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What matters in a price negotiation: Evidence from the U.S. auto retailing industry

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Abstract While there is a great deal of theoretical and experimental literature on what factors affect bargaining outcomes, there is little empirical work based on data from real markets. In this paper we analyze negotiations for new cars, a $340 billion industry in the United States in 2010. Our results suggest that search costs, incomplete information, and bargaining disutility have an economically significant effect in real-world negotiations: we estimate that relative to an uninformed consumer, a consumer with basic information about the seller's reservation price and his own outside options captures 15% of the average dealer margin from selling an automobile. We also find that a buyer's search cost and bargaining disutility have significant effects on bargaining outcomes. Finally, our results show that while search is common, there remains a substantial group of consumers who do not engage in any of the search behaviors we measure. We hypothesize that these buyers are not aware of how easy and effective certain activities in improving negotiation outcomes can be.

Keywords Bargaining · Search · Consumer characteristics · Survey · Auto industry

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1 Introduction

Negotiation is a common way to determine transaction prices in a market economy. In the United States the prices of large consumer purchases such as houses and cars are negotiated. In other countries, price negotiations take place over less expensive products as well. Common to most of these bargaining situations is that buyer characteristics vary over time and across buyers in how much information the buyer has about the reservation price of the seller, how patient the buyer is, how much the buyer enjoys or dislikes bargaining, and how costly search is to the buyer. Over the last few decades there has been an interest in bargaining and a large literature in both the theoretical and experimental areas that has examined all of these factors and others. So far, however, there has been little empirical evidence in real-world product markets about how large the effects of incomplete information, bargaining disutility, and search cost are on the outcomes of price negotiations.[1] There are several reasons for this. One, it is difficult to find bargaining situations that are similar across multiple instances. Two, it is also difficult to collect data on negotiator and transaction characteristics, especially on characteristics such as bargaining disutility. Most importantly, it is usually not possible to measure the information of a negotiating party, nor how and where people searched for the information they do have.

This paper studies sales of new cars using data that overcome these difficulties. We combine transaction data that record car characteristics and prices with responses to a survey of new car buyers that reveals how informed customers were, how they searched for information, and their attitudes towards bargaining. Studying new car sales allows us to examine hundreds of bargaining outcomes for exactly identical cars. In many other negotiations–the sale of a house, for example–the quality of the product will be less observable to the researcher than to the bargaining parties. The consequence is that correlations between buyer characteristics and price may be driven by correlations between buyer characteristics and quality attributes that the negotiators can observe but that researchers cannot. New cars, in contrast, are homogeneous products. A second advantage of studying the new car market is that common search and bargaining behaviors can be precisely described, for example, "Did you research the invoice price of the car?" or "Did you get an offer from a competing dealer?"

[1] There is, or course, a large non-experimental empirical literature in economics on labor negotiations between unions and firms (Kennan and Wilson 1993).

The primary goal of this paper is to assess in a real-world setting the importance of key factors that bargaining theory predicts should matter for bargaining outcomes. First, we want to know how strongly incomplete information on the buyer's side is associated with bargaining outcomes. Game-theoretic bargaining models predict that buyers are better off when they know the seller's reservation price. Models also predict that consumers obtain better bargaining outcomes when they are better informed about their own outside options. In fact, search for information about the prices offered by competing car dealers is the key motivating example for the seminal paper by Stigler (1961). However, what is the magnitude of these effects? Do informed buyers pay prices that are lower by an economically significant amount than consumers who are uninformed? What is the effect of informed consumers on the average dealer margin?

Second, we also want to know how much consumer characteristics affect bargaining outcomes. One prediction from bargaining and search models is that consumers with lower search costs in general do better in price negotiations. Other common predictions are that more patient buyers do better and buyers with lower bargaining disutility do better. However, do differences in these consumer characteristics matter in practice? What is the difference in the price negotiated by a consumer with very low search cost compared to that of a consumer with very high search cost? Does aversion to bargaining result in significantly worse bargaining outcomes?

Finally, we also want to answer the substantive question of what determines the price that consumers pay when purchasing a new car. Specifically, are there behaviors in consumers' control that lower the price they can negotiate? Is there evidence that consumers leave money on the table when negotiating for a new car?

Our final dataset contains transactional information and survey responses for 1,402 car buyers who purchased one of eight car models during April and May 2002 in California. The results from this data show that incomplete information has an economically important effect on bargaining outcomes in car sales. Buyers who have learned the seller's reservation price (the dealer's invoice price) pay $121 less on the average car; this corresponds to 8% of the average seller surplus. Also, buyers do better when they have better information about their outside options; for example, search at one additional dealer is associated with a 7% lower dealer margin. In estimating these effects we account for potential selection effects that arise because our measures of how informed consumers are may be correlated with buyer characteristics that affect both negotiated prices and negotiation-relevant behavior. By using a survey we are able to measure, albeit imperfectly, these normally "unobserved" consumer traits. While these controls cannot fully rule out selection bias, it gets us closer to estimating a treatment effect of information (see Section 3.1 for a detailed discussion of our estimation approach).

We also find that consumers with different characteristics obtain very different bargaining outcomes. Consumers with low search cost pay on average $287 less—which is 18% of the average dealer margin—than consumers with

high search cost.[2] Also, buyers who are patient, according to our proxy measure, are associated with 8% lower dealer margins compared to other buyers. Finally, consumers which our proxy measures indicate have a low bargaining disutility pay on average $261 less than consumers with a high bargaining disutility. This corresponds to 17% of the average dealer margin.

While the predictions about the direction of the effects of incomplete information and consumer characteristics on bargaining outcomes are commonly accepted among economists, there is a lack of evidence that their effects on negotiations are large enough to meaningfully influence market outcomes. A contribution of this paper is to show that they are. As the results in the two paragraphs above suggest, incomplete information and consumer characteristics contribute significantly to the outcome of a price negotiation over a new car. With more than 16 million cars sold in the United States in 2004, and average dealer margins of around $1,500, the economic effect of incomplete information and consumer characteristics is substantial.

If we interpret the estimated effects of the analyzed search and bargaining behaviors as "treatment effects," we can also determine whether the behaviors consumers engage in are consistent with the average gains we estimate for such behaviors. We find that a substantial fraction of consumers seems to not behave in a manner that is consistent with the average gains we estimate for obtaining information. For example, we have estimated that a successful search for the invoice price of a car is associated with a $121 lower price, an activity that should take an Internet user no longer than twenty minutes. Yet, only 60% of buyers who used the Internet said that they had collected information on the invoice price. We find a similar result for obtaining an offer from a competing dealer. We speculate that a substantial group of buyers is not aware of how easily one can find the invoice price or generate a competing offer and/or how effective these can be in a price negotiation.

We proceed as follows. Section 2 presents the factors predicted to matter by the theoretical bargaining literature. Section 3 describes the estimation strategy, then presents the survey and transaction data, and discusses the survey findings. Section 4 contains the empirical analysis. Section 5 investigates whether consumer search is consistent with the average gains and cost we estimate for search. Section 6 relates our results to other empirical literature. Section 7 concludes the paper.

2 Theoretical predictions

There is a large game-theoretic literature analyzing bargaining situations. In this section we discuss theoretical predictions that apply to price negotiations between car dealers and buyers. We focus particularly on predictions about

[2]The difference is statistically significant, as are all of the findings presented in this introduction.

the role of information and buyer characteristics on bargaining outcomes.[3] For each prediction, we describe the relevant theoretical model or models, state the prediction, and apply the prediction to the setting of new car sales. We describe the exact survey questions and other data we use to test the predictions in Section 3.

Buyer information about the dealer's reservation price In keeping with the first-order concern that economists generally place on economic efficiency, the division of surplus is a concern secondary to efficiency in most papers on bargaining with incomplete or private information. In practical terms, this means that most papers in this literature focus on whether bargaining leads to inefficient outcomes, either because there is no agreement in equilibrium despite gains from trade, or because there is costly delay in reaching an agreement.

From the point of view of dealers, consumers, and policy makers, however, the question of how the division of surplus is affected by information asymmetries between the bargaining parties is extremely important. Fortunately, some of the important papers in this literature make clear predictions not only about efficiency, but also with regards to the effect of asymmetric information on the division of surplus.

Beginning with static bargaining models, Chatterjee and Samuelson (1983) propose a simultaneous offer bargaining game in which one seller faces one buyer and each party is uncertain about the other's reservation price.[4] If the buyer's offer is higher than the seller's offer, the parties trade at a price that splits the difference. Chatterjee and Samuelson (1983) show that an increase in one party's uncertainty (a mean-preserving spread) about the opponent's reservation price makes that party worse off.

One unattractive feature of static models is that the solutions can require a commitment to walk away from known gains from trade (Cramton 1985). An alternative is to model bargaining as occurring through a dynamic process of bilateral negotiation. The models that apply to our setting follow the seminal paper by Rubinstein (1982), but assume that one of the bargaining parties has incomplete information about the reservation price of the opponent. Suppose that the buyer is the uninformed party. Two bargaining protocols are commonly considered. In the first protocol, the "buyer-offer game," only the buyer (the uninformed party) is allowed to make offers, while the seller can only reject or accept an offer. Should the offer be rejected, the buyer can make another offer. The game ends when an offer is accepted. While such games can have a great many Bayesian equilibria (see Fudenberg and Tirole 1991, p. 399), several papers show that under the "stationary equilibrium"

[3]See the excellent review papers by Kennan and Wilson (1993) and Ausubel et al. (2002) for an overview of this literature.

[4]The models in this subsection don't consider search for outside options or different levels of bargaining disutility—we discuss these in the next subsections.

refinement, the buyer-offer game allows the buyer to screen seller types by a series of sequential, increasing price offers (Fudenberg et al. 1985; Gul et al. 1986). The important result for our empirical prediction is that, as long as the buyer is not infinitely patient, the buyer's screening is imperfect and the buyer is thus worse off than in a situation in which the buyer has complete information about the seller's reservation price.

This basic result also extends to the "alternating-offer game," in which buyer and seller alternate in making proposals. Here, Ausubel and Deneckere (1998) show that under an equilibrium refinement termed "assuredly perfect equilibrium," there exists a unique equilibrium in which the buyer is able to screen seller types, albeit imperfectly. As in the buyer-offer game, the buyer's equilibrium payoff is bounded from above by what the buyer could extract in the complete-information game.

Each of these models describes car negotiations partially but not perfectly. For example, Chatterjee and Samuelson (1983) recognize that there is uncertainty about reservation prices for both parties. However, it is not reasonable to assume that either party can credibly commit to walk away from known gains from trade. The models by Fudenberg et al. (1985), Gul et al. (1986) and Ausubel and Deneckere (1998) capture the dynamic, forth-and-back nature of car negotiations, but they focus only on one-sided uncertainty. In using predictions of the one-sided incomplete information models, we implicitly assume that the basic comparative statics with regards to how much information the buyer has about the dealer's reservation prices would hold, even if the seller had incomplete information about the buyer.[5]

Across a variety of modeling assumptions, these models suggest that a negotiating party with incomplete information about its opponent will obtain a smaller share of the surplus in the negotiation than if that party were better informed. This is one of the theoretical predictions that we take to our data.

In the context of car negotiations, we will be interested in variation among consumers in how well informed they are about the dealer's reservation price. The theoretical models predict that better-informed buyers will do better in price negotiations.

Search costs and buyer information about her/his own outside options One important feature of car negotiations is that buyers can suspend the negotiation process with a given dealer and opt to search for price offers from competing dealers. We are interested in comparative statics that relate buyer search and search cost for information about his/her outside options to the share of the surplus a buyer can obtain in the negotiation.

A standard prediction from the search literature is that consumers who search more for outside options pay less. This results from the property of the

[5]While there are papers which consider two-sided incomplete information in a dynamic model, their concern is with efficiency and not how varying degrees of incomplete information affects the division of surplus (see, for example, Ausubel and Deneckere 1998).

order statistic: the expected price for consumers who sample more prices from (heterogeneous) dealerships should be lower.

Finding theoretical predictions about the effect of search cost (as opposed to the actual search) is harder. At first glance one can find such a comparative static in Chikte and Deshmukh (1987). This and subsequent models in this subsection focus on both parties' uncertainty about willingness to pay that arises from uncertain outside options (there is no incomplete information about search cost or bargaining disutility). After an initial offer by either party, if the offer is rejected both parties can engage in a costly and time-consuming search for an outside offer. Both the buyer and seller are uncertain about what outside offers they might get. Once either party has received such an offer, he or she can accept the outside offer (ending the bargaining game), make a new offer to the other party, or continue searching. If the new offer is rejected, the process starts over and any existing outside option is replace by a new draw. The key finding is that buyers with a lower search cost are able to achieve better bargaining outcomes because a smaller search cost leads to a lower reservation price for the buyer.

One unattractive feature of this and related models in the particular context of car buying is that search never occurs in equilibrium.[6] This problem has motivated the papers by Lee (1994) and Chatterjee and Lee (1998), who, in fact, use car buying as their motivating example. Both models have a similar setup as Chikte and Deshmukh (1987); however, they allow buyers to hold on to the outside offers they have received throughout the entire bargaining process. The models in Lee (1994) and Chatterjee and Lee (1998) differ in that the former paper assumes that outside offers to the buyer are known to both the buyer and the seller, whereas the latter assumes that such offers are private information of the buyer (i.e., that the buyer cannot credibly convey to the seller what the outside offer is). Whether Lee (1994) or Chatterjee and Lee (1998) better describe car negotiations is not ex-ante obvious. When negotiating through online channels, dealer offers are often in writing. When negotiating face-to-face, written offers are less common.

Irrespective of which paper better applies, in both of their models lower search costs are no longer monotonically related to better bargaining outcomes for the buyer, because the buyer's payoff is discontinuous at the search costs which separates the "search" (informed about outside option) equilibrium from the "no-search" (not informed about outside option) equilibrium. However, *conditional* on the equilibrium, lower search costs lead to better bargaining outcomes for the buyer. This is because the seller is willing to agree to a lower price to prevent further search from a buyer with low search costs.

Hence, we make use of two predictions: First, consumers who search more for outside options should pay less. Second, holding consumers' equilibrium search behavior constant, consumers with lower search costs should do better

[6] See Wolinsky (1987) and Muthoo (1995) for a discussion.

in price negotiations. In the context of car buying, we will measure how much better consumers who have indicated a high willingness to search (our survey based measure of individual-specific search cost) do in price negotiations, while simultaneously controlling for and estimating the effect of consumers' search behavior for information about their outside options (e.g., number of dealers visited).

While the role of information in bargaining is an important focus of this paper, there are other factors that influence bargaining outcomes and on which our survey gives us information. Two of these are patience and disutility from the bargaining process.

Our survey gives us information on other factors that influence bargaining outcomes, in particular disutility from the bargaining process.

Bargaining disutility We think of a person with a high disutility of bargaining as being eager to minimize the number of rounds of back-and-forth, perhaps because he or she dislikes confrontation or dislikes the effort of reformulating a new offer. This is particularly important in the context of cars because consumers strongly distrust car salespeople (see the 2006 Gallup "Honesty/Ethics in Professions" poll). Our survey dataset contains information on disutility realized from the process.

A higher bargaining disutility can be modeled most naturally as a higher per-period bargaining cost. Perry (1986) considered such a situation. In his model the buyer and seller make alternating offers until they reach agreement or one party decides to terminate the negotiation. Both parties have incomplete information about the other's reservation price. The paper considers a bargaining model in which the discount factor is 1, but each party incurs a fixed cost each period until agreement is reached. If the buyer and seller each privately know their per-period bargaining cost, the buyer will in expectation obtain a larger share of the surplus if her bargaining disutility is lower (see Kennan and Wilson 1993, Section 5.3). In the context of car buying, we will measure how much better buyers who, according to our measure, have a low disutility of bargaining fare.

As did most of the models above, this model describes car negotiations partially but not perfectly. While the model captures the dynamic, back-and-forth nature of car negotiations as well as incomplete information for both the buyer and the seller, it does not allow for search during the bargaining process.

In summary, the game-theoretic literature analyzing bargaining gives us a series of predictions that suggest how (1) buyer information about the dealer's reservation price, (2) search costs and buyer information about her/his own outside options, and (3) bargaining disutility affect the division of surplus in car negotiations. Ideally, we would have liked to derive all predictions from a unified model that captures the key features of car negotiations, namely dynamics, two-sided incomplete information, search for outside options, and heterogeneity in bargaining disutility. Regrettably, we are not aware of such a model. Therefore we have tried to focus on simple predictions that are robust across different models with different assumptions (where such models exist).

3 Data and estimation approach

Our data come from two sources. The first source is a major supplier of transaction-level data in the automotive industry, which we will call DSA in this paper. DSA collects transaction data from a 25% sample of dealers, designed to be representative of national sales, in the major metropolitan areas in the United States. Transactions are uploaded to DSA nightly from internal dealer accounting systems and cover all new car transactions at the sampled dealerships.[7] These data provide our dependent variable (transaction price) and many of the variables we use as controls (for example the make, model, and trim level of the car, and the competitiveness of each dealer's market). The data also contain census-based demographic information about buyers.

Our second data source is a survey that was sent to 5,250 new car buyers whose transactions were recorded by DSA in April and May 2002 in California. These data provide most of our explanatory variables, in particular, measures of negotiation-relevant information obtained by customers, buyer price search behavior, and individual buyer characteristics.

We begin with an explanation of our estimation approach in Section 3.1 to provide the context for how we will use the data we describe in Sections 3.2 and 3.3. In Section 3.4 we present basic survey findings and summary statistics.

3.1 Estimation approach

We can conceptualize the car negotiation process as occurring in two stages. In the first stage the consumer engages in search, broadly defined. Our concept of search behaviors includes, but is not limited to, learning about types of cars, learning which dealers have a reputation for offering low prices, obtaining the invoice price for a particular car, etc. The search behaviors of a consumer will be a function of that consumer's demographics, D (e.g., education, income); the consumer's individual traits, T ("bargaining disutility," "willingness to search," and "car knowledge"); and market- and time-specific factors, Z (e.g., the density of dealers in the local area, the month of purchase).[8]

In the second stage the dealer and the consumer negotiate the transaction price of the car. We model price as a function of the market- and time-specific factors, Z, and car-specific factors, X (e.g., car fixed effects, time since model introduction). Whether a consumer manages to negotiate a comparatively low price for a specific car depends on what we refer to as the consumer's "bargaining ability," which we define broadly. This bargaining ability depends on the search behaviors S this consumer engaged in in the first stage (e.g., obtaining the invoice price for a particular car). In addition, the bargaining

[7] Dealers provide their data to DSA in exchange for information about local market conditions.

[8] We introduce variables here only as needed to explain our estimation approach. For an exact definition of variables used in the paper, please see Sections 3.2 and 3.3.

ability is a function of that consumer's demographic characteristics, D, which will be correlated with her willingness to pay. Finally, the bargaining ability of the consumer is also a function of her intrinsic characteristics, which we have referred to as individual traits, T, such as whether the consumer dislikes the (often confrontational) bargaining process.

$$S_i = D_i\omega + T_i\phi + Z_i\xi + \mu_i$$

$$Price_i = Z_i\alpha + X_i\beta + S_i\delta + D_i\gamma + T_i\nu + \epsilon_i$$

In a typical empirical setting, a researcher might be able to measure objective or quantifiable actions of the buyer, such as visiting dealers or obtaining the invoice price, and these would become the measures of search behavior. The researcher may also be able to control for demographic variables. However, consumer traits T (for example, "bargaining disutility", "willingness to search", and "car knowledge") would remain unobservable. Because the researcher would not be able to control for T in the price equation, the unobserved consumer traits T would be part of the error term of the price equation, thereby causing the OLS coefficients of search behaviors to be correlated with the error term in the price equation. In particular, a person who tends to gather information is likely to search more than usual and also to negotiate harder than usual, and so the OLS estimates would be biased upwards—search behaviors would seem more effective than they actually are.

The inclusion of demographics is important in the context of this paper because Scott Morton et al. (2003) show that several demographic variables are related to negotiated car prices. In addition, these variables are also correlated with the search behaviors we intend to analyze; their inclusion is thus a critical first step in avoiding bias in the coefficients of interest.

The novel feature of our dataset, however, is that we are able to measure consumer traits T. This allows us to control for selection with a "selection on observables" approach. We can do so because our survey instrument allows us to (imperfectly) elicit normally unobservable consumer characteristics that we ex-ante believed correlated with the price paid by consumers and their underlying propensity to engage in negotiation-relevant search behaviors. In practice, this means that we estimate only the price equation but control for (normally unobserved) individual-level consumer characteristics. Controlling for consumer traits is thus the critical second step in avoiding bias in the coefficients of interest.

While 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 engage in different search and bargaining behaviors. Going forward we will thus interpret (cautiously) the effect of the analyzed search and bargaining behaviors as "treatment effects." Note, however, that the validity of this approach relies on the maintained assumption that, once we have controlled for consumers' trait measures and their demographic characteristics, there are no more unobserved characteristics that

affect both the prices paid by consumers and their propensity to engage in the search behaviors we measure in this paper.[9]

3.2 Transaction data

DSA collects from its sample of dealerships detailed information on every new car transaction, including basic customer information, the make, model, and trim level of the car, financing information, trade-in information, dealer-added extras, the price of the car, and the profitability of the car and the customer to the dealership.

The price observed in the dataset 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.[10] The *Price* variable we use as the dependent variable is this price, minus the *ManufacturerRebate*, if any, given directly to the consumer, and minus what is known as the *TradeInOverAllowance*. *TradeInOverAllowance* is the difference between the trade-in price paid by the dealer to the consumer and the wholesale value of the trade-in vehicle as booked by the dealer. We adjust for this amount to account for the possibility, for example, that dealers may offer consumers a low price for the new car because they are profiting from the trade-in.

We expect the price of the car to vary with the type of car purchased, the date of the transaction, and the amount of local competition. To allow us to compare only identical products to each other, we define a "car" as a unique combination of make, model, body type, transmission, displacement, number of doors, number of cylinders, and trim level (for example, one "car" is a 2002 Honda Accord sedan with automatic transmission, a 2.2-liter engine, four doors, four cylinders, and the EX trim). Because there is substantial variation in price across makes and models, we include in our hedonic regression car fixed effects according to the above definition of a "car." The only characteristics not captured by the fixed effects are factory- and dealer-installed options that vary within trim level. The transaction price we observe covers such options, but we do not observe what options the car actually has. In

[9]The error term in the price equation might nonetheless absorb factors important to a negotiation that we do not measure, such as whether the consumer has a friendly smile or is attractive. We have no reason to think, however, that a "winning smile" and similar consumer characteristics are correlated with the search behaviors of consumers. The only reason one might think that a friendly smile would affect search is a version of the Peltzman seat-belt argument (Peltzman 1975): If a buyer knows that her smile will lower the price of the car, she might exert somewhat less effort in searching than she otherwise would. Such correlation would result in OLS estimates being biased downwards and would thus be biased against our findings.

[10]Dealer-installed accessories that contribute to the resale value include items such as upgraded tires or a sound system, but would exclude options such as undercoating or waxing.

order to control for price differences attributable to options, we include as an explanatory variable the percent deviation of the *dealer's* cost of purchasing the vehicle from the manufacturer (the invoice price) from the average vehicle cost of that car in the dataset.[11] This percent deviation, called *VehicleCost*, will be positive when the car has an unobserved option (for example, a sunroof) and is therefore relatively expensive compared to other examples of the same car as specified above. Our measure of cost also takes into account any variation in holdback and transportation charges.[12]

To control for time variation in prices, we define a dummy *EndOfMonth* that equals 1 if the car was sold within the last five days of the month. This dummy accounts for the fact that sales people get bonuses when they fulfill monthly sales quotas, changing their incentive to hold out for a high price. A dummy variable *WeekEnd* specifies whether the car was purchased on a Saturday or Sunday to control 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 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 within a 10-mi radius of the zip code of the focal dealership. We take into account cases where 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 DSA matches with the buyer's address from the transaction record. The data is on the level of a "census block group," which makes up about one-fourth of the area and population of a census tract. On average, block groups have about 1,100 people in them. We will discuss the motive for including demographic information later in the paper. Finally, we control for whether the car was sold in northern or southern California.

3.3 Survey data

Sample We chose our sample from all new car transactions recorded by DSA in April and May 2002 in California. We surveyed 5,250 consumers, a number we chose in order to obtain approximately 1,000 responses at an expected response rate of 20%. In choosing which consumers to survey, we wished to restrict ourselves to a small number of cars in order to minimize the number of car fixed effects that would be required to control for variation in price across

[11] All dealers in California are charged the same invoice price by the manufacturer.

[12] "Holdback" is the industry term for a percentage of the invoice price that is held by the manufacturer for a period and then rebated to the dealer. It serves the purpose of creating a small margin for the dealer even if he sells the car at the invoice price.

different cars. Specifically, we ranked "cars" (as defined above) by the number of transactions in our transaction data during the sample period. We added cars to our sample in the order of the ranking with two exceptions: First, we skipped cars for which a more popular variant of the same model had already been added to the sample. Second, for our last car before we reached our target sample size of about 5,000, the ranking suggested picking the Nissan Sentra (with 491 transactions). Instead, we picked the next ranked car, the Chrysler PT Cruiser (with 482 transactions) because our sample already contained a compact car (the Toyota Corolla) and we wanted to diversify the sample across car categories. Our procedure yielded the most popular variants of the following cars: Honda Accord, Chrysler PT Cruiser, Nissan Altima, Chevrolet Silverado, Toyota Corolla, Honda Odyssey, and Chevrolet Tahoe. To this list we added the most popular variant of the Jeep Grand Cherokee, which we had selected for a pre-test a few weeks earlier.[13] All these cars have "normal" demand patterns during 2002 in the sense that none was in very short supply nor massive oversupply.[14] We then mailed a survey to everyone in our transaction data who had purchased one of the selected cars during the April–May 2002 window.

Survey instrument The survey asked questions about the number of dealers a buyer visited, the buyer's communication with the dealer, the sources of information the buyer used, the information the buyer learned at each of these information sources, demographics, and personal attitudes towards bargaining and information search.

For the purposes of this paper we are interested in the survey questions that tell us about the information of buyers and their personal characteristics. Regarding the former we would like measures of (1) the buyer's negotiation-relevant information about the seller, and (2) the buyer's search behavior for information about their outside options. Regarding the latter, we would like measures of (3) the buyer's disutility of bargaining, and (4) the buyer's search cost. We will also utilize (5) additional measures of consumer characteristics that may affect both the price paid by the consumers and their negotiation-relevant information and price search behavior. A copy of these survey questions can be found in the Electronic supplementary material.

(1) *Measures of the buyer's negotiation-relevant information about the seller*

We use two measures of the buyer information that may be useful in negotiations with the dealer. First, we asked buyers whether they collected any

[13] We wanted to pre-test the survey with 250 consumers of one car model. Among cars that sold approximately 250 units in our transaction data, the Jeep Grand Cherokee fell closest to the average purchase price of new cars.

[14] This does not exclude that any specific dealer might have low inventory of a particular model on a particular day; any price response to random inventory shocks will be absorbed in the error term.

information at all that was specific to the vehicle that they ended up purchasing (question 24). We are particularly interested in whether buyers have researched the seller's reservation price. For this we asked respondents whether they researched "dealer cost (invoice/hold-back)" (questions 16 and 18). We use this measure because the invoice price of a car is a key determinant of the dealer's reservation price. At first blush, one might think that the invoice price is a sunk cost (and therefore should not be part of the reservation price) because a dealer takes possession of the car and cannot return the car to the manufacturer. However, the invoice price is tied closely to the dealer's reservation price because the dealer must repeatedly sell vehicles of the same type as part of ongoing business. If the dealer sells a car today and expects to sell an identical vehicle in the future, then the invoice price is the replacement value of the car.

(2) *Measures of the buyer's search behavior for information about their outside options*

We use two measures of the buyer's information about his/her own outside options. First, we asked buyers how many other dealerships of the same nameplate they had visited (question 5).[15] Second, we asked specifically whether a buyer obtained a price offer from a competing dealer (question 10).

(3) *Measures of the buyer's bargaining disutility*

To assess whether a consumer derives a high disutility from the bargaining process, we asked consumers to rate their agreement or disagreement with a list of statements. Included in the list was the statement, "I am afraid that I will be taken advantage of by a dealer when negotiating the price of a new car" (four categories range from 1 = "Disagree Strongly" to 4 = "Agree Strongly"). We believe a number of characteristics might lead an individual to strongly agree with this 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 describes the consumer's level of apprehension about the bargaining process.[16] In addition, we also asked whether individuals have a time constraint

[15] We asked about the number of dealers of the *same nameplate* because we knew from prior work that price competition occurs primarily between dealers of the same nameplate. We also collected information on the total number of dealers visited, irrespective of their nameplate. The results of the paper do not change substantially with this alternative measure. This is not surprising given that the average response category for total dealers visited in our sample is 2.97, while the average response category for visited dealers of the focal brand is 2.61. Response categories: 1 (0 dealers), 2 (1 dealer), 3 (2–3 dealers), 4 (4–6 dealers), and 5 (7 or more dealers).

[16] One might be concerned that buyers who indicate apprehension about the bargaining process do so because they happen to have negotiated a bad price, not—as we will suggest—the other way around. In the empirical analysis on page 29 we will explicitly control for this possibility with a variable that measures independently how well the buyer thought he or she did in the negotiation.

that would make participation in extended negotiations costly for them. This is measured through the response to the statement "It is hard for me to find time to shop for a car." We expect that both aspects will make the bargaining process unattractive.

(4) *Measures of the buyer's search costs*

To obtain a measure of consumers' individual search costs we asked buyers to agree or disagree with statements that indicated their willingness to search. Specifically, we asked consumers to rate their agreement or disagreement with the statements "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" (four categories range from 1 = "Disagree Strongly" to 4 = "Agree Strongly"). Notice that the statement "It is hard for me to find time to shop for a car" that we used to measure whether extended negotiations are costly to a consumer, could also measure whether searching for outside options and other information come at a high cost. Hence, we will later allow for the fact that this may also be a measure of consumers' search costs.

(5) *Measures of other buyer characteristics*

In addition to the consumer traits "bargaining disutility" and "willingness to search," we also want to measure whether a consumer has extensive product knowledge. This is because we know that a number of consumers closely follow the car industry, and are therefore very informed about cars and their characteristics. We have no ex ante prediction as to how the "car knowledge" trait might affect transaction prices. Knowledgeable buyers may have different valuations from other consumers, higher or lower cross price elasticities, or different search propensities. To measure this car knowledge trait we asked consumers to rate their agreement with the statement "I read car- and/or truck-enthusiast magazines regularly" and "I tend to visit dealers whenever a new model is introduced."

To investigate how the above seven statements in the survey map into the three consumer traits they are intended to measure (bargaining disutility, willingness to search, and car knowledge), we follow the standard procedure in survey-based research: a factor analysis shows that three factors have eigenvalues above 1 and their interpretation corresponds to our three consumer traits. The first factor—with high factor loadings on the three "willingness to search" questions[17]—has an eigenvalue of 1.99 and explains 28% of the variation in

[17]The rotated factor loadings (varimax rotation) for the first factor are 0.82 for *DoPriceComparisons*, 0.72 for *InternetForInfo*, and 0.85 for *GatherMuchInfo*. For the second factor, corresponding to "car knowledge," the factor loadings are 0.85 for *ReadCarMagazine*, and 0.84 for *VisitDealerForFun*. For the third factor, corresponding to "bargaining disutility," the factor loadings are 0.73 for *AfraidTakenAdvantage*, and 0.78 for *NoTimeToShop*.

the seven items. The second factor—with high factor loadings on the two "car knowledge" questions—has an eigenvalue of 1.50 and explains 21.5% of the variation in the seven items. The third factor—with high factor loadings on the two "bargaining disutility" questions—has an eigenvalue of 1.08 and explains 15.5% 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 0.7; the correlation coefficient for the two two-question scales is 0.44 (p-value < 0.001) for "willingness to search" and 0.17 (p-value < 0.001) for "bargaining disutility." Notice that while ex ante the item *NoTimeToShop* may be both a measure of bargaining disutility and of willingness to search, the factor analysis suggests that it primarily picks up bargaining disutility. In the empirical analysis we will include the answers to the individual consumer trait questions directly in our first specifications. As we move on we will use the factors to sort consumers on a consumer trait (e.g., "willingness to search") for simplicity of interpretation and also to facilitate calculation of magnitudes.

Finally, the survey also asks respondents for demographic information such as gender, age, education, race/ethnicity, and household income (questions 26 through 30). Table 1 summarizes the survey questions by the theoretical concept for which they will be used.

Procedure Each potential respondent received three mailings. The first mailing contained a letter announcing the forthcoming arrival of the survey, introducing ourselves as researchers and explaining the purpose of the project. The second mailing was sent out five days later and contained a cover letter,

Table 1 Overview of survey questions by concept

Theoretical concept	Questions	Variable name	Q. #
Buyer information about the seller's reservation price	Collected information specific to the purchased car	*Informed*	24
	Collected information on dealer cost (invoice/hold-back)	*KnowInvoice*	16/18
Buyer information about own outside options	Had price offer from a competing dealer	*CompetingOffer*	10
	Visited x competing dealers who sold the same type of car purchased	*#DealersVisited*	5
Bargaining disutility	Afraid that will be taken advantage of by a dealer when negotiating the price of a new car	*AfraidTaken-Advantage*	31
	Hard for me to find time to shop for a new vehicle	*NoTimeToShop*	31
Buyer search cost (willingness to search)	Do a lot of price comparison when making large purch.	*DoPrice Comparisons*	31
	Kind of person who gathers as much information as possible before visiting car dealers	*GatherMuchInfo*	31
	Frequently use the Internet to obtain information about products I am interested in	*InternetForInfo*	31

the survey, a pre-stamped return envelope, and a $1 bill. The third mailing was sent out five days after the second mailing and consisted of a postcard thanking buyers for their participation and reminding them to return the survey. Of the 5,250 surveys we sent, 2,470 were returned completed or partially completed, for a response rate of 47%. Unfortunately, we later discovered that some variables in the transaction dataset were missing for some buyers to whom we sent surveys. This reduced the usable sample size somewhat from its original level. We were left with 1,402 observations for which we had complete matched survey and transaction data.

Response issues In survey-based research it is normally difficult to assess how respondents and non-respondents differ along relevant dimensions. In our case this assessment is easier: because we have transaction data for respondents and non-respondents alike, 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. Assuming that these census-based measures are representative of individual buyers' demographics, non-respondents are statistically significantly (at the 5% level) less likely to be college graduates (27% vs. 31%), more likely to be high school drop-outs (18% vs. 13.5%), more likely to be Hispanic or black (20% and 5% vs. 16% and 4%, respectively), have lower household incomes ($55,000 vs. $59,000), and own less valuable houses ($214,000 vs. $228,000). 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 names. Second, we can compare how respondents and non-respondents differ with regards to behavioral measures contained in the transaction data. With regards to price—the dependent variable used in this study—there is no significant difference between respondents and non-respondents at the 5% level. Nor do we find a statistically significant difference in the dealer profitability of purchases by respondents and non-respondents.

We are not concerned about the demographic differences between respondents and non-respondents. This is for two reasons. First, the differences do not seem large enough for respondents and non-respondents to differ significantly with respect to our dependent variable (or other transaction-based behavioral measures). Second, in our previous research we have found that it is the poorest, least-educated buyers who pay most for a car, ceteris paribus. These are precisely the buyers who were least likely to respond to our survey (although the difference in prices paid by these buyers compared to respondents is not large enough to be statistically significant). Our results rely on between-consumer differences in transaction prices due to differences in search behavior, and our sample contains less variation in the former than we would have if all consumers had answered the survey. In addition, the marginal benefits of search are likely to be bigger for the omitted group, just because the average surplus its members leave the dealer is larger. This suggests that our

results are a conservative lower bound of the true benefits of searching and being informed.

3.4 Survey findings and summary statistics

In this subsection we present basic findings from our survey and summary statistics from our transaction data. Many respondents collected negotiation-relevant information – 82% of buyers reported having collected some information specific to the vehicle they ended up buying. Buyers collected information for a variety of reasons. For example, 77% of buyers reported collecting information that helped them decide which car to buy, and 47% of buyers reported having used information sources to learn the dealer's invoice price. On average, consumers spent 5.4 h for such research on the Internet, and 1.8 h using offline sources (excluding visiting dealerships). The most frequently visited websites by buyers who reported using the Internet were those of manufacturers (70%), followed by informational sites such as consumerreports.com or kbb.com (63%), online buying services such as Autobytel.com or Carsdirect.com (56%), and individual dealers' sites (31%). Regarding offline sources of information, 50% of respondents received information from a friend, co-worker, or mechanic, followed by information from a dealer (47%). Of all buyers, 42% used *Consumer Reports*, 37% used other guide publications (e.g. *Edmunds*), 28% looked at the manufacturer's brochure, 18% relied on auto enthusiast magazines (e.g., *Car & Driver*), and 12% received information from a financial institution such as a credit union.[18]

Many consumers also engage in search for their outside option at other dealerships: 40% of buyers reported having obtained a price offer from a competing dealer when they negotiated for the car they eventually purchased. In line with this finding, 44% of our respondents reported having visited zero or one dealer while another 45% visited two to three dealers; the remaining consumers visited four or more dealers. Many consumers reported having used the price offer they obtained from a competing dealer to help them negotiate. Specifically, 74% of the buyers who had a competing offer explicitly mentioned this offer in the negotiation with the dealer from whom they eventually purchased their car. On average, consumers spent 6.3 h visiting dealerships.

We found considerable variation in consumer traits across our respondents. The standard deviation on a four-point scale is approximately 0.9 for all the statements in question 31 (see Table 2). For example, 26% of buyers agreed strongly with the statement "I am afraid that I will be taken advantage of by a dealer when negotiating the price of a new car;" another 34% agreed with the

[18]Note that these sources are not mutually exclusive, so the percentages add up to more than 100.

Table 2 Summary statistics

Variable	Mean	Std. dev.	Min.	Max.	*N*
Consumer trait answers from survey[a]					
AfraidTakenAdvantage	2.74	0.97	1	4	1,402
NoTimeToShop	2.57	0.83	1	4	1,402
DoPriceComparisons	3.48	0.66	1	4	1,402
InternetForInfo	3.04	0.96	1	4	1,402
GatherMuchInfo	3.16	0.8	1	4	1,402
ReadCarMagazine	1.85	0.84	1	4	1,402
VisitDealerForFun	1.67	0.76	1	4	1,402
Demographic variables from survey					
CustomerAge[b]	3.02	0.91	1	5	1,402
Education[c]	4.84	1.43	1	7	1,402
Income[d]	5.21	2.2	1	10	1,402
Black	0.03	0.18	0	1	1,402
Hispanic	0.19	0.39	0	1	1,402
Female	0.4	0.49	0	1	1,402
Demographic variables from census[e]					
%HouseOwnership	0.67	0.24	0.01	1	1,402
MedianHouseVal. (000s)	2.3	1.06	0.19	5	1,402
%Professional	0.16	0.08	0	0.62	1,402
%Executives	0.17	0.08	0	1	1,402
%BlueCollar	0.27	0.16	0	0.91	1,402
%Technicians	0.03	0.02	0	0.16	1,402
Summary statistics from transaction data[f]					
Price	23,294.74	5,515.03	9,800	38,750	1,402
Trade	0.3	0.46	0	1	1,402
EndOfMonth	0.2	0.4	0	1	1,402
Weekend	0.3	0.46	0	1	1,402
Competition	4.53	3.07	0	16	1,402
MonthMay	0.51	0.5	0	1	1,402
SouthernCal	0.62	0.48	0	1	1,402

[a]The four response categories for the consumer trait questions range from 1 = "Disagree Strongly" to 4 = "Agree Strongly"
[b]Age response categories: *1* (Under 20), *2* (20–34), *3* (35–49), *4* (50–64), *5* (65 and over)
[c]Education response categories: *1* (8th grade or less), *2* (Some high school (but did not graduate)), *3* (High school graduate (or GED)), *4* (Some college), *5* (College degree), *6* (Some graduate work), *7* (Graduate or professional degree)
[d]Income response categories *1* (Under $20,000), *2* ($20,000–$29,999), *3* ($30,000–$44,999), *4* ($45,000–$59,999), *5* ($60,000–$74,999), *6* ($75,000–$99,999), *7* ($100,000–$124,999), *8* ($125,000–$149,999), *9* ($150,000–$199,999), *10* ($200,000 or more)
[e]MedianHouseValue in $100,000
[f]Competition: number of dealers of same nameplate in a 10-mi radius of dealership

statement but not strongly so. Twenty eight percent of consumers disagreed with the statement; 11% strongly so.

Table 2 also reports summary statistics for the demographic information from the survey and the transaction data. The last part of Table 2 reports summary statistics for the transaction data used in the paper. The average price paid for a new car in the sample is $23,285. On average, there were 4.5 competing dealerships of the same nameplate within a 10-mi radius of the zip-code of the transaction dealer. Of all sales, 30% occured on weekends, 20%

within the last five days of any given month. Sales were split evenly between April and May 2002. Finally, 62% of sales took place in southern California.

4 Results

We now investigate how information possessed by buyers about the dealer's reservation price and their own outside option affects negotiated prices. We also analyze the implication of search cost and bargaining disutility on negotiated prices. For this analysis we combine the survey responses from each consumer with information on the outcome of that consumer's car purchase.

Our dependent variable is *Price* as defined in the data section. In order to provide the appropriate baseline for the price of the car, we transform the price equation introduced in the previous section to 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 a particular month, are likely to be better modeled as a percentage of the car's value than a fixed-dollar increment.

$$\ln(Price_i) = Z_i\alpha + X_i\beta + S_i\delta + D_i\gamma + T_i\nu + \epsilon_i$$

The Z matrix in this estimation equation is composed of market- and time-specific effects: we include month and region fixed effects, controls for whether the vehicle was purchased at the end of the month or the weekend, and a measure of dealer competition. The X matrix is composed of transaction-specific variables: we include car fixed effects, vehicle costs, and the time since the introduction of the current model-year. The matrix also contains an indicator for whether the buyer traded in a vehicle. The D matrix contains demographic characteristics of the buyer and her census block group. To this basic specification we add a matrix S, which contains the search behaviors of interest: survey responses that indicate the information obtained by a buyer about the seller's reservation price and the buyer's search behavior for outside options. Finally, the T matrix contains our measures of consumer traits (these will be explained in the next subsection).

4.1 The effect of buyer information about the seller's reservation price

We begin by looking at very general measures of whether a buyer is informed. Our first specification accounts for whether buyers reported collecting any information specific to the vehicle that they ended up purchasing. To demonstrate the role of demographics, we begin with a specification that includes neither demographics nor consumer traits. We find that the negotiated prices of buyers who are informed are on average 1.36% lower than the prices negotiated by other buyers (see the variable *Informed* in column 1 in Table 3; note that we have multiplied all coefficients by 100, i.e., a coefficient of 0.1 implies that a unit increase in the variable would increase price by 0.1%). This represents $316 on the average car (which costs $23,295). Because the average

Table 3 Price effects of buyer information about the dealer's reservation price[a]

Dep. var. ln(price)	(1)	(2)	(3)	(4)	(5)
Informed	−1.36	−1.14	−0.71		
	(0.38)***	(0.38)***	(0.39)*		
KnowInvoice				−0.59	−0.66
				(0.29)**	(0.30)**
KnowMarketPrice				−0.14	0.19
				(0.28)	(0.28)
KnowCars				0.57	0.44
				(0.33)*	(0.33)
KnowDealers				−0.17	−0.23
				(0.26)	(0.27)
AfraidTakenAdvantage			0.44	0.44	0.30
			(0.13)***	(0.13)***	(0.13)**
NoTimeToShop			0.26	0.25	0.18
			(0.15)*	(0.15)*	(0.16)
DoPriceComparisons			−0.42	−0.43	−0.63
			(0.24)*	(0.24)*	(0.24)***
InternetForInfo			−0.19	−0.18	−0.25
			(0.16)	(0.16)	(0.17)
GatherMuchInfo			−0.33	−0.32	−0.19
			(0.21)	(0.21)	(0.21)
ReadCarMagazine			0.22	0.21	0.27
			(0.17)	(0.17)	(0.17)
VisitDealerForFun			−0.07	−0.08	−0.12
			(0.20)	(0.21)	(0.21)
CustomerAge		−0.03	−0.09	−0.11	−0.01
		(0.14)	(0.15)	(0.15)	(0.15)
Education		−0.42	−0.39	−0.41	−0.36
		(0.10)***	(0.10)***	(0.10)***	(0.11)***
Income		−0.27	−0.20	−0.23	−0.09
		(0.26)	(0.25)	(0.25)	(0.27)
Income^2		0.04	0.04	0.04	0.02
		(0.02)*	(0.02)*	(0.02)**	(0.02)
Black		0.83	1.01	0.98	0.61
		(0.83)	(0.82)	(0.82)	(0.88)
Hispanic		0.38	0.38	0.43	0.67
		(0.39)	(0.39)	(0.39)	(0.40)*
OtherRace		0.11	0.23	0.21	−0.01
		(0.45)	(0.42)	(0.42)	(0.44)
Female		0.45	0.26	0.23	0.23
		(0.27)*	(0.27)	(0.27)	(0.28)
%HouseOwnership		−0.86	−0.89	−1.00	−1.16
		(0.57)	(0.57)	(0.56)*	(0.56)**
MedianHouseVal. (000s)		−0.44	−0.45	−0.45	−0.24
		(0.15)***	(0.15)***	(0.15)***	(0.18)
%Professional		0.51	0.27	0.27	−0.52
		(2.22)	(2.19)	(2.18)	(2.29)
%Executives		3.29	3.85	3.84	1.89
		(2.58)	(2.54)	(2.60)	(2.90)
%BlueCollar		0.44	0.54	0.41	−0.77
		(1.74)	(1.71)	(1.72)	(1.76)
%Technicians		−8.93	−8.00	−8.13	−0.03
		(6.02)	(5.96)	(5.96)	(6.20)
Trade	0.65	0.65	0.58	0.55	0.70
	(0.29)**	(0.29)**	(0.28)**	(0.28)*	(0.29)**

Table 3 (continued)

Dep. var. ln(price)	(1)	(2)	(3)	(4)	(5)
VehicleCost	98.36	98.36	98.54	98.55	103.65
	(2.37)***	(2.38)***	(2.35)***	(2.35)***	(2.49)***
Competition	0.02	0.04	0.03	0.04	0.00
	(0.05)	(0.05)	(0.05)	(0.05)	(0.00)
Car fixed effects (8)	yes	yes	yes	yes	yes
Dealer fixed effects (178)	no	no	no	no	yes
Constant	1,004.40	1,007.11	1,007.47	1,007.23	1,005.60
	(0.46)***	(1.47)***	(1.79)***	(1.77)***	(1.74)***
Observations	1402	1402	1402	1402	1402
R-squared (within, car fixed effects)	0.605	0.618	0.627	0.628	0.715

*, **, ***significant at 10%, 5% and 1% levels, respectively. Robust SEs in parentheses. For comparison with previous work, the R-squared is 0.96 for columns 1 and 2, and 0.97 for the remaining columns. All coefficients are multiplied by 100. MedianHouseValue in $100,000. Response scale on trait variables (question 31): 1 = "Disagree Strongly", 4 = "Agree Strongly"
[a]Unreported are car fixed effects and dummies for May, Southern California, *EndOfMonth*, and *Weekend*

dealer gross margin on the vehicle in the sample is $1,565, the information is associated with a lower dealer surplus of 20%.[19]

In the second column of Table 3 we include demographics as well as the variable *Informed*. Our demographics are gender, age, education, income, and race from the survey, and house ownership, median house value, and type of occupation in the census block group in which the buyer resides. Scott Morton et al. (2003) have shown that these demographic variables are related to negotiated car prices. In addition, we expect that these variables are also correlated with whether buyers obtain negotiation-relevant information and engage in search for outside options; for example, only 17% of buyers without a high school degree reported knowing the invoice price of the car they eventually purchased, compared with 54% of buyers with a college degree. The coefficient will be biased upwards if the variable picks up the effects both of knowing the invoice price and of being more highly educated. By including detailed demographics, we are effectively identifying the effect of negotiation-relevant information and price search from variation in these measures within demographically similar groups.

We find that education, house value, and gender are the only statistically significant demographic variables (see column 2 of Table 3). Higher levels of education and higher house values are associated with lower transaction prices. Each higher educational level the buyer attains is associated with a 0.42% price decrease. The fact that other demographic variables are not significant

[19]In this and other specifications we did not any significant effect of our "Competition" variable. We think this due to our small sample size. Using a similar but much larger dataset (650,950 observations), Scott Morton et al. (2003) find that one additional dealer of the same nameplate within a 10 mile radium is associated with approximately 0.2% lower prices.

is most likely the result of our small sample size.[20] The change of interest is that, as predicted, the estimated coefficient on *Informed* declines in magnitude to −1.14%.[21]

As discussed above, demographics alone do not solve the problem that our search measures may be picking up unobserved buyer characteristics that affect both negotiated prices and negotiation-relevant behavior. By using a survey we are able to measure, albeit imperfectly, these normally "unobserved" consumer traits. While controlling for these measures cannot rule out that some of the effect of negotiation-relevant behavior remains driven by unobserved differences between consumers, it gets us much closer to estimating a treatment effect of information. The additional traits in this specification are first the answers to the questions directly; in later tables we will use the factors. We repeat the specification from column 2 of Table 3 adding these normally unobserved consumer traits. Only one consumer trait is statistically significant on its own: buyers who were more afraid of being taken advantage of by the dealer paid more: 0.44%, or 6.5% of the average dealer's gross margin for each increase in the response category (four categories ranging from 1 = "Disagree Strongly" to 4 = "Agree Strongly"; see the coefficient on *AfraidTakeAdvantage* in column 3 of Table 3). The search questions have negative coefficients as expected, but do not have statistical significance on their own. However, the coefficients on all three search questions are jointly significantly different from zero, indicating that consumers who have a high willingness to search pay less for cars. The importance of the search traits will be confirmed when we use the search factor in later specifications. Finally, consumer car knowledge does not have any significant effect on transaction price. We speculate that perhaps consumer knowledge is offset by a higher willingness to pay for cars in general. A Hausman test rejects the hypothesis

[20] Using a larger sample of (similar) transaction data we found in Scott Morton et al. (2003) that not just gender but also race were significant predictors of price. Specifically, we found a 0.8% price premium for blacks and a 0.6% price premium for Hispanics. Looking across all specifications in Table 3 reveals that the point estimates of "Black" and "Hispanic" are not inconsistent with these prior results. However, the vastly smaller sample size (1,402 vs. 650,850 observations) in this study does not allow us to reject the hypothesis that the coefficients are zero. Turning to gender, the female coefficient in Scott Morton et al. (2003) was 0.2%. This is also not inconsistent with the findings in Table 3, although no specification in column 2 allows us to conclude that the female coefficient is different from zero at a 5% level. Finally, Scott Morton et al. (2003) found that age and income were also significant predictors of price. In the smaller sample considered here, the coefficient on income is negative but statistically insignificant (−0.27, p-value 0.30). The coefficient on squared income (0.04, p-value 0.055) implies that those with the highest incomes pay more, all else equal.

[21] We can further control for demographic differences by allowing for zip-code fixed effects. While these are not at the level of the individual, they are likely to control for unobserved consumer characteristics that are not measured in our demographic variables. We find that including 641 zip-code fixed effects somewhat increase the magnitude of the "Informed" coefficient relative to the estimate in column 2. Specifically, the coefficient on 'Informed' goes from −1.14 to −1.42 and remains significant (p-value < 0.01). Because zip-code level fixed effects use up so many degrees of freedom we don't include them in the remaining specifications.

that the model without consumer traits in column 2 of Table 3 is correctly specified. Hence, it appears that our consumer trait variables play a role in controlling for the choice of the consumer to collect information.[22]

After controlling for consumer traits, the coefficient on *Informed* decreases from −1.14 to −0.71 (see column 3 in Table 3), indicating that some of the effect picked up by *Informed* in column 2 in Table 3 was due to selection into searching. Furthermore, after controlling for selection into searching, the estimated coefficient is only marginally statistically significant, which leads us to the next specification.

We suspect that "being informed" is a somewhat broader variable than we would like for our price regression. For example, many consumers might say they are informed after collecting information that is useful to them in some way, but is not useful in lowering transaction price. Therefore, we are interested in testing the prediction of bargaining theory that consumers who know more about the seller's reservation price pay lower prices. In questions 16 and 18 we asked respondents what information they researched, in particular "dealer cost" (invoice/hold-back), but also "which car to purchase," "which dealers to visit or buy from," "fair price or market value of the car." We find that buyers who reported having researched the invoice price reduced the average dealer gross margin by 8.7% (the coefficient of *KnowInvoice* is −0.59, see column 4 in Table 3). Knowledge of other pieces of information seemed not to affect price (see the coefficients of *KnowCars, KnowDealers, KnowMarketPrice*).[23] The fact that the invoice price is a good measure of the dealer's reservation price suggests that consumers who know the dealer's reservation price pay lower negotiated prices.

We now address an important alternative explanation. It could be that consumers who reported knowing the invoice price of a car also gathered information about which were low-price dealerships. As a result, these consumers would pay lower prices not because they knew the dealer's reservation price, but because they benefited from searching for low-price dealers. We can address this alternative explanation by adding dealer fixed effects to the specification in column 4. In this regression, the estimated coefficient on the *KnowInvoice* 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 between dealers, the results

[22]The consumer traits we construct are based in part on consumers' assessment of their bargaining disutility. These assessments were made six to twelve weeks after the consumers purchased a car. If consumers infer their bargaining disutility from the price they obtained for this particular vehicle, there could be an endogeneity between prices and consumer traits. Please see page 29 for an investigation of this issue.

[23]It is perhaps surprising that buyers who claim to have learned the "fair price or market value" do not do as well as buyers who say that they learned the invoice price. We conjecture that this is because the term "fair price" is much more open to interpretation by respondents. If "fair market price" is included without the other three types of information, it is negative and significant at the 3% level, suggesting it also is collinear with invoice price.

cannot be due to consumers searching for low-cost dealerships. The coefficient on *KnowInvoice* remains highly significant and changes little (from −0.59 to −.66, see column 5 in Table 3).[24] As before, knowledge of other pieces of information does not affect price.

In concluding our investigation of buyer information about the seller's reservation price, we find that such information has an economically meaningful effect. Buyers who have learned the dealer's invoice price pay $140 less on the average car; this corresponds to 9% of the average seller surplus.

For the rest of the analysis we settle on a specification that includes *KnowInvoice*, demographics, and all consumer traits, but excludes dealer fixed effects, because the fixed effects do not change our results appreciably but lead to a large reduction in degrees of freedom.

4.2 The effect of search costs and buyer information for outside options

One important feature of car negotiations is that buyers can suspend the negotiation process with a given dealer and opt to search for price offers from competing dealers. As we have discussed in Section 2, the theoretical bargaining literature makes two predictions. First, consumers who search more for outside options should pay less. This results from the property of the order statistic: the expected price for consumers who sample more prices from (heterogeneous) dealerships should be lower. Second, holding consumers' equilibrium search behavior constant, consumers with lower search cost should do better in price negotiations. In our empirical specifications we will simultaneously control for and estimate the effect of the search behavior of the buyer with measures such as the number of dealers the buyer visits. Our traits will proxy for the search cost of the buyer because they measure general attitudes and past behavior.

From the survey we know how many other dealerships of the same nameplate the buyer visited (question 5), #*DealersVisited*. We run a specification, reported in column 1 in Table 4, that includes #*DealersVisited*, *KnowInvoice*, and all the consumer traits as before. *KnowInvoice* has a similar coefficient as before, at −.60. Consistent with our prediction, the results in column 1 show that consumers who search more in equilibrium for information about outside options pay less: for example, an increase in dealers visited from two or three (one of the response categories) to four or five (the next response category) decreases price by 0.5%, or 7.4% of the average dealer gross margin.

To get a sense of the magnitude of the search cost effect, we would like to sort consumers into quartiles, ranging from the highest to the lowest search cost. To do so we now move to including consumer traits in their factor forms from the factor analysis on page 16. In this section we are primarily interested in the factor *WillingnessToSearch*. We assign each consumer a variable that contains the search cost quartile of the consumer (quartile 1 contains consumers with the highest search cost, quartile 4 those with the lowest search cost). Similarly, we assign each consumer a variable that contains

[24] The dealer fixed effects are jointly significant, $F(170, 1{,}199) = 36.6$, p-value < 0.01.

Table 4 Price effects of buyer information about outside options, and bargaining disutility[a]

Dep. var. ln(price)	(1)	(2)	(3)	(4)	(5)
KnowInvoice	−0.60	−0.55	−0.53	−0.52	−0.51
	(0.27)**	(0.27)**	(0.27)**	(0.27)*	(0.27)*
#DealersVisited	−0.50	−0.46			−0.47
	(0.17)***	(0.17)***			(0.17)***
#DealersVisited=2−3			−0.66		
			(0.26)**		
#DealersVisited=4−6			−1.01		
			(0.43)**		
#DealersVisited=7+			−2.76		
			(1.24)**		
CompetingOffer				−0.55	
				(0.26)**	
GoodPrice					−0.46
					(0.16)***
AfraidTaken Advantage	0.44				
	(0.13)***				
NoTimeToShop	0.23				
	(0.15)				
DoPrice	−0.37				
Comparisons	(0.24)				
InternetForInfo	−0.19				
	(0.16)				
GatherMuchInfo	−0.24				
	(0.21)				
ReadCarMagazine	0.23				
	(0.17)				
VisitDealerForFun	−0.09				
	(0.21)				
WillingToSearch (quartile 2)		−0.52	−0.52	−0.57	−0.46
		(0.39)	(0.39)	(0.39)	(0.39)
WillingToSearch (quartile 3)		−0.92	−0.91	−0.98	−0.83
		(0.39)**	(0.39)**	(0.39)**	(0.38)**
WillingToSearch (quartile 4)		−1.32	−1.30	−1.39	−1.22
		(0.40)***	(0.40)***	(0.40)***	(0.40)***
Barg.Disutility (quartile 2)		0.82	0.82	0.86	0.78
		(0.34)**	(0.34)**	(0.34)**	(0.34)**
Barg.Disutility (quartile 3)		1.34	1.34	1.38	1.21
		(0.38)***	(0.38)***	(0.38)***	(0.38)***
Barg.Disutility (quartile 4)		1.29	1.28	1.37	1.11
		(0.36)***	(0.36)***	(0.35)***	(0.36)***
CarKnowledge (quartile 2)		0.45	0.44	0.44	0.42
		(0.34)	(0.34)	(0.34)	(0.34)
CarKnowledge (quartile 3)		0.44	0.44	0.50	0.43
		(0.32)	(0.32)	(0.32)	(0.32)

the quartile for the other two factors, *BargainingDisutility* and *CarKnowledge*, respectively.

In column 2 of Table 4 we repeat the prior specification with dummies for factor quartiles (omitting the first quartile) instead of question answers. We find that consumers in the lowest search cost quartile pay 1.32% less than consumers in the highest search cost quartile (p-value < 0.01). This corresponds

Table 4 (continued)

Dep. var. ln(price)	(1)	(2)	(3)	(4)	(5)
CarKnowledge (quartile 4)		0.37	0.39	0.41	0.37
		(0.35)	(0.35)	(0.35)	(0.35)
Car Fixed Effects (8)	yes	yes	yes	yes	yes
Constant	1,008.17	1,006.93	1,006.09	1,006.03	1,008.81
	(1.80)***	(1.52)***	(1.47)***	(1.47)***	(1.68)***
Observations	1402	1402	1402	1402	1400
R-squared (within, car fixed effects)	0.629	0.631	0.632	0.631	0.633

*, **, ***significant at 10%, 5% and 1% levels, respectively. Robust SEs in parentheses. All coefficients are multiplied by 100. For comparison with previous work, the R-squared is 0.97 for all columns

[a]Unreported are demographic variables, car, month, and region fixed effects, *EndOfMonth*, *Weekend*, *Trade*, *VehicleCost*, and *Competition*. Response scale on trait variables: 1 = "Disagree Strongly", 4 = "Agree Strongly"

to $307 on the average car or 20% of the average dealer margin.[25] One can also clearly see in this specification that being in the top half of the consumer population in terms of disliking bargaining raises price by over 1% compared to being in the bottom quartile. A consumer's car knowledge has no impact on negotiated price. The coefficients on #*DealersVisited* and *KnowInvoice* are very similar to previous estimates at −.46 and −.55 respectively.

It is possible that the impact of visiting an additional dealer is not constant in the number of dealers already visited. To pick up any nonlinearities in this search behavior, we repeat the specification in column 2 with dummies for whether consumers visited two to three, four to six, and seven or more dealers instead of the #*DealersVisited* variable. As in the linear specification, we find that consumers who visited more dealers paid less. The coefficients of −1.0% on consumers who visited four to six dealers and −2.8% on consumers who visited seven or more dealers, indicate that for these consumers, dealers retained about 15% and 41% less gross margin, respectively (see column 3 in Table 4).

From the survey we know also whether a buyer has obtained a price offer from a competing dealer (question 10). In a final specification, we use this alternative measure to measure a buyer's equilibrium search behavior for information about outside options. We find that buyers with a price offer from a competing dealer lower the gross margin by 8% on average compared to those who did not obtain one (see column 4 in Table 4).

Overall, our results are consistent with the predictions of the theory we discussed earlier. First, we find that consumers who search more for outside options pay less. The magnitude of the effect is quite large. A dealer loses 7%

[25]Alternatively, we can also sort consumers by constructing a variable that is the sum of the normalized values of the responses to the three measures of consumers' willingness to search. For each variable we calculate the mean and standard deviation over all respondents. Then we normalize the answer for each individual by subtracting the mean and dividing by the standard deviation.

of his gross margin when faced with a consumer who shops at two dealerships instead of a consumer who shops at only one dealership, and 40% if faced with a consumer who shops at as many as seven dealerships. Second, conditioning on their equilibrium search behavior for information about their own outside options, consumers who have lower search costs do better in price negotiations. The magnitude of the effect is substantial: consumers in the lowest search cost quartile pay 1.32% less than consumers in the highest search cost quartile. This corresponds to 20% of the average dealer margin.[26]

It remains the case that our interpretation of the coefficients on search behavior as treatment effects depends on our assumption that we have controlled for unobserved bargaining ability. This interpretation is lent support by an additional analysis we perform using the "know invoice price" indicator and a different dependent variable, namely dealer profit on ancillary services. Ancillary services include financing, insurance, and additional warranty programs, which carry high profit margins for dealerships.

To understand our analysis, note that knowing the invoice price does not help consumers bargain over ancillary services. Hence, if "know invoice price" predicted dealer profit on ancillary services even after we control for our consumer traits, it would suggest that "know invoice price" proxies for high bargaining ability. This would invalidate the treatment effect interpretation of our results. When we regress the absolute level of dealer profit on ancillary services for each transaction on car, month, and region fixed effects as well as our demographic variables and consumer traits, we find that knowing the invoice price of the vehicle is insignificant in predicting dealer profit on ancillary services (not reported).

If the effect of knowing the vehicle invoice price were due to an unobserved "high bargaining ability" consumer characteristic, a person with that characteristic would presumably not just pay less for the vehicles but also for ancillary services. This turns out not to be the case, i.e., our consumer traits seem to

[26]Notice that while our data allows us to infer that consumer actions (e.g., getting to know invoice price, going to additional dealers, or having a competing offer) yield the outcomes predicted by the bargaining theory literature, our data cannot conclusively answer whether the *mechanisms* that links these actions to better bargaining outcomes are the *same mechanisms* that are modeled in the bargaining theoretic papers we discuss. For example, the models in the first part of Section 2 imply that knowing the invoice price of the dealer will help the consumer in the negotiation because it reduces uncertainty about the reservation price of the dealer. However, it could be that knowing the invoice price helps consumers because it signals to the dealer that the consumer searches a lot and thus perhaps will visit competing dealers (we thank an anonymous referee for pointing this out). We cannot conclusively distinguish between these different mechanisms because—while we have data from a consumer survey—we do not have corresponding data from a dealer survey. Nonetheless, we can present some evidence that suggests that our results may not be driven by signaling. We can do this because we know from the survey which consumers told dealers about their search and dealer visits. When we exclude from the sample consumers who stated that they told the dealer about obtaining an invoice price, and/or obtaining a competing offer, we obtain results that are similar to our main findings. Details are available from the authors. We recognize that dealers may still make inferences even if consumers did not explicitly tell them about having searched. However, we think that the signaling issue is less likely to be present in the restricted sample.

adequately control for this "high bargaining ability" consumer characteristic. This does not mean that the negotiated price consumers pay for ancillary services is unaffected by search behaviors in general: having a competing offer and visiting more dealerships are associated significantly with lower dealer profit (by $75 and $68, respectively; not reported).

4.3 The effect of bargaining disutility

As we have discussed in Section 2, a higher bargaining disutility can be modeled as a higher per-period bargaining cost. A person with a high disutility of bargaining is eager to minimize the number of rounds of back-and-forth, perhaps because he or she dislikes confrontation or dislikes the effort of reformulating a new offer. The literature predicts that if the buyer and seller each privately know their per-period bargaining cost, the buyer will in expectation obtain a larger share of the surplus if her bargaining disutility is lower (see Kennan and Wilson 1993, Section 5.3).

To test this prediction and determine the magnitude of the effect, we can use earlier specifications in Table 4. Two measures among the consumer traits that capture aspects of bargaining disutility are the responses to the statement "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 a number of characteristics might lead a consumer to strongly agree with the first statement, including a dislike of conflict and stressful situations, or anxiety in high-pressure environments. The second statement captures whether individuals have a time constraint that would make participation in extended negotiations costly for them. We expect that both aspects will make the bargaining process unattractive. We can measure the magnitude of the bargaining disutility by looking at the coefficients on the *BargainingDisutility* quartiles. We find that consumers in the lowest bargaining disutility quartile pay 1.30% less than consumers in the highest bargaining disutility quartile (p-value < 0.01). This corresponds to $302 on the average car or 19% of the average dealer margin.

One concern in this specification is that buyers who indicate that they have a low disutility of bargaining do so because they happen to have negotiated a good price, not—as we have suggested—the other way around. To investigate this alternative explanation we add to the specification a variable that measures independently how well buyers thought they did in the negotiation. Question 15 asks consumers: "How happy are you with the price you paid for your car?" If a buyer reports a low disutility of bargaining because the buyer was happy with the price obtained during the negotiation, controlling for this *GoodPrice* variable should eliminate our finding that consumers with a low disutility of bargaining pay less. However, as column 5 in Table 4 shows, the coefficient on the *BargainingDisutility* quartile dummies fall only slightly and remain significant. This is the case despite the fact that buyers' estimates of how well they did are strongly negatively correlated with the price they actually negotiated; consumers appear to be reasonably aware of how well they are

Table 5 Magnitude of bargaining effects

Effect of ...	Price change (in $)	Dealer gross (in %) margin change
information about seller's reservation price (knowing dealer invoice price)	−121	−8
search for information about outside option (visit one additional dealer)	−109	−7
search costs (highest to lowest quartile)	−287	−18
bargaining disutility (highest to lowest quartile)	−261	−17

doing in the negotiation. We find that each increase in response category of *GoodPrice* is associated with a 0.46% lower price. Hence, we conclude that consistent with the theoretical predictions, consumers with a high disutility of bargaining pay more in price negotiations than consumers with a low disutility of bargaining.

4.4 Summary of effects

In summary, we find empirical support for all predictions from theory that we have reviewed here: First, buyers who know the seller's reservation price are better off. Second, consumers who are better informed about their own outside options obtain better bargaining outcomes. Third, consumers with a lower search cost do better in price negotiations. Fourth, buyers with lower bargaining disutility do better (see Table 5).

While these predictions are commonly accepted among economists, there is next to no empirical evidence that they hold in negotiations in the field. More importantly, there is a lack of evidence that these bargaining effects are large enough to meaningfully influence market outcomes. Our results suggest that they do.

5 Do consumers search "enough"?

We have estimated the bargaining effects associated with consumer characteristics (search cost and bargaining disutility) and consumer information (about the seller's reservation price and her own outside options). While consumer characteristics are fixed (at least in the short run), consumers control their own search behavior for information. We would like to use what we have learned in this paper to evaluate whether consumers' search decisions seem consistent with the estimated average gains resulting from search. In doing so we are relying on the "treatment effect" interpretation of our estimation results, which assumes that once we have controlled for consumers' trait measures and their demographic characteristics, there are no more unobserved characteristics that both affect the prices paid by consumers and their propensity to engage in the

search behaviors we discussed. The reader should keep in mind that this is a maintained assumption when interpreting our findings in this section.

While we have estimates of the average *gains* resulting from consumer search, we have no direct measures of the average *cost* of these activities. Thus, we will use back-of-the-envelope estimates of cost for different search activities and caution that this analysis is illustrative only. We assume that the cost of searching includes the cost of time to the consumer, any disutility from the activity, and the cost of purchasing the information (if any). The gains from consumer search in this setting consist of savings on the price of a new car, for which we will use our prior estimates.[27]

We now consider the two search activities that we have identified as having a substantial estimated payoff in our price results: search that uncovers the dealer's invoice price and search for the consumer's own outside options.

Search for the dealer's invoice price Determining the invoice price of a car requires a consumer to search online for invoice prices (for example, on the free Web sites edmunds.com or http://autobytel.com), or to examine a publication with current invoice prices (for example *Kelly Blue Book*, *Consumer Reports*, and *Edmunds*; these cost approximately $10). The authors, who are experienced Internet car buyers, took approximately five minutes to find an invoice price online that is specific to a make, model, option package, and geographic area. We obtained a measure of search time for an active Internet user who had never before searched for invoice price data by instructing several research assistants to look for particular invoice prices. The assistants took between five and eighteen minutes. Even a doubling of this time to allow for slower users, or users who wanted to explore multiple cars, would lead to an invoice search time of under 1 h. Because knowing the invoice price is associated with a $121 lower transaction prices for the average car (and more for more expensive cars), active Internet users with a cost of time below $120 an hour should find it worthwhile to search for the invoice price. This should describe the vast majority of Internet users. Yet, 40% of buyers who used the Internet indicated that they had not collected information on the invoice price.

Among those buyers who did not use the Internet, search for invoice price information was much lower, only 13%. Of course, the cost of finding invoice price information for such buyers is substantially higher: visiting the local library or a book store to consult an invoice price publication might take 1 or 2 h inclusive of transportation. The invoice price in the book might not be specific about particular options or geographic areas. *Consumer Reports* has a fax service that allows a consumer to purchase a written invoice cost for any car for $14. Phoning or writing a letter to request a fax and paying for it by writing a check or giving a credit card number should not take more than thirty minutes at most. This implies that consumers who value their time at less than $60

[27] We cannot measure and thus abstract from the gains consumers obtain from searching to find a car that matches their needs.

(a visit to the library) or $240 (a fax to *Consumer Reports*) per hour should be willing to look up an invoice price offline; this is likely to hold for a substantial fraction of offline buyers.

Given the expected gain, our rough calculations suggest that only consumers with a high value of time *and* no Internet access should optimally not search for invoice price information. This is likely to be a small group, because Internet access is highly correlated with household income.[28] The substantial group of consumers that is not searching leads us to the conclusion that these buyers are not aware of how easy it is to find the invoice price of a particular car and/or how effective it is at reducing transaction price in a negotiation. This might be true in light of the infrequency of new car purchases; consumers may not have had much opportunity to learn how to behave optimally in light of the new technology of free online pricing guides. A second explanation for the observed consumer behavior is that the use of invoice price information is quite specific to the new car market. In other domains, for example, consumer electronics or household durables, there is no source of retailer marginal cost to consult. Also, due to the commonly used fixed price format in these markets, there is no clear benefit to having such information. Consequently, consumers may not have learned from other markets that searching for invoice price information can be beneficial.

Search for outside options We have shown earlier that consumers who search more in equilibrium for outside options pay less: consumers who visit one additional dealer pay $109 less on the average car or 7% of the average dealer gross margin. Also, buyers who obtained a price offer from a competing dealer left dealers with an 8% lower average gross margin than buyers who did not obtain one.

Visiting one additional dealership requires a consumer to drive (or take public transit) to the dealer's location, wait for an available salesperson, and listen to the salesperson's pitch. Suppose one additional dealer visit takes 2 h. Then a person with a cost of time of approximately $60 per hour or less should find it worthwhile to search at dealerships. This also implies that some fraction of consumers should choose not to search by visiting dealerships, and, in particular, dealer visits should be less frequent among higher-income consumers.

Our data confirms this hypothesis. We estimate an ordered probit regression of #*DealersVisited* (i.e., number of visited dealers that sell the purchased car) on the demographic characteristics of individual buyers (see Table 6). We include income, income squared, education, gender, age, and control for car fixed effects. The coefficients on income and income squared are highly significant, implying that the effect of income on dealer visits is nonlinear. Moving

[28]Only 37% of buyers who reported not having a high school degree used the Internet. This is in contrast to 81% of buyers with a college degree or higher. Eighty-seven percent of buyers with income above $150,000 but only 47% of buyers with income between $20,000 and $29,999 reported using the Internet for car buying.

Table 6 Ordered probit of number of dealers visited[a]

Dep. var. #DealersVisited	(1)
Income	0.16 (0.06)***
Income^2	−0.01 (0.01)***
Education	0.03 (0.02)
Female	−0.10 (0.06)
CustomerAge	−0.01 (0.03)
Observations	1,402

*, **, ***significant at 10%, 5% and 1% levels, respectively. Robust SEs in parentheses. All coefficients are multiplied by 100
[a]Unreported are car fixed effects

from the top income category ($200,000) to the mean ($60–75,000) raises the dependent variable by .15 response categories on the survey, or about one quarter of one additional dealer. This is consistent with the hypothesis that very high-income consumers visit fewer dealers due to higher opportunity cost of time. However, moving from the lowest income category (under $20,000) to the mean ($60–75,000) raises the dependent variable by a similar amount (0.18 response categories). We speculate that relatively low-income consumers visit fewer dealers because doing so is more costly for them than for medium-income consumers. For example, such buyers may be less likely to have easy access to transportation when shopping for a new car.

We can also tell whether buyers searched for outside options by whether they generated a competing offer. Buyers who obtained a competing offer paid $120 less on the average car. It is somewhat more difficult to determine the time cost of obtaining a competing offer. Conditional on visiting more than one dealership, it should have a low marginal time cost; a consumer must simply ask for a price quote on the car.[29] Hence, for the 56% of the sample who visited more than one dealership of the same nameplate, obtaining a competing offer should not have been a matter of time. Nonetheless, only 54% of these consumers reported obtaining a competing offer for the car they eventually purchased. This suggests that consumers do not understand the value of a competing offer in the negotiation process. The reason is perhaps the same as we hypothesized when discussing why so many Internet users fail to search for the invoice price of their vehicle: fixed price formats dominate in most other markets. Consumers therefore may not have the chance to learn in other domains that obtaining a competing offer is beneficial. This stands in contrast to visiting dealers, which is analogous to shopping at different retailers looking for a low price, and is standard search behavior in many markets.[30]

[29]To the extent the salesperson offers an obviously "too high" price and the consumer gets disutility from pointing this out, there may be a disutility associated with collecting the offer.

[30]Consumers who did not visit an additional dealership selling the car model they ended up buying are much less likely to have a competing offer (22 versus 54%). This is consistent with a standard value of time explanation: it is costly for them to generate a competing offer without a second dealer visit.

6 Relation to literature

Our paper is related to a large empirical literature on bargaining. Because our goal has been to establish in a real-world setting the importance of incomplete information and consumer characteristics for bargaining outcomes, we will focus on the field-based empirical literature.[31] Most of the field-based literature on bargaining with incomplete information falls outside of bargaining in product market settings. Instead, it is mainly concerned with union contract negotiations and focuses on strike activity and strike duration.[32] While there are other field-based empirical bargaining papers, they mostly focus on the demographic factors that affect bargaining outcomes. For example, Ayres and Siegelman (1995) perform an experiment in which they send trained "buyers" to car dealerships in Chicago to negotiate for a car using a prepared script. The authors are interested in the effect of race and gender on negotiated prices. Due to this focus, Ayres and Siegelman (1995) are careful to hold constant the very factors in whose effect we are interested. As a result, their paper does not analyze the effect on bargaining outcomes of incomplete information, search behavior, and consumer characteristics (other than race and gender).

In the context of car sales, Scott Morton et al. (2003) and Chen et al. (2003) also analyze the effect of race and gender on car sales negotiation, however, using a dataset of new car transactions that includes car characteristics, seller financial incentives, and demographic characteristics of the buyer.[33] Aside from having a different objective than the present paper, those papers have no direct measurements of buyer information and no measures of bargaining disutility. In the context of real estate sales, Harding et al. (2003) examine whether differences between buyer and seller demographics influence the negotiated price, while using the sum of buyer and seller demographics to control for unobserved features of the house.[34]

A paper by Zettelmeyer et al. (2006) uses a dataset similar to the one we employ in this paper. However, that work closely focuses on how the Internet is used, in particular on the effect of a referral from an online buying service.

[31] For laboratory-based experimental papers that discuss how the information available to the bargaining parties affects bargaining outcomes, we refer the reader to Valley et al. (1992) and Croson et al. (2003). For an experimental paper that analyzes the role of search for information about outside options in a bargaining setting, please see Zwick and Lee (1999). If we interpret a higher bargaining disutility as a higher per-period bargaining cost, Rapoport et al. (1990) and Weg and Zwick (1991) present experiments about the effect of bargaining disutility on bargaining outcomes. For a detailed discussion of the experimental literature please see Thompson (1990), Kennan and Wilson (1993), and Roth (1995).

[32] See Kennan and Wilson (1993) and Ausubel et al. (2002) for a detailed discussion.

[33] Please see Scott Morton et al. (2003) for a discussion of how the various race and gender results in the literature compare.

[34] To understand why this is necessary, suppose wealthy individuals are more likely to buy houses with central air-conditioning, an attribute that is unobservable to the researcher. If such houses sell for a premium compared to houses without central air-conditioning, the researcher will concluded that wealthy individuals are worse off in price negotiations than other individuals, controlling for all observable product characteristics.

It does not examine the predictions of bargaining theory in general or employ the full set of survey information on the consumer's search activities.

We are aware of only one other paper that examines the effect of asymmetric information on market outcomes in the field. Busse et al. (2006) show that buyers obtain a larger fraction of manufacturer rebates for new cars if they know that the rebate is offered. (This is typically true of the manufacturer's cash promotions aimed at consumers and less likely to be the case for cash promotions provided to dealers.) However, because the paper has no measurements of buyer information, it is unable to analyze the role of information and search directly as we do in this project. Additionally, our buyer survey allows us to directly measure and analyze important features of the negotiation such as bargaining disutility, and underlying shopping behavior that are not known in Busse et al. (2006).

Thus, the contribution of this paper has been to explicitly measure a variety of factors that bargaining theory suggests should be important in determining the outcome of a price negotiation, and then empirically analyze whether they are, in fact, important and how large the effects are. To the best of our knowledge, this kind of field test of bargaining theoretic predictions on real-world data has not been done before.

The last section of our paper, where we have shown evidence that suggests that consumers do not search enough given full information about the benefits and costs of doing so, is related to a paper by Ratchford and Srinivasan (1993). The authors use a structural model to estimate the returns to price search for a new car. While they find that most consumers are making the correct choice of how much to search, their estimates imply that for some consumers the marginal return to an hour of search is very high ($99 for the 95th percentile), suggesting that they should search more. While the main focus of our paper is not on returns to search, there is a substantial literature focused on this topic. First, there is a related empirical literature in the area of labor markets, where employees must search for jobs.[35] Second, a number of papers specifically deal with search for cars. Zwick et al. (2003) show that there can be too much or too little search in the laboratory as the cost and benefits of search are manipulated by experimenters. Punj and Staelin (1983) and Srinivasan and Ratchford (1991) lay out an information search model and test it with survey data from new car buyers to determine correlations between search behavior and consumer beliefs, information, and characteristics. Our paper measures many of the same constructs as these papers, but combines measurement of consumer characteristics and consumer search behavior from a survey with transaction-level data on the outcomes of negotiations into one analysis. There are two more related papers. First, Ratchford et al. (2003) show that the

[35] A number of papers that carefully model the search process and estimate parameters of policy interest are Kiefer and Neumann (1979), Stern (1989), Narendranatha and Nickell (1985) and Keith and McWilliams (1999).

Internet saves its users, disproportionately educated and young consumers, not only money, but substantial time. The paper does not examine the predictions of bargaining theory in general and is thus much closer related to Zettelmeyer et al. (2006) with its focus on how the Internet is used. Second, Beatty and Smith (1987) correlate the amount of search with consumer characteristics such as attitudes towards shopping and time availability, but the setting is one of posted, not negotiated, prices.

7 Conclusion

We have analyzed empirically how strongly bargaining outcomes are affected by incomplete information on the buyer's side and by variation in consumer characteristics. In doing so our goal has been to assess in a real-world setting the importance of key factors that bargaining theory predicts should matter for bargaining outcomes. While the predictions about the *direction* of the effects of incomplete information and consumer characteristics on bargaining outcomes are commonly accepted among economists, there is a lack of evidence that their effects on negotiations are large enough to meaningfully influence market outcomes. The primary contribution of this paper is to show that they are.

With regards to incomplete information, bargaining theory predicts that buyers are better off when they know the seller's reservation price. We find that buyers who have learned the seller's reservation price (the dealer's invoice price) pay $121 less on the average car; this corresponds to 8% of the average seller surplus. Consumers are also predicted to benefit from better information about their own outside options. Our results indicate that a search at one additional dealer is associated with a 7% lower dealer margin, or $116 on the average car. With more than 16 million cars sold in the United States in 2004 and average dealer margins of around $1,500, the effect of these two examples of incomplete information on bargaining outcomes is economically significant.

Bargaining theory also makes predictions about the effect of consumer characteristics on bargaining outcomes. In particular, holding consumers' equilibrium search behavior for outside options constant, consumers with lower search costs are predicted to do better in price negotiations. We find this predicted search cost effect to be large in car retailing: consumers in the lowest search cost quartile pay on average $287 less than consumers in the highest search cost quartile. This corresponds to 18% of the average dealer margin. We also find evidence consistent with the prediction that buyers with lower bargaining disutility do better. The magnitude of this effect is substantial: consumers in the lowest bargaining disutility quartile pay on average $261 less than consumers in the highest bargaining disutility quartile. This corresponds to 17% of the average dealer margin. We conclude that consumer characteristics can account for large differences of the bargaining outcomes observed in car retailing.

To the best of our knowledge, this paper is among the first to analyze how incomplete information affects price negotiations between individuals in real-world product markets. We are also among only a few researchers to analyze with field data how consumer characteristics affect price negotiations. This paper confirms that the factors predicted to matter by bargaining theory really do—including knowledge of the other party's reservation price, search for one's own outside options, and bargaining disutility. Most importantly, the paper shows that the magnitudes of the effects predicted by bargaining theory are economically significant in an important industry.

Our findings also answer the substantive question of what determines the price that consumers pay when purchasing a new car. We have shown that there are several actions in which consumers can engage that are likely to lower the price they pay for a new car. However, not as many consumers engage in these activities as back-of-the-envelope cost calculations suggest they should, thereby leaving money on the table.

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