online buying services change the way price negotiations are conducted. Scott Morton, Zettelmeyer, and Silva-Risso (2005) use the same data set that we use herein to test predictions from bargaining theory about how private information, patience, and bargaining disutility affect the division of surplus between negotiating parties, but their research has no

measures of Internet use and does not consider the role of the Internet for car negotiations.

In the current article, we proceed as follows: In the next section, we describe the survey and transaction data. Then, we analyze the different ways that the Internet lowers prices. Finally, we offer conclusions.

#### DATA

Our data come from two sources. The first source is a survey instrument that we mailed to 5250 consumers who purchased one of eight popular new car models in California during April and May 2002. We matched the individual survey data to the transaction data from our second source, a data supplier in the automotive industry (hereinafter DSA).

##### *Survey Data*

*Survey instrument.* The survey asked questions about (1) the number of dealers a buyer visited, (2) the buyer's negotiation strategy, (3) the offline and online sources of information the buyer used, (4) the information the buyer learned at each of these information sources, (5) the referrals the buyer requested, (6) demographics, and (7) personal attitudes toward bargaining and information search. The survey questions we used appear in the Appendix.

*Sample.* We chose our sample by car type and then mailed the survey to every buyer of the selected car types for whom we had transaction data in April and May 2002. The first objective in selecting car types was to include a variety of car categories (e.g., midsize sedan, luxury sedan, pickup, sport-utility vehicle). The second objective in selecting car types was to keep the number of different cars small so that we could control for car fixed effects without losing too many degrees of freedom. We defined a "car" as the interaction of make, model, body type, transmission, displacement, doors, cylinders, and trim level (e.g., one car is a 2002 Honda Accord sedan with automatic transmission, a 2.2 liter engine, 4 doors, 4 cylinders, and the EX trim). We added the purchases of the most common cars for a variety of car categories until we reached our desired sample size. This yielded the most popular variants of Honda Accord, Chrysler PT Cruiser, Nissan Altima, Chevrolet Silverado, Toyota Corolla, Jeep Grand Cherokee, Honda Odyssey, and Chevrolet Tahoe.

*Procedure.* Each potential respondent received three mailings. We sent the first mailing in mid-July 2002. It contained a letter that announced the arrival of the survey, introduced us as the researchers, and explained the purpose of the project. We sent the second mailing five days later; it contained a cover letter, the survey, a prestamped return envelope, and a \$1 bill. This means that buyers received the survey between 6 weeks and 14 weeks after purchasing their vehicle (depending on when in April and May the purchase took place). We sent the third mailing five days after the second mailing; it consisted of a postcard that thanked buyers for their participation and reminded them to return the survey.

The survey design, including the cover letter, the multiple mailings, and the \$1 token of thanks, seemed to be effective at encouraging response. Of the 5250 surveys we sent out, 2470 were returned completed or partially completed, for a response rate of 47%.

*Response issues.* In cases in which the answer to a question was missing but could be easily inferred from a follow-

up question, we filled in the answer. For example, if a buyer did not answer whether he or she used the Internet but subsequently detailed the types of sites he or she visited, we filled in that the respondent used the Internet. We also corrected two inconsistencies in the way surveys were filled out. The first correction pertains to a question about the respondent having collected information about the car he or she eventually purchased. We corrected answers for which there were two ways to determine that the answer was erroneous. For example, if a person indicated that he or she researched zero cars and spent zero hours doing research online *and* zero offline, we did not allow the respondent to have "collected information about the car he or she eventually purchased." The second correction pertains to the question whether the respondent had in any way used the Internet in conjunction with buying a car. For example, some buyers checked off that they did not use the Internet to search for a car but then continued to indicate which Web sites they visited for research. In this case, we changed the answer on the Internet-use question to "yes."<sup>1</sup>

In survey-based research, it can be difficult to assess how respondents and nonrespondents differ along relevant dimensions. In our case, this assessment is easier; because we have transaction data for both respondents and nonrespondents, we can compare these two groups along any variable we observe in the transaction data. First, we can compare the census-based demographic information associated with the census block groups in which buyers reside. If we assume that these census-based measures are representative of individual buyers' demographics, nonrespondents are significantly (at the 5% level) less likely to be college graduates (27% versus 31%), more likely to be high school dropouts (18% versus 13.5%), more likely to be Hispanic or black (20% and 5% versus 16% and 4%, respectively), have lower household incomes (\$55,000 versus \$59,000), and own less valuable houses (\$214,000 versus \$228,000) than respondents. There is no statistically significant difference between the two groups in the percentage of buyers who are identified as female on the basis of their first name. Second, we can compare how respondents and nonrespondents differ with regard to behavioral measures contained in the transaction data. For price (i.e., the dependent variable we used in this study), there is no significant difference between respondents and nonrespondents at the 5% level. In addition, we do not find a statistically significant difference in the dealer profitability of purchases by respondents and nonrespondents.

We are not concerned about the demographic differences between respondents and nonrespondents for two reasons: First, the differences do not seem large enough for respondents and nonrespondents to differ significantly with respect to our dependent variable (or other transaction-based behavioral measures). Second, in our previous research, we found that, all else being equal, the poorest, least-educated buyers pay most for a car and are the least likely to use the Internet. These are precisely the buyers

<sup>1</sup>Our conclusions are unaffected by these corrections. To test for robustness, we repeated all specifications in the article with a data set from which we dropped the inconsistent 71 survey responses. We also repeated all specifications with a data set that was left completely unaltered. Although the magnitude of coefficients varies slightly between data sets, our substantive findings remain unchanged.

who were least likely to respond to our survey. What this means is that the most significant undersampling in our survey is non-Internet users who paid high prices. Most of our empirical results arise from a comparison of the conditional mean of prices paid by buyers who used the Internet (or were informed or searched) with the conditional mean of prices paid by buyers who did not use it. Because the survey undersamples buyers who pay high prices and are in the non-Internet-using group, the conditional mean of prices for non-Internet users will be lower in the sample than in the population at large. In the sample, we find that non-Internet users pay higher prices than Internet users. Thus, if the population conditional mean of prices for non-Internet users is higher than the sample conditional mean of prices for non-Internet users, the population difference in the mean prices between Internet users and nonusers will be larger than the difference observed in the sample. Consequently, our results are likely to be a conservative lower bound of the true benefits of being informed and using the Internet.<sup>2</sup>

*Basic survey findings.* Seventy-two percent of respondents reported that they used the Internet in some way to help them shop for a new vehicle. The most frequently visited sites by buyers who reported using the Internet were manufacturer Web sites (70%). Internet consumers also frequently visited informational Web sites, such as consumer-reports.com or kbb.com (63%), followed by online buying services, such as Autobytel.com or Carsdirect.com (56%), and individual dealer Web sites (31%). Only 6% of buyers who used the Internet collected information in chat rooms or from bulletin boards. Respondents also used the Internet to obtain price quotes. Twenty-seven percent of Internet users reported using an online buying service to request a quote from a dealer. Somewhat fewer Internet users (14%) reported using a manufacturer Web site to request a quote from a dealer. Seventy-eight percent of buyers who used the Internet responded that they had explicitly mentioned this to the dealer.

Internet users reported having collected information on more car types than buyers who did not use the Internet. The median buyer who used the Internet collected information for two to three cars, whereas the median offline buyer collected information for only one car. Most strikingly, only 52% of buyers who did not use the Internet reported that they collected information (from any source) specifically on the vehicle that they ended up buying. This contrasts with 95% for buyers who used the Internet. Across both groups, the average is 82%.

#### *Transaction Data*

The DSA collects transaction data from a sample of dealers in the major metropolitan areas in the United States. These data include some customer information; the make, model, and trim level of the car; financing information; trade-in information; dealer-added extras; and the profitability of the transaction to the dealership.

The price observed in the data set is the price that the customer pays for the vehicle, including factory-installed accessories and options and the dealer-installed accessories

contracted for at the time of sale that contribute to the resale value of the car.<sup>3</sup> The “Price” variable we use as the dependent variable is this price less “Manufacturer Rebate,” if any, given directly to the consumer and less “Trade-In Over Allowance.” Trade-In Over Allowance is the difference between the trade-in price the dealer pays to the consumer and the wholesale value of the specific trade-in vehicle (as estimated by the dealer). We adjust for this amount to account for the possibility, for example, that a dealer may offer a consumer a low price for the new car because the dealer is profiting from the trade-in.

We control for car fixed effects according to our definition of a “car.” Although our car fixed effects control for many of the factors that contribute to the price of a car, they do not control for the factory- and dealer-installed options, which vary within trim level. The price we observe covers such options, but we do not observe what options the car actually has. To control for price differences attributable to options, we include as an explanatory variable the percentage deviation of the dealer’s cost of purchasing the vehicle from the average vehicle cost of that car in the data set. This percentage deviation, which we call “Vehicle Cost,” is positive when the car has an unobserved option (e.g., a CD player) and therefore is relatively expensive compared with other examples of the same car. Our measure of price also takes into account any variation in holdback and transportation charges.

To control for time variation in prices, we define a dummy variable, “End of Month,” which equals 1 if the car was sold in the last five days of the month. This dummy accounts for salespeople receiving bonuses when they fulfill monthly sales quotas, which changes their incentive to hold out for a high price. Another dummy variable, “Weekend,” specifies whether the car was purchased on a Saturday or a Sunday; this controls for whether consumers who buy cars on weekends are different from other consumers in ways that are otherwise unobserved. In addition, we include a dummy for the second month in our two-month sample period to control for other seasonal effects.

We also control for the competitiveness of each dealer’s market. For each dealership, we count the number of dealerships with the same nameplate that fall in a zip code that is within a ten-mile radius of the zip code of the focal dealership. We take into account cases in which one owner owns several franchises in close proximity so that our measure counts only the number of separately controlled entities.

We also supplement the demographic information from the survey with census data that the DSA matches with the buyer’s address from the transaction record. The data are on the level of a “block group,” which makes up about one-fourth of the area and population of a census tract. On average, block groups consist of approximately 1100 people. Finally, we control for whether the car was sold in Northern or Southern California.

When we combine the two data sets, we obtain 1436 observations. This is smaller than the number of returned surveys because of missing information in the transaction data set and some partially completed surveys.

<sup>2</sup>For this statement to be true, the exact condition we need is for there to be a greater nonresponse rate in the upper tail of the price distribution for non-Internet users than in the upper tail of the price distribution for Internet users.

<sup>3</sup>Dealer-installed accessories that contribute to the resale value include items such as upgraded tires or a sound system but exclude options such as undercoating and waxing.

## RESULTS

We now use the direct measures of search behavior and consumer characteristics to investigate how the Internet lowers negotiated prices in car retailing. Our dependent variable is Price, as we defined it in the "Data" section. To provide the appropriate baseline for the price of the car, we use a standard hedonic regression of log price. We work in logs because the price effect of many of the attributes of the car, such as being sold in Northern California or in May, is likely to be modeled better as a percentage of the car's value than as a fixed dollar increment. We estimate the following specification:

$$(1) \quad \ln(\text{Price}_i) = X_i\alpha + D_i\beta + S_i\gamma + \varepsilon_i.$$

The X matrix is composed of transaction and car variables: car, month, and region fixed effects; car costs; and controls for whether the car was purchased at the end of the month or during the weekend and whether the buyer traded in a vehicle. The D matrix contains buyers' demographic characteristics and their census block group (see Table 1). We use demographic information on gender, age, education, income, and race from the survey. We use information on house ownership, median house value, and type of occupation in the census block group in which the buyer resides. We control for these demographic variables because we know from the work of Scott Morton, Zettelmeyer, and Silva-Risso (2003) that they are related to negotiated car prices. In addition, these variables are also correlated with the search and purchasing behavior we analyze in this article; thus, their inclusion is critical to avoid bias in the coefficients of interest.<sup>4</sup> To this basic specification, we add a

<sup>4</sup>For example, education is a good predictor of Internet usage. Only 37% of buyers who reported not having a high school degree used the Internet, in contrast to 81% of buyers with a college degree or higher. In addition, 87% of buyers with an income greater than \$150,000 reported using the Internet for car buying, in contrast to only 47% of buyers with an income

matrix S, which contains survey responses that indicate buyers' search behavior and Internet usage.

We begin our investigation of the role of the Internet by including an indicator to the specification, which is 1 if a buyer answered yes to the following question: "Did you use the Internet in any way to help you shop for a new vehicle (e.g., to research vehicles, find a dealer, etc.)?" We refer to this indicator as "Internet Use" (see Table 2, Column 1). We find that, on average, buyers who reported using the Internet in any way to help them shop for a new vehicle pay 1.16% less than other buyers ( $p < .001$ ).

Although this describes the average difference in the prices that Internet users and nonusers pay, this average likely does not measure the expected return to a customer of deciding to use the Internet. The reason is that the average effect on price likely includes effects caused by unobserved customer traits (e.g., being a "smart shopper"), which happen to correlate with use of the Internet.

#### *Is the Internet Effect Driven by Unobserved Differences Between Online and Offline Consumers?*

To estimate the "treatment effect" of using the Internet, in this section, we run the same specification as we described previously, but this time, we control for consumer types. We can measure, albeit imperfectly, normally "unobserved" consumer types by asking consumers particular questions on the survey. Although controlling for these measures cannot rule out that some of the Internet effect remains driven by unobserved differences among consumers, we measure consumers' characteristics that we *ex ante* believe best pre-

between \$20,000 and \$29,999. We do not discuss the estimated coefficients on the demographics in this article, because they are not the focus of the study. For a detailed analysis of the effects of demographics on the price of a new car, see Scott Morton, Zettelmeyer, and Silva-Risso (2003). For another approach on the effect of demographics on bargaining outcomes, see Chen, Yang, and Zhao (2005).

Table 1  
SUMMARY STATISTICS

	Observations	M	SD	Minimum	Maximum
<i>Demographic Variables from Survey</i>					
Age	1436	3.03	.91	1.00	5.00
Education	1436	4.82	1.44	1.00	7.00
Income	1436	5.18	2.19	1.00	10.00
Black	1436	.03	.18	.00	1.00
Hispanic	1436	.20	.40	.00	1.00
Female	1436	.40	.49	.00	1.00
<i>Demographic Variables from Census</i>					
House ownership (%)	1436	.67	.24	.01	1.00
Median house value <sup>a</sup>	1436	2.28	1.06	.19	5.00
Professional (%)	1436	.16	.08	.00	.62
Executives (%)	1436	.17	.08	.00	1.00
Blue collar (%)	1436	.27	.16	.00	.91
Technicians (%)	1436	.03	.02	.00	.16
<i>Summary Statistics from Transaction Data</i>					
Price	1436	23,284.92	5499.61	9800	38,750
Trade-in	1436	.30	.46	.00	1.00
End of month	1436	.20	.40	.00	1.00
Weekend	1436	.30	.46	.00	1.00
Competition	1436	4.50	3.06	.00	16.00
Month (May)	1436	.52	.50	.00	1.00
Southern California	1436	.62	.48	.00	1.00

<sup>a</sup>Median house value is in hundreds of thousands of dollars.

Notes: Age, education, and income represent response categories.

Table 2  
PRICE EFFECTS OF SEARCH AND PURCHASING BEHAVIOR

<i>Dependent Variable Ln(Price)</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
Internet use	-1.16 (.32)***	-.98 (.39)**				-.76 (.39)*	
Informed			-.74 (.39)*				-.67 (.39)*
Know cars				.02 (.31)			
Know dealers				-.14 (.28)			
Know invoice				-.61 (.30)**			
Know market price				-.04 (.31)			
Number of dealers visited					-.35 (.14)**	-.31 (.14)**	-.33 (.14)**
Manufacturer site					.13 (.28)		
Dealer site					-.19 (.30)		
Information site					-.12 (.29)		
Chat room					.73 (.45)		
OBS site					-.90 (.27)***		
OBS referral						-.72 (.28)**	-.80 (.28)***
Manufacturer referral						.10 (.34)	.09 (.34)
Afraid to be taken advantage of		.42 (.13)***	.42 (.13)***	.44 (.13)***	.45 (.13)***	.43 (.13)***	.44 (.13)***
No time to shop		.23 (.15)	.22 (.15)	.25 (.15)	-.21 (.15)	.19 (.15)	.18 (.15)
Do price comparisons		-.39 (.23)*	-.31 (.23)	-.36 (.23)	-.31 (.23)	-.32 (.23)	-.26 (.23)
Internet for information		.01 (.18)	-.17 (.16)	-.14 (.17)	-.09 (.17)	.04 (.19)	-.09 (.16)
Gather much information		-.25 (.20)	-.28 (.21)	-.26 (.21)	-.24 (.21)	-.23 (.20)	-.24 (.21)
Read car magazine		.21 (.17)	.23 (.17)	.22 (.17)	.28 (.17)*	.24 (.17)	.25 (.17)
Visit dealer for fun		-.10 (.20)	-.10 (.20)	-.11 (.20)	-.11 (.20)	-.13 (.20)	-.13 (.20)
Customer age	-.13 (.14)	-.12 (.15)	-.09 (.15)	-.13 (.15)	-.11 (.14)	-.12 (.14)	-.10 (.15)
Education	-.41 (.10)***	-.39 (.10)***	-.39 (.10)***	-.41 (.10)***	-.38 (.10)***	-.39 (.10)***	-.39 (.10)***
Income	-.23 (.25)	-.20 (.25)	-.20 (.25)	-.25 (.25)	-.20 (.25)	-.20 (.25)	-.20 (.25)
Income <sup>2</sup>	.04 (.02)*	.04 (.02)*	.04 (.02)*	.05 (.02)**	.04 (.02)**	.04 (.02)*	.04 (.02)*
Black	.52 (.88)	.69 (.87)	.67 (.87)	.68 (.87)	.68 (.87)	.68 (.87)	.66 (.87)
Hispanic	.37 (.38)	.40 (.38)	.41 (.38)	.40 (.39)	.50 (.38)	.41 (.38)	.41 (.38)
Other race	.24 (.44)	.28 (.42)	.31 (.42)	.20 (.44)	.34 (.43)	.27 (.42)	.30 (.43)
Female	.48 (.26)*	.32 (.27)	.31 (.27)	.25 (.27)	.32 (.27)	.32 (.27)	.31 (.27)
Constant	1007.30 (1.43)***	1007.09 (1.75)***	1007.18 (1.76)***	1007.14 (1.77)***	1007.62 (1.76)***	1007.62 (1.77)***	1007.71 (1.77)***
Car fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1436	1436	1436	1419	1435	1435	1435
Adjusted R-square	.96	.96	.96	.96	.97	.97	.97

\**p* = .10.  
\*\**p* = .05.  
\*\*\**p* = .01.

Notes: Robust standard errors are in parentheses. All coefficients are multiplied by 100. We do not report car, month, and region fixed effects; end of month; weekend; trade-in; competition; vehicle cost; and census demographics. OBS = online buying service.

dict consumers' underlying propensity to search for purchase-relevant information and to use the Internet.<sup>5</sup>

We asked consumers to rate their agreement or disagreement with a list of statements to obtain a measure of three consumer traits: (1) whether a consumer has a high willingness to search, (2) whether a consumer is a car enthusiast, and (3) whether a consumer has a high disutility of bargaining.<sup>6</sup> To obtain answers that are reliable and as comparable as possible across respondents, we asked survey participants questions about their behavior or their attitudes, not about their traits directly. For example, we are interested in the "car enthusiast" trait to control for whether a consumer knows a lot about cars, even if he or she did little or no search for the car purchase. We could have asked a survey participant to agree or disagree with the statement "I am a car enthusiast," thus leaving it up to the respondent to decide what a car enthusiast is. Instead, we obtain more consistent answers by asking "I read car- and/or truck-enthusiast magazines regularly" and "I tend to visit dealers whenever a new model is introduced."<sup>7</sup> Similarly, we measure consumers' willingness to search with statements such as "I do a lot of price comparison when making large purchases," "I am the kind of person who gathers as much information as possible before visiting car dealers," and "I frequently use the Internet to obtain information about products I am interested in." Finally, to assess whether consumers derive a high disutility from the bargaining process, we presented them with the statements "I am afraid that I will be taken advantage of by a dealer when negotiating the price of a new car" and "It is hard for me to find time to shop for a new vehicle." We assume that consumers who feel vulnerable dislike bargaining more than consumers who do not feel vulnerable. The response to the second statement measures consumers' assessments of their opportunity cost of being engaged in a bargaining interaction.<sup>8</sup>

To investigate how our survey questions map onto the three consumer traits that they are intended to measure, we employ a factor analysis. Three factors have eigenvalues greater than 1, and their interpretation corresponds exactly to our three consumer traits. The first factor, which has high factor loadings on the three willingness-to-search

questions,<sup>9</sup> has an eigenvalue of 1.99 and explains 28% of the variation in the seven items. The second factor, which has high factor loadings on the two car-enthusiast questions, has an eigenvalue of 1.51 and explains 22% of the variation in the seven items. The third factor, which has high factor loadings on the two bargaining-disutility questions, has an eigenvalue of 1.09 and explains 16% of the variation in the seven items. The reliability of the measures is as follows: Cronbach's alpha for the three willingness-to-search questions is .7, and the correlation coefficient for the two two-question scales is .45 ( $p < .001$ ) for willingness to search and .18 ( $p < .001$ ) for bargaining disutility.<sup>10</sup>

We begin with specifications that include the answers to the individual consumer trait questions directly in the regression (we use the factors subsequently). We repeat the specification in Table 2, Column 1, adding these measures of "unobserved" consumer traits. The coefficient on Internet Use decreases from  $-1.16$  to  $-.98$  ( $p = .01$ ; see Table 2, Column 2). Consumer traits are related to price as follows: Buyers who are more afraid of being taken advantage of by the dealer pay more, suggesting that they had reason to be afraid. Consumers who agree more with the statement "I do a lot of price comparison when making large purchases" pay less ( $p = .10$ ). Other consumer trait variables are not significantly different from zero. This reflects a consequence of our approach of including all consumer trait variables in the regression. Because several of the questions are similar by design, they may be only jointly significant. Thus, we test the hypothesis that the subsets of variables that measure each consumer trait are jointly zero. We reject the hypothesis that the variables that measure consumers' disutility of bargaining ("Afraid to Be Taken Advantage of," "No Time to Shop") are jointly zero ( $p = .001$ ). We also reject the hypothesis that the variables that measure consumers' willingness to search ("Do Price Comparisons," "Internet for Information," "Gather Much Information") are jointly zero ( $p = .05$ ). We cannot reject the hypothesis that the variables that measure whether a consumer is a car enthusiast ("Read Car Magazine," "Visit Dealer for Fun") are zero ( $p = .43$ ).

We conclude that the Internet effect is unlikely to result from differences between online and offline consumers in their demographics, their bargaining disutility, their willingness to search, or their knowledge about cars; buyers who use the Internet pay approximately 1% less, even after we control for demographics and (normally unobserved) consumer traits. This corresponds to 15% of dealers' average gross profit margin per vehicle.

<sup>5</sup>At the end of the "Conclusion" section, we show that these consumer characteristics are indeed correlated with Internet use. This is also true for some other independent variables of interest (we do not report these here). Because our measures of consumer characteristics are also related to the prices that consumers pay, this shows the importance of controlling for these characteristics in subsequent specifications to avoid biased estimates.

<sup>6</sup>We chose these measures on the basis of our prior research findings and discussions with car and Internet industry experts.

<sup>7</sup>Note that these questions may not entirely overcome our concerns with asking consumers questions with vague terms. In particular, some of our questions involve an implicit norm that may differ between, for example, Internet-based buyers and other buyers. This is a limitation of our survey that we cannot overcome at this time.

<sup>8</sup>The consumer traits we construct are based in part on a consumer's own assessment of his or her bargaining ability. These assessments are made 6–14 weeks after the consumers purchased a car. If consumers infer their bargaining ability from the price they obtained for this particular vehicle, there could be an endogeneity between prices and consumer traits. If this is the case, too much of the price effect will be attributed to consumer traits, and too little will be attributed to other factors, such as information search. Although this endogeneity is of concern, because the primary purpose of the consumer traits is to function as control variables, we believe that such endogeneity biases the results against our main findings.

<sup>9</sup>The rotated factor loadings (Varimax rotation) for the first factor are .82 for Do Price Comparisons, .72 for Internet for Information, and .85 for Gather Much Information. For the second factor, which corresponds to car enthusiast, the factor loadings are .85 for Read Car Magazine and .84 for Visit Dealer for Fun. For the third factor, which corresponds to Bargaining Disutility, the factor loadings are .73 for Afraid to be Taken Advantage of and .78 for No Time to Shop.

<sup>10</sup>The somewhat lower correlation of the bargaining-disutility measures should not be a cause for concern, because bargaining disutility is best thought of as a formative indicator (Diamantopoulos and Winklhofer 2001; Jarvis, MacKenzie, and Podsakoff 2003). Both feeling vulnerable in negotiations and having a time constraint should make the bargaining process less desirable for consumers. Note, however, that these two measures need not be highly correlated within individuals.

In this section, we controlled for selection with a selection-on-observables approach. We were able to do so because our survey instrument enables us to elicit normally unobservable consumer characteristics, which we *ex ante* believe are correlated with the prices that consumers paid and consumers' underlying propensity to search for purchase-relevant information and to use the Internet. Thus, going forward, we interpret the effect of Internet usage as a "treatment effect." Note, however, that the validity of this approach relies on the maintained assumption that after we control for consumers' trait measures and their demographic characteristics, there are no more unobserved characteristics that affect both prices paid and propensity to use the Internet.<sup>11</sup>

#### *Does Internet Use Serve as a Signal to Dealers?*

We have shown that the Internet effect does not seem to be the result of measurable differences between online and offline consumers, but it could still be that the Internet discount results from dealers' *perceptions* that Internet consumers are different. We can analyze this possibility because we asked consumers whether they had mentioned to the dealer that they used the Internet to do research. If the Internet saves consumers money because dealers assume that consumers who use the Internet are different from "regular" consumers, we should find that the Internet effect differs between consumers who told the dealer they had used the Internet and consumers who did not.<sup>12</sup> No consumer in our sample reported telling the dealer that they had used the Internet when, indeed, they had not. We repeat the specification in Table 2, Column 2, with the addition of an indicator variable, "Told the Dealer," which is 1 if a buyer who used the Internet told the dealer that he or she used the Internet to do research (unreported). We cannot reject the hypothesis that consumers who used the Internet and told the dealer that they had done so paid, on average, the same price for a new car as consumers who did not tell the dealer about their Internet use (the coefficient on Told the Dealer is .14;  $p = .70$ ).

On the basis of the results of this and the previous discussion and the survey measures at our disposal, we conclude that the Internet effect is unlikely to result from actual or dealer-perceived differences between online and offline consumers. We now determine the mechanism by which the Internet lowers the prices that consumers pay.

#### *The Role of the Internet*

In the results so far, we have shown that Internet usage leads to prices that are lower by approximately 1% and that,

<sup>11</sup>Another way to control for selection would be to instrument for Internet use. Any instrument would need to be correlated with Internet use while being uncorrelated with the prices that individual consumers paid. Regrettably, it is difficult to find such instruments. In other research settings, demographic information can be used to predict Internet usage. In the case of negotiated prices, however, almost all demographic indicators (e.g., income, education) are also likely to be correlated with price. In general, individually negotiated prices are a function of consumer characteristics that are also likely to predict Internet use. Thus, it is difficult to argue that there are measures that could be used to predict Internet use in the first-step selection equation but should be excluded from the price equation. This is the reason we chose the alternative selection-on-observables approach by eliciting normally unobservable consumer characteristics through a survey instrument.

<sup>12</sup>This argument is not valid if dealers can determine whether consumers used the Internet, regardless of whether consumers inform the dealer.

insofar as we can tell, this is not because Internet users and nonusers differ on observable demographic characteristics or on individual traits that our survey enables us to observe. The aim of this article, however, goes beyond showing that Internet usage indeed has a "treatment effect." Our aim is to "unpack" this treatment effect, that is, to understand what it is about what consumers do online that leads to lower prices. We first consider the effect the Internet has on prices by aiding consumers in obtaining information.

*Does the Internet lower prices by facilitating purchase-relevant information search?* Our aim in this subsection is to estimate how much of the effect of Internet Use on prices is attributable to consumers being better informed. To do so, we make use of the question in our survey that asked whether the consumer obtained information about the specific vehicle he or she eventually purchased. This enables us to observe whether a consumer is informed independently of whether he or she used the Internet. This is because the variable "Informed" includes both consumers who gathered information entirely offline and consumers who used the Internet but not to obtain information about the specific car they purchased. By comparing the effect of Informed with the effect of Internet Use, we can begin to understand how much of the Internet usage effect on price is due to being better informed.

We begin with a specification in which we include the indicator Informed (instead of Internet Use) for whether the buyer collected information specific to the vehicle that he or she ended up purchasing (see Table 2, Column 3). We find that, on average, buyers who reported having collected information for the type of car they eventually purchased pay .74% less than other buyers ( $p = .06$ ). This is somewhat smaller than the coefficient of .98% for Internet Use. In an unreported specification with both variables, Informed becomes insignificant ( $p = .26$ ), whereas the Internet Use coefficient changes to  $-.81$  ( $p = .045$ ). The similar effect of the two variables and a high and significant correlation coefficient of .5 suggest that becoming better informed is an important part of the advantage of using the Internet.

*How does Internet information help buyers?* Having found that information is an important part of how the Internet helps consumers in negotiating lower prices, we also wanted to know *how* the information is helping. In particular, we consider two possible hypotheses: First, consumers could be benefiting from using the Internet because it provides them with information that helps them better negotiate with a dealer. Second, consumers could be benefiting from using the Internet because it helps them find low-price dealers.

We begin by investigating what kind of information matters most in price negotiations. We asked respondents what information they researched on the Internet, including "which car to purchase," "which dealers to visit or buy from," "dealer cost (invoice/holdback)," and "fair price or market value." We find that the only piece of information that affects transaction price is the invoice price of the car. On average, consumers who collect information about the invoice price of the car they wish to buy pay .61% less than other buyers ( $p = .04$ ; see Table 2, Column 4).<sup>13</sup> Because a

<sup>13</sup>This result is not due to collinearity among the four information variables. We obtain the same result if we run four separate specifications,

dealer's invoice price is closely related to its reservation price for a specific vehicle, our result implies that, on average, consumers who have better information about a dealer's reservation price do better in price negotiations than consumers who are uninformed. This finding is consistent with predictions from the game-theoretic literature on bargaining with incomplete information (for a static model, see Chatterjee and Samuelson 1983; for dynamic buyer-offer models, see Fudenberg, Levine, and Tirole 1985; Gul, Sonnenschein, and Wilson 1986; for a dynamic alternating-offer model, see Ausubel and Deneckere 1998; together, these sources generate this prediction).<sup>14</sup> Overall, consumers seem to benefit from using the Internet because it provides them with information that helps them better negotiate with a dealer.

In contrast, we can find no evidence that consumers benefit from using the Internet because it helps them find low-price dealers. For many noncar products, the Internet makes it possible to compare competing retailers' prices either by checking multiple sites or by using a price comparison site, such as MySimon.com. Because dealer franchise laws require cars to be sold through dealerships and because almost all dealerships engage in price negotiation, this kind of direct price comparison is not possible for cars. However, we can observe in our data that some dealers offer consistently lower prices than others. Although it is possible that consumers may be able to learn this information—for example, in an online discussion forum or by inference from a dealer's own Web site—we find no evidence in our data that this occurs to any significant degree.

We can observe this in several specifications. First, in Table 2, Column 4, a response indicating that a consumer has collected information on which dealers to visit or buy from has no statistically significant effect on the price. A second way to test whether the Internet effect is due to consumers finding low-price dealerships is to add dealer fixed effects to the core specification in Table 2, Column 2. In this unreported regression, the estimated coefficient on the Internet Use variable is identified by within-dealer variation in whether consumers are informed or not. Because identification in this specification does not rely on differences in average price levels among dealers, the results cannot be due to consumers searching for low-price dealerships. The coefficient on Internet Use remains significant and negative at  $-.81\%$  ( $p = .04$ ).

A third way to investigate whether consumers use the Internet to gather information that helps them find low-price dealers is to test whether Internet Use substitutes for search among dealers. We asked buyers how many other dealerships they visited. If we add the number of visited dealers to the core specification in Table 2, Column 2, each increase in response scale category for the number of visited dealers decreases price by  $.34\%$  ( $p = .02$ ; we do not report the regression). More important, the coefficient on Internet Use remains significant and changes little ( $-.85\%$ ;  $p = .03$ ). That each variable appears to influence negotiated prices when both are included in the regression suggests

that dealer search and Internet Use do not perform exactly the same role.

The results in this subsection suggest that Internet information helps consumers by enabling them to negotiate a low price at a given dealership. However, Internet information seems not to help car buyers find low-price dealerships.

Next, we assess whether the Internet serves any additional role in lowering prices for consumers. We explore this question by distinguishing among the different ways that consumers can use the Internet. In particular, we distinguish among manufacturer Web sites, individual dealer Web sites, online buying services, informational Web sites, and chat rooms. For each type of online source, we construct an indicator that is 1 if a buyer used that source of information. Table 2, Column 5, reports a specification for "Number of Dealers Visited" and the indicators for how the Internet was used. We find that online buying services are the only type of online site associated with lower price.<sup>15</sup> The coefficient is  $-.90$  and is highly significant ( $p = .001$ ). This leads us to investigate the role of online buying services.

*How do online buying services help buyers?* Online buying services and manufacturer Web sites differ from other online sources in that they go beyond providing information to consumers. All online buying services and many manufacturer Web sites allow consumers to request a quote from a dealer. The dealer typically calls or e-mails the referred consumer within 24–48 hours with a price quote. A consumer can ask for a price quote in a few seconds on a Web site and receive it in his or her home the next day. This raises the question whether some of the savings from using the Internet could be driven by a mechanism that is distinct from informing customers, namely, the referral process. To investigate the effect of using the referral process, we add to the basic Internet specification with Number of Dealers Visited an indicator that is 1 if consumers answered yes to the question, "Did you submit a formal request to any online buying service (e.g., Autobytel.com, Carpoint.com, Autoweb.com) to be referred to one of the site's affiliated dealers?" (27% of Internet users replied that they did). We also add an indicator that is 1 if consumers answered yes to the equivalent question for referrals from manufacturer Web sites (14% of Internet users replied that they requested a quote from such Web sites).

We find that submitting a referral to an independent online buying service is associated with  $.72\%$  lower prices, in addition to the savings of  $.76\%$  ( $p = .05$ ) associated with use of the Internet (see Table 2, Column 6). In contrast, manufacturer referrals have no effect on price.

This result is important because it indicates that there is an important aspect of the business model of independent referral sites that drives the difference. The major difference between a referral from an online buying service and that from a manufacturer is that the manufacturer refers consumers to the closest dealer selected from the entirety of its dealerships, whereas online buying services sign contracts with only a subset of dealers. For example, of the approxi-

each of which contains all controls but only one of the four information variables at a time (we do not report this here).

<sup>14</sup>For a more detailed literature review, see Scott Morton, Zettelmeyer, and Silva-Risso (2005).

<sup>15</sup>This result is not due to collinearity among the five variables describing how consumers use the Internet. We obtain the same result if we run five separate specifications, each of which contains all controls but only one of the five information variables at a time (we do not report this here).

mately 22,000 dealers in the United States, in the first quarter of 2001, Autobytel.com contracted with 5000 dealerships. Online buying services assign dealers exclusive territories and refer all customers within that territory who submit a purchase referral for the dealer's nameplate to that dealer. Because only a subset of dealers is affiliated with a given online buying service, this dealer's exclusive territory is larger than the territory in which it is the closest dealer of that nameplate. This implies that referrals from an online buying service are more often incremental to the dealership's regular customers than referrals from manufacturers. Manufacturers refer to dealers only customers for whom the dealer is already the closest dealer of that nameplate. Provided that the incremental stream of customers generated by the online buying service is valuable to the dealership, the dealership has an incentive to quote prices low enough to convert a substantial number of referrals into sales. This is because online buying services monitor the percentage of referrals that result in a sale, and if the percentage is too low, the dealer may be terminated and replaced by another dealer in that area. The implied threat is not only that incremental sales get lost but also that the replacement dealer can then "steal" some of the dealership's own consumers. Such a threat is not available to manufacturers.

This argument bears resemblance to that of Klein and Murphy (1988) and Klein (1995) on contractual provisions in franchising. Klein (1995) argues that three elements are necessary for the loss of future rents to be a credible threat for a franchisee: (1) The contract between the franchisor and the franchisee must leave downstream rents for the franchisee, (2) the franchisor must be allowed to monitor the performance of the franchisee, and (3) the franchisor must be able to easily drop the franchisee. These conditions are similar to what we observe for the contracts between online buying services and their affiliated dealers: (1) Dealers are given exclusive "online territories" that are substantially larger than their offline territories, thus creating incremental profits for dealers; (2) online buying services monitor the performance of dealers with customer satisfaction surveys; and (3) online buying services can easily drop dealerships from their roster. This interpretation of the role of exclusive territories is different from the one that Chen, Iyer, and Padmanabhan (2002) hypothesize. In their article, online buying services grant exclusivity to dealers to avoid Bertrand-type competition among dealers. In contrast, our argument, in addition to that of Klein (1995), suggests that exclusivity is granted to ensure dealer performance, which in this context means offering lower prices to consumers. In a sense, independent online buying services bargain with dealers on behalf of a large group of consumers, though that group is not yet formed. With this interpretation, our result is also consistent with the theoretical predictions of Snyder (1998), who shows why groups of buyers should expect to pay lower prices than individual buyers to a seller.

In summary, buyers who use the Internet to shop for a car seem to pay lower prices for two distinct reasons: First, on average, they are better informed than other buyers. This information gives consumers better knowledge of a dealer's opportunity cost, which tends to lower the transaction price the consumer pays. Second, buyers seem to be able to take advantage of any pressure that online buying services exert on dealers through their ability to direct customers among

dealers. The total Internet effect is 1.5% of the purchase price, or 22% of dealers' average gross profit margin.<sup>16</sup>

#### *Does the Internet Benefit All Consumers Equally?*

Next, we investigate whether the information and referral effects accrue to all buyers equally. In particular, we are interested in whether the Internet "levels the playing field" by improving outcomes for people who would do worse without the Internet. In this article, we can examine this question because, in our survey, we ask explicitly about indicators that a person is at a bargaining disadvantage and observe a range of car-purchase-related Internet activities.

In the survey, we asked respondents to rate their agreement with the statements "I am afraid that I will be taken advantage of by a dealer when negotiating the price of a new car" and "It is hard for me to find time to shop for a car." We believe that there are several characteristics that might lead a person to agree strongly with the first statement, including aversion to conflict, dislike of stressful situations, or anxiety in high-pressure environments. Instead of trying to assess these elements independently, we asked for a summary assessment that described the consumer's level of apprehension about the bargaining process. In addition, we asked whether people had a time constraint that would make participation in extended negotiations costly for them. We expected that both aspects would make the bargaining process unattractive and lead to less desirable outcomes for consumers.

We use the responses to these statements to create the indicator variable "Dislike Bargaining," which is 1 if a buyer derives a higher disutility from the bargaining process than the median buyer. We derive this indicator using two different approaches. In our first approach, we construct a variable that is the sum of the normalized values of the responses to the two statements.<sup>17</sup> We then create an indicator that is 1 for a buyer with a higher value on this variable than the median buyer. We run a specification in which we include Dislike Bargaining both on its own and interacting with Internet Use and "OBS Referral" (online buying service referral) (see Table 3, Column 1).<sup>18</sup> We find that consumers who dislike bargaining pay 2.1% more than consumers who do not dislike it ( $p < .001$ ). We also find that consumers who obtain a referral from an online buying service pay .83% less than those who do not obtain one ( $p = .07$ ); these savings accrue equally to buyers who dislike and do not dislike bargaining. (The dislike bargaining  $\times$  OBS referral interaction is statistically zero.) However, using the Internet benefits only consumers who dislike bargaining (by 1.7%;  $p = .01$ ); consumers who like to bargain (presumably

<sup>16</sup>We provide one additional piece of evidence to show that the "Internet effect" can be broken down into a referral and an informational component. In a regression that controls for the referral effect, the variables Internet Use and Informed are almost interchangeable (see Table 2, Columns 6 and 7). We estimate the Internet Use coefficient at  $-.76$  in Column 6 ( $p = .05$ ). The second specification no longer includes Internet Use but yields a coefficient estimate of  $-.67$  for Informed ( $p = .09$ ). The effect of a referral is similar in the two specifications.

<sup>17</sup>For each variable, we calculate the mean and standard deviation over all respondents. Then, we normalize the answer for each respondent by subtracting the mean and dividing by the standard deviation.

<sup>18</sup>We use a median split approach because the resulting indicator variable allows for an intuitive interpretation of the interaction between bargaining disutility and Internet usage.

Table 3  
PRICE EFFECTS BY BARGAINING DISUTILITY AND PROBIT ON INTERNET USE

<i>Dependent Variable</i>	<i>1</i> <i>Ln(Price)</i>	<i>2</i> <i>Ln(Price)</i>	<i>3</i> <i>Ln(Price)</i>	<i>4</i> <i>Internet Use</i>
Internet use	.17 (.48)	.06 (.42)		
Dislike bargaining	2.09 (.52)***	1.97 (.54)***	2.57 (.67)***	
Internet use × dislike bargaining	-1.70 (.62)***	-1.49 (.63)**		
OBS referral	-.83 (.46)*	-.74 (.40)*		
OBS referral × dislike bargaining	.26 (.57)	.17 (.54)		
Informed			.49 (.51)	
Informed × dislike bargaining			-2.00 (.72)***	
Number of dealers visited	-.29 (.14)**	-.31 (.14)**	-.35 (.14)**	
Do price comparisons	-.25 (.23)		-.20 (.24)	
Internet for information	.02 (.18)		-.17 (.15)	
Gather much information	-.23 (.20)		-.29 (.20)	
Read car magazine	.21 (.16)		.25 (.16)	
Visit dealer for fun	-.12 (.20)		-.10 (.20)	
Willingness to search		-.29 (.16)*		.76 (.05)***
Car enthusiast		.05 (.13)		-.18 (.04)***
Bargaining disutility				.16 (.04)***
Customer age	-.07 (.14)	-.10 (.14)	-.04 (.14)	-.22 (.05)***
Education	-.39 (.10)***	-.38 (.10)***	-.39 (.10)***	.06 (.03)**
Income	-.21 (.25)	-.18 (.25)	-.20 (.25)	.02 (.09)
Income <sup>2</sup>	.04 (.02)*	.04 (.02)*	.04 (.02)*	.01 (.01)
Black	.75 (.87)	.69 (.87)	.67 (.86)	.03 (.23)
Hispanic	.42 (.38)	.38 (.38)	.39 (.38)	-.36 (.11)***
Other race	.36 (.43)	.36 (.43)	.42 (.42)	-.02 (.20)
Female	.39 (.27)	.34 (.27)	.38 (.27)	-.02 (.09)
Constant	1007.80 (1.75)***	1006.60 (1.52)***	1007.93 (1.77)***	.94 (.48)**
Car fixed effects	Yes	Yes	Yes	No
Observations	1435	1435	1435	1436
Adjusted R-square	.97	.97	.97	

\* $p = .10$ .

\*\* $p = .05$ .

\*\*\* $p = .01$ .

Notes: Robust standard errors are in parentheses. All coefficients are multiplied by 100. In Columns 1–3, we do not report car, month, and region fixed effects; end of month, weekend, trade-in, competition, vehicle cost, and census demographics. In Column 4, we do not report census demographics. OBS = online buying service.

because they are good bargainers) do not benefit from using the Internet other than by obtaining a referral.<sup>19</sup>

<sup>19</sup>The previous estimate of the effect of Internet use on prices was  $-.76\%$  (see Table 2, Column 6). To reconcile the previous estimate with the current estimate in Table 3, Column 1, note that the previous estimate reflects the average effect of using the Internet (across consumers of high and low

To ensure the robustness of these findings, we use the bargaining-disutility factor from the previous factor analysis to derive our indicator variable. We redefine our indica-

levels of bargaining disutility), whereas the current results estimate the Internet effect separately for consumers with a high and a low bargaining disutility.

tor to be 1 if a buyer derives a higher bargaining disutility than the median buyer.

We repeat the previous specification, but instead of including the consumer trait measures directly, we make use of the “Willingness-to-Search” and the “Car Enthusiast” factors to control for consumer types. The results are similar to the previous specification (see Table 3, Column 2). We find that consumers who dislike bargaining pay 2.0% more than consumers who do not dislike it. We also find that consumers who obtain a request from an online buying service pay .74% less than those who do not obtain one ( $p = .10$ ); again, these savings accrue equally to buyers who dislike and do not dislike bargaining. As was the case previously, we find that use of the Internet for information benefits only consumers who dislike bargaining (by 1.5%); consumers who like to bargain or have the time to do so do not benefit from using the Internet other than by obtaining a referral. The sum of the marginal Internet effects appears in Table 4.

Our first result of this section is that buyers who dislike the bargaining process benefit much more from being informed. This suggests that at least in car buying, the effect of the Internet’s information provision role is to move consumers toward a more level playing field in terms of bargaining ability. Indeed, people who like bargaining do not appear to benefit at all from being better informed by the Internet. It can be argued that this is the very definition of being good bargainers—that is, to be able to do well without knowing much about their own and the other party’s outside options.<sup>20</sup>

The second key result is that the benefits of requesting a referral accrue equally to all buyers. Previously, we argued that a referral from an online buying service lowers a dealer’s prices because of the implicit threat to direct customers to the dealer’s competitors. Consistent with our findings, if this threat operates, it seems reasonable that it should apply uniformly across consumers.

Note that our result that buyers who like the bargaining process do not benefit from being informed is not specific to the Internet specification; we repeat the basic Informed specification from Table 2, Column 7, with the Dislike Bargaining dummy and the interaction between the dummy and Informed.<sup>21</sup> We find that consumers who dislike bargaining pay 2.6% more than consumers who do not dislike it (see

Table 3, Column 3). We find the same qualitative result as in our two Internet specifications, namely, that the benefits of being informed accrues only to consumers who dislike bargaining (by 2.0%).

Finally, if a subset of consumers gains disproportionately from using the Internet to buy a car, economic theory suggests that this group should be disproportionately likely to use the Internet. Our final specification in Table 3 is a probit that relates a buyer’s decision to use the Internet to the consumer trait measures constructed in the factor analysis. We find that buyers with a higher disutility for the bargaining process are more likely to use the Internet.

CONCLUSION

In this article, we use direct measures of search behavior and consumer characteristics in the car industry to investigate how the Internet affects negotiated prices in car retailing. We match transaction data on 1500 car purchases in California with the responses to a survey that asks buyers detailed questions about their Internet usage, their attitudes toward information search and bargaining, and their demographics.

Our survey data enable us to control for heterogeneity in attitudes toward search and bargaining disutility directly at an individual level. Although these controls cannot fully rule out selection bias, they increase our confidence that the price effects are not an artifact of differences in unobserved characteristics between people who use the Internet and those who do not use it.

We show that the Internet lowers prices for two distinct reasons: First, the Internet informs consumers. The information that seems to be most valuable to consumers is the invoice price of the dealer; it enables them to negotiate a low price at a given dealership. Internet information seems not to help consumers find low-price dealerships. In particular, the Internet does not substitute for searching at multiple dealers, and searching at multiple dealers does not substitute for being better informed.

Second, the incentives provided by online buying services’ contracts with dealerships help consumers obtain lower prices through a referral process. Referrals from manufacturer Web sites do not lower prices. We believe that online buying services are more effective because unlike manufacturers, they can exert pressure on dealers by directing incremental business to affiliated (and away from unaffiliated) dealerships. The magnitude of the combined information and referral effect of the Internet is 1.5% of the purchase price, or 22% of dealers’ average gross profit margin.

We find that the benefit of gathering information differs by consumer type. Although buyers with a high disutility of bargaining pay 1.5% less when they collect information on the specific car they eventually purchase, buyers who like the bargaining process do not benefit from such information.

The point estimate of the combined information and referral price effects is close to Zettelmeyer, Scott Morton, and Silva-Risso’s (2005) estimate. After controlling for selection, they find that Autobyte.com lowered prices by 2.2%. Because Autobyte.com is a major online buying service, we can compare this estimate with the sum of our Internet Use and OBS Referral coefficients (1.5%) in the

<sup>20</sup>For example, being able to negotiate a salary raise after receiving a competing job offer is not a sign of good bargaining skills. However, negotiating a raise without such an offer may be.

<sup>21</sup>We construct the dummy according to the first approach in this subsection.

Table 4  
MARGINAL INTERNET EFFECTS

	Likes Bargaining	Dislikes Bargaining
Used the Internet for information but did not request a referral	0%	-1.5%
Used the Internet for information and requested referral	-.7%	-.7%
Total Internet effect	-.7%	-2.2%

last subsection or with the estimate of 2.2%–2.5% for consumers with a high disutility from bargaining. The similarity of the coefficient estimates is remarkable, given that Zettelmeyer, Scott Morton, and Silva-Risso use data from 1999, the height of the Internet boom and a time of experimentation by both consumers and retailers. In contrast, the data in this article are from April and May of 2002, when the Internet had become more mainstream.

In general, our results suggest that consumers' decisions to use the Internet to gather information and to use the negotiating clout of an online buying service have a real effect on the prices they pay. The results speak both to the significance of the Internet in making information more easily available and to the potential of Internet institutions to affect the distribution of surplus, even in established offline industries, such as automotive retailing.

#### APPENDIX: SURVEY QUESTIONS

##### Demographics and Consumer Traits

••**“What is your gender?”**

Response categories: male/female

••**“What is your age?”**

Response categories: under 20, 20–34, 35–49, 50–64, 65 and over

••**“Please tell us what is the highest level of education you completed? (MARK ONLY ONE ANSWER)”**

Response categories: Eighth grade or less, some high school (but did not graduate), high school graduate (or GED), some college, college degree, some graduate work, graduate or professional degree

••**“Please tell us the race or ethnicity you identify with: (MARK ALL THAT APPLY)”**

Response categories: Caucasian, black or African American, Asian, Pacific Islander, Hispanic or Latino, other

••**“Which one of the following best describes your household's total income before taxes in 2001? (MARK ONLY ONE ANSWER)”**

Response categories: under \$20,000, \$20,000–\$29,999, \$30,000–\$44,999, \$45,000–\$59,999, \$60,000–\$74,999, \$75,000–\$99,999, \$100,000–\$124,999, \$125,000–\$149,999, \$150,000–\$199,999, \$200,000 or more

••**“Please tell us how you feel about the following statements:”**

-I do a lot of price comparison when making larger purchases.

-I frequently use the Internet to obtain information about products I am interested in.

-I am the kind of person who gathers as much information as possible before visiting car dealers.

-I read car- and/or truck-enthusiast magazines regularly.

-I tend to visit dealers whenever a new model is introduced.

-I am afraid that I will be taken advantage of by a dealer when negotiating the price of a new car.

-It is hard for me to find time to shop for a new vehicle.

Response categories for each statement: agree strongly, agree, disagree, disagree strongly

##### Interactions with Dealer

••**“How many dealers did you visit that sold the type of car you eventually purchased? (For example, if you bought a Honda Accord, how many Honda dealers did you visit?)”**

Response categories: 0, 1, 2–3, 4–6, and 7 or more

••**“When talking about price with the dealer from whom you bought your car, did you tell the dealer each of following? (MARK ONE ANSWER FOR EACH)”**

-I used the Internet to do research.

Response categories for statement: yes/no

##### Search and Information Gathering

••**“For each source of information you used to shop for a new car, please tell us how it was used: (PLEASE MARK ALL BOXES THAT APPLY FOR EACH SOURCE OF INFORMATION.)”**

**Source of Information:**

-Consumer Reports

-Other guide publications (e.g., *Edmunds*, *Kelly Blue Book*)

-Auto enthusiast magazine (e.g., *Motor Trend*, *Car and Driver*)

-Manufacturer brochure

-Financial institution (e.g., credit union)

-Friends/coworkers/mechanic

**Response categories for each source of information: did not use, I used it to find out ...**

-which car to purchase.

-which dealers to visit or buy from.

-dealer cost (invoice/holdback).

-fair price or market value for the car.

••**“Did you use the Internet in any way to help you shop for a new vehicle? (e.g., to research vehicles, find a dealer, etc.)”**

Response categories: yes/no

••**“For each source of information on the Internet you used to shop for a new car, please tell us how it was used: (PLEASE MARK ALL BOXES THAT APPLY FOR EACH SOURCE OF INFORMATION.)”**

**Source of Information:**

-Manufacturer Web sites (e.g., Audi.com, Lexus.com, Saturn.com)

-Individual dealer Web site (e.g., of your neighborhood dealer)

-Online buying services (e.g., Autobytel.com, Carpoint.com, Autoweb.com, Cars.com, Carsdirect.com, CarClub.com, Sam's or Costco's Internet referral service, Driversseat.com, AutoVantage.com, Vehix.com)

-Informational Web sites (e.g., ConsumerReports.com, Kbb.com [Kelly Blue Book.com], Edmunds.com, JDPower.com)

-Chat rooms or bulletin boards

**Response categories for each source of information: did not use, I used it to find out ...**

-which car to purchase.

-which dealers to visit or buy from.

- dealer cost (invoice/holdback).
- fair price or market value for the car.

•“Did you submit a formal request to any online buying service (e.g., Autobytel.com, Carpoint.com, Autoweb.com) to be referred to one of the site’s affiliated dealers?”

Response categories: yes/no

•“Did you submit a formal request to any manufacturer Web site you visited (e.g., Audi.com, Lexus.com, Saturn.com) with the understanding that it would be forwarded to a dealer who would get back to you with a price quote?”

Response categories: yes/no

•“For how many types of cars did you collect information from traditional or Internet sources? For example, if you collected information on a Honda Accord, a Honda Civic, and a Toyota Camry, you collected information on 3 types of cars.”

Response categories: 0, 1, 2–3, 4–6, 7 or more

•“Did you end up purchasing a type of car for which you had collected information from traditional or Internet sources?”

Response categories: yes/no

•“Please tell us how many hours you spent shopping for your car.”

Approximately \_\_\_\_ hours researching on the Internet.

Approximately \_\_\_\_ hours visiting dealerships.

Approximately \_\_\_\_ hours researching offline information sources (other than dealerships).

#### REFERENCES

- Ausubel, L.M. and R.J. Deneckere (1998), “Bargaining and Forward Induction,” working paper, Department of Economics, University of Maryland.
- Brown, J.R. and A. Goolsbee (2002), “Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry,” *Journal of Political Economy*, 110 (5), 481–507.
- Chatterjee, K. and L. Samuelson (1983), “Bargaining Under Incomplete Information,” *Operations Research*, 31 (5), 835–51.
- Chen, Y., G. Iyer, and V. Padmanabhan (2002), “Referral Infomediarities,” *Marketing Science*, 21 (4), 23–45.
- , S. Yang, and Y. Zhao (2005), “A Structural Approach to Modeling Negotiated Prices of Automobiles,” working paper, Stern School of Business, New York University.
- Diamantopoulos, Adamantios and Heidi M. Winklhofer (2001), “Index Construction with Formative Indicators: An Alternative to Scale Development,” *Journal of Marketing Research*, 38 (May), 269–77.
- Fudenberg, D., D.K. Levine, and J. Tirole (1985), “Infinite-Horizon Models of Bargaining with One-Sided Incomplete Information,” in *Game Theoretic Models of Bargaining*, A. Roth, ed. Cambridge, UK: Cambridge University Press.
- Furse, D.H., G.N. Punj, and D.W. Stewart (1984), “A Typology of Individual Search Strategies Among Purchasers of New Automobiles,” *Journal of Consumer Research*, 11 (March), 417–31.
- Gul, F., H. Sonnenschein, and R. Wilson (1986), “Foundations of Dynamic Monopoly and the Coase Conjecture,” *Journal of Economic Theory*, 39 (July), 155–90.
- Jarvis, C.B., S.B. MacKenzie, and P.M. Podsakoff (2003), “A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research,” *Journal of Consumer Research*, 30 (September), 199–218.
- Klein, B. (1995), “The Economics of Franchise Contracts,” *Journal of Corporate Finance*, 2 (1–2), 9–37.
- and K. Murphy (1988), “Vertical Restraints as Contract Enforcement Mechanisms,” *Journal of Law and Economics*, 31 (2), 265–97.
- Klein, Lisa R. and Gary T. Ford (2003), “Consumer Search for Information in the Digital Age: An Empirical Study of Pre-Purchase Search for Automobiles,” *Journal of Interactive Marketing*, 17 (3), 29–49.
- Moorthy, S., B.T. Ratchford, and D. Talukdar (1997), “Consumer Information Search Revisited: Theory and Empirical Evidence,” *Journal of Consumer Research*, 23 (4), 263–77.
- Ratchford, Brian T., Myung-Soo Lee, and Debabrata Talukdar (2003), “The Impact of the Internet on Information Search for Automobiles,” *Journal of Marketing Research*, 40 (May), 193–209.
- and N. Srinivasan (1993), “An Empirical Investigation of Returns to Search,” *Marketing Science*, 12 (1), 73–87.
- Scott Morton, F., F. Zettelmeyer, and J. Silva-Risso (2001), “Internet Car Retailing,” *Journal of Industrial Economics*, 49 (4), 501–520.
- , ———, and ——— (2003), “Consumer Information and Discrimination: Does the Internet Affect the Pricing of New Cars to Women and Minorities?” *Quantitative Marketing and Economics*, 1 (1), 65–92.
- , ———, and ——— (2005), “What Matters for Price Negotiations: Evidence from the U.S. Auto Retailing Industry,” discussion paper, Haas School of Business, University of California, Berkeley.
- Snyder, C.M. (1998), “Why Do Larger Buyers Pay Lower Prices? Intense Supplier Competition,” *Economic Letters*, 58 (2), 205–209.
- Zettelmeyer, F., F. Scott Morton, and J. Silva-Risso (2005), “Cowboys or Cowards: Why Are Internet Car Prices Lower?” discussion paper, Haas School of Business, University of California, Berkeley.