Issues in Political Economy, Vol 29(1), 2020, 5-40

The apartment sublease market: time-constrained negotiation behavior with outside options and asymmetric information

Erik Rosenbaum, University of Maryland[i]

I. Introduction

College students enjoy living in their own apartments: they feel more independent, find living arrangements nicer than dorms, and hope to save money. However, lease agreements, which typically run for a full calendar year, are not compatible with the semesters and breaks of a university's academic calendar. As a result, many students renting an apartment find that, for a variety of reasons, they do not need to live in their apartments for the full calendar year, i.e., for the full lease term. The reasons for moving out may be preplanned – studying abroad, graduating early, starting a job in a different location – or more unexpected – roommate issues, wanting to save money, living with new friends in a house. Regardless of the reason, when students need to leave their apartments they hope to sublease and make back some of the rent they would lose by leaving the apartment unoccupied. Unfortunately, students often do not find someone willing to sublease for the full rental price, and thus incur a potentially significant loss (over 50 percent of rent in some cases).

There are many factors, however, that determine whether or not a given sublessor (the seller) gets a good deal out of a prospective sublessee (the buyer). This variation in final sublease prices ultimately stems from the vagueness of finding a match. Although existing literature models predict negotiation outcomes and conduct controlled negotiation experiments, they fail to capture the realism of a truly observational study. This paper involved collecting information on real-life sublease negotiations taking place in the college town of College Park, MD. Participants (sellers) were first contacted individually based on their online advertisements, then compensated to provide detailed information on their negotiations, and occasionally received follow up inquiries depending on their previous responses. This paper analyzes how the sublease market functions and attempts to gauge the effects of time pressure, outside options, and market perceptions on a seller's behavior and relative success.

II. Literature Review

Currently, the match-making system for buyers and sellers in the sublease market is fairly de-centralized and confused. Advertising, searching, bargaining, and finalizing sublease agreements can be a tricky business — a seller must first think of ways to reach out to buyers. Then, the seller thinks what price they want to advertise. Many factors go into this posting price. A seller does not want to post too high and scare away prospective buyers, nor does the seller want to post too low and be forced to accept a low offer right away. The seller's perceived likelihood of buyers' willingness to negotiate down, or the chances of scaring buyers away from a high post price, depends on the seller's perception of the market: are there more sellers than buyers? What is the typical posting price? What price are people typically settling on? A seller's post price may also depend on the seller's value of time, or level of patience.

If a seller hopes to quickly release themselves of the apartment and find a sublease, they may spend little time searching, and thus settle on a low price by either posting an initial price that is low (and thus attract buyers very quickly) or generally negotiate closer to the buyer's counter offers. On the other hand, if a seller waits longer they may increase their probability of finding a

better deal (Harding, Knight, and Sirmans 2003). Of course, sellers cannot wait forever as there is typically some cost associated with delay (Harding, Knight, and Sirmans 2003). Time plays an especially important role for this paper because sellers (and buyers) are generally under a time constraint. This deadline typically aligns with each of the academic terms (Fall Semester, Winter Term, Spring Semester, and Summer Term) for which a college student might want to sell or buy a sublease. For example, students who are studying abroad for the Spring semester would hope to have secured a sublessor by their deadline, which would be the start of Spring semester. This time pressure comes from the fact that all buyers and sellers are assumed to be students, therefore the seller knows that a prospective buyer for the Spring semester would have no choice but to secure living arrangements before Spring classes start. As a result, after the Spring semester begins, the seller can reasonably assume the market for buyers has dried up because few to zero students would wait until after classes start to obtain housing.

This paper covers two overarching topics in existing literature – negotiation modeling and theories of behavior. As mentioned before, sellers must gauge their competition in terms of price and quantity: for how much are other sellers posting their sublease? How many other sellers are there? The latter question implies that buyers will have other options in the market. The more options the buyer has, the harder it will be for the seller to find someone for a good price – or at all. Negotiation behavior is then structured around 1) market conditions (outside options, pricing, etc.) and 2) time pressures (deadlines).

An extensive literature on negotiation behavior models discusses similar conditions. Ausubel, Camton, & Deneckere have written extensively on a variety of different bargaining setups (2002). Alternative-offer bargaining is the basic framework for back-and-forth negotiation, where each party proposes counter offers to the opposing party. Countering or refusing to accept an offer comes at a cost based on that party's discount rate, or time-value (Ausubel, Cramton, and Deneckere 2002). Within this basic framework arise many possible setups. The most relevant setups involve discounting, two-sided incomplete information, asymmetric information, independent bargaining pairs, and hazard rates, whereby the marginal probability of making it to the next round of bargaining is known at the end of each round (Ausubel, Cramton, and Deneckere 2002; Gantner 2008). A common way to understand bargaining behaviors is to discuss labor union negotiations. For example, when a firm negotiates wages with a labor union, a firm's valuation of labor is private information, while a labor union's reservation wage is known (Ausubel, Cramton, and Deneckere 2002). This one-sided incomplete information is similar to how sublease buyers do not know a seller's reservation price, i.e., a seller's minimum valuation of their apartment. Additionally, if there are other labor union negotiations taking place in similar industries, unions may stage holdouts, whereby workers continue working but do so very inefficiently via work-to-rule or sick-out strategies (Ausubel, Cramton, and Deneckere 2002). Such in-plant actions force negotiations to stall and allow unions to observe the outcomes of other labor union disputes, thus revealing similar firms' private information: "holdouts [in wage disputes] are used as a delaying tactic to get information about other bargaining outcomes in the same industry…There is an incentive to holdout, since one bargaining pair benefits from information revealed in the negotiation of another pair" (Ausubel, Cramton, and Deneckere 2002, 47). In the case of subleasing negotiations, buyers use a similar strategy via readily available outside options. Buyers may delay or balance multiple negotiations at once to reveal the private information of different sellers (though not the same as independent bargaining pairs), thus giving buyers an idea of what to ask each seller. Further delay, however, can be costly if not balanced against the benefit of waiting.

Another theory is that having information is a disadvantage: "bargainers with little information about their opponent may be more aggressive bargainers and reach better agreements for themselves than bargainers with more information… information leads a negotiator to consider the interests and aspirations of the opponent" (Stuhlmacher and Champagne 2000, 474). This theory, however, implies that people do not look out for their self-interests – a central assumption of most negotiation models. Although some research suggests that revealing private information (under a complete-information setup) is more efficient (Stuhlmacher and Champagne 2000), the reality for this paper may involve asymmetric information.

More outside options give the buyer leverage. Rather than one-sided incomplete information, the sublease market represents asymmetric information because the buyer does not know for certain the seller's reservation price, and the seller does not know for certain how many options the buyer has. In the case of symmetric information ("Regime I"), buyers and sellers would both know the distribution of outside offers, and the buyer always has the option to return to bargaining (Gantner 2008). In reality, however, there is asymmetric information of the buyer's outside options ("Regime II"). Since sublease sellers do not know for certain the availability of outside options for the buyer, this paper focuses on Regime II. Under this setup, the seller believes there is some probability (q) in which the buyer has a better outside option (Gantner 2008). Gantner, who has modeled both Regime I and II, states, "with complete information, the game with an option to move between the bargaining and search process is, in equilibrium, identical to one without such option. With incomplete information, this is not true anymore. The option to return to bargaining may help the flexible buyer to get the high surplus from bargaining even if search *per se* is not profitable" (2008, pg. 431). The intuition is that under complete information the buyer never returns to bargaining because outside options are common knowledge, therefore the best price will always be offered. As a result, this subleasing study must fall under Regime II because the best price is not always known to everyone. This concept is directly related to this paper's discount modeling/analysis of subleasing negotiations and is reflected in many of the anecdotal responses I gathered.

Some theories suggest time pressure magnifies the impact of this incomplete information (Stuhlmacher and Champagne 2000). In the case where there are no alternative options, operating under a deadline may foster cooperation between two side of a negotiation. Time pressures and delay are inherently tied to the concept of discounting, or time-value. Individuals must balance the costs against the benefits of waiting longer to make a deal. As a deadline approaches, Stuhlmacher and Champagne expect decisions to become simpler and poorer, and that concessions become larger and more frequent (2002). In a controlled experiment, Stuhlmacher and Champagne test the impact of both time pressure and information levels using a computer that would "negotiate" with participants. The authors pitted students against this computer opponent. In most cases, time pressure is not well-perceived at the start of negotiation, thus indicating a change in patience (or pressure) occurs over time. This result could stem from a difference in expectations and reality. However, their paper's main findings are contradictory; having information was disadvantageous based on target agreements, while they also found that concessions were smaller when there was more complete information. The authors found no interaction between time pressure and information. This experimental setup explores the impacts of time pressure and information availability, though the general setup of the experiment convoluted the more important elements of the study. Additionally, there was little clarity on the back-and-forthness of the computer program's ability. Lastly, participants were volunteers and did not receive compensation for their performance, thus

removing any real-world incentives from their behavior. Like many other controlled experiments on negotiation behavior, the study lacked a certain element of realism only captured in observational studies. I attempt to capture similar behavior as it happens in a real-world situation, where real strangers negotiate for money via online messaging.

The last theoretical element for this paper pertains to the importance of trust and the bargaining medium used in this marketplace. First, there is an interesting issue of liability in this market. If subleases are conducted legally, the property owners typically charge a substantial fee for re-leasing (whereby the rental contract is legally transferred to someone else) that is transferred to the buyer or incurred by the seller. However, since many subleases are conducted "under the table" (without the property owner's knowledge) so as to avoid this fee, sellers are liable for any damage buyers cause since sellers are still under contract. Additionally, sellers are still billed for the apartment each month, trusting that buyers will reimburse them for the agreed upon price. If the buyer simply stops paying, there is also nothing to enforce their informal agreement with the seller. What allows two strangers, communicating exclusively online, to trust each other enough for a successful deal? Before even engaging in communication, other websites like eBay create trust via publicly available ratings and reviews based on transaction history. Facebook (FB) is in a unique situation of creating trust from personal profiles. A seller and buyer will view the FB profile of the other person to quickly gauge if they will be trustworthy, or agents of a favorable "type" (Hazard and Singh 2010, 700). Someone with a less developed FB profile may appear less trustworthy, thus creating an incentive for individuals to more fully develop their FB profiles. Most participants in this study only used FB to advertise and reach out to people. For the few who also used other sites, most people found those sites unhelpful. Both sellers and buyers post online, and discussions between the two sides play out via direct messaging though FB. Trust is thus formed further during the communication process.

If two people trust each other more, they may be more likely to reveal private information (McCabe and Smith 1998). When this private information is revealed sooner, negotiators cooperate more (McCabe and Smith 1998) and may come to a more efficient price (Ausubel, Cramton, and Deneckere 2002). Other research also suggests efficiency is lost when trust is absent (Bülow 2011). For example, online negotiation can be a very turn-based process (especially over email) in which parties try to persuade one another rather than reveal interests, thus creating a less efficient form of communication (Bülow 2011). This need to persuade rather than reveal, as Bülow states in her paper, may be rooted in the perception that the opponent is more inflexible than they would have been in person (2011). In other words, online communication exacerbates reluctance to trust someone you have never met. For my study, there were a few participants who had at least some prior connection or similarity to the person they were negotiating with. For example, having gone to the same high school as the other person or vaguely knowing them in any way may produce "fewer refusals and more trade-offs and value-creating strategies" (Bülow 2011, 3). Roughly a quarter of participants reported issues with prospective buyers exiting negotiations without warning. In the context of social interaction, such a quick turn-around suggests the faceless nature of their communication makes rejection easier (Bülow 2011). In this paper, I briefly explore issues of trust, especially when reviewing participants' anecdotal responses.

I contacted participants individually based on their public FB posts made in various University of Maryland groups. These posts were meant to reach entire graduating classes. Since participants were promised compensation or a prize for their responses, this method of recruitment was chosen over mass-emailing. The concern was that those who are not subleasing would also respond

to the surveys to receive the compensation/prize. For three subleasing terms (Summer, Fall, Spring) I ask for negotiation descriptions, specific pricing, and important dates. To more thoroughly determine participants' success/failure, I followed up with participants later on if they did not make a deal at the time they completed the survey. Individuals were chosen randomly and their participation was dependent purely on their consent. The average rent normally paid by sellers was $919/month (N=45). The average price posted was a 7% reduction from an individual's normal rent, indicating sellers perceived the market was weak for them. In the end, 73% of people were able to find a deal before their sublease term started (N=44). For people who made a deal, the average agreed upon price was a 12.5% reduction from their original rent (N=32). If we count people who did not make a deal as receiving a final price of $0/month, the average final price is 40% below rent (N=45). Additionally, the average amount of time spent searching for a deal was 50 days (N=44, SD=50). People posted on average once every five days during their search process (N=44). I develop an indexed proxy for a "discount factor" by dividing price drop from rent by total search duration. This illustrates the average rate of change in price and acts as a measure of patience. I estimate the effect that time, patience, and other seller attributes have on relative success in the market, where success is defined as the final price a seller agrees on. The results show that posting frequency, patience, and time spent searching certainly have the greatest impact. If a seller posts an additional 0.10 times per day (half of one standard deviation), they are expected to find a deal that is $90 higher. Additionally, a 10 percentage point increase in patience, or lowering the price at a slower rate, can increase a seller's final price by more than $110. Lastly, for every additional day the seller spends searching for a deal, they are expected to find a deal that is $3 higher. Alternatively, I show the impact of these same variables on the percent reduction in rent. Finally, I present findings on other noteworthy relationships from the data.

While the design and analysis presented in this paper builds on existing research, this study also addresses the shortcomings of previous works. I model behavior based on an individual's utility breakdown, in line with similar models presented by Ausubel et al. (2002), Gantner (2008), and Hazard and Singh (2010). Additionally, based on this particular setup and existing works, I model the importance of outside options and information balance (Ausubel, Cramton, and Deneckere 2002; Gantner 2008; Harding, Knight, and Sirmans 2003; Hwang and Li 2017). However, unlike some of the models proposed in these existing works, I propose explicit, testable measures of patience based on price change and negotiation duration. I also assume homogenous goods while controlling for possible differences and use directly relevant methods for measuring valuation, relative success, and aggregate negotiation behavior. Many existing works use controlled experiments to study similar behavior (Bülow 2011; Stuhlmacher and Champagne 2000). Ausubel et al. state that experimental tests would allow for a constructed insight on the impact of private information on negotiation (2002); however, models and controlled experiments fail if good theoretical analysis proves contrary to real-world behavior. Although these controlled experiments provide a significant degree of control, many of them lack the realism of 1) actual time pressures, 2) significant monetary pressures, 3) outside negotiation options, and 4) market uncertainty. Additionally, the data collected for this paper provides explicit clarity on the assumptions made in most other empirical studies (Ausubel, Cramton, and Deneckere 2002). This paper presents novel data on the real-world behavior of a local, decentralized, online, informal marketplace. The results of this study should add to the existing body of knowledge by directly applying novel, observed data to theories on negotiation.

The rest of the paper is organized as follows. Section II describes the theoretical setup of the analysis. Section III then discusses data and results. Section IV concludes.

III. Theory

Game theorists and economists have developed bargaining models that reflect various time horizons, degrees of incomplete information, negotiation styles, etc. (Ausubel, Cramton, and Deneckere 2002; Gantner 2008; Hwang and Li 2017; Pan et al. 2013). The model proposed in this section incorporates variables specific to this study, though a generalized form could be applied to other bargaining models with similar circumstances (outside options, buyer/seller leverage imbalance, time constraints, concurrent negotiations, seller-first-mover assumption, and differing perceptions of market conditions). This modeling exercise first covers how an individual seller gauges his or her decisions (Sections II.A – II.D). Then, I cover estimation methods for a seller's relative performance in the sublease market (Sections II.E and II.F). In this section, I provide an overview of definitions, illustrate bargaining behavior, and describe how the modeling will be applied to empirical analysis.

A. Basic Definitions and Setup

The buyer is an individual who needs housing and seeks to sublease from someone who is currently under a lease. The seller is an individual who is currently under a lease, and seeks to sublease their unit to someone else. Although this paper focuses primarily on the seller, understanding the seller's decisions also depends on understanding the buyer's behavior. For two rounds of negotiation, where the seller makes the initial offer in round 1, and the buyer accepts or rejects the offer in round 2, the expected utilities for the buyer (B) and seller (S) are defined as

$$\begin{aligned} \mathrm{U_S} &= E\left[u\left(\delta_{\mathrm{S},p} d_{\mathrm{S}} + \delta_{\mathrm{S},x} d_{\mathrm{S},x} - \delta_{\mathrm{S},f} c - \delta_{\mathrm{S},k} c\right)\right] \\ \mathrm{U_B} &= E\left[u\left(\delta_{\mathrm{B},p} d_{\mathrm{B}} + \delta_{\mathrm{B},x} d_{\mathrm{B},x} + \delta_{\mathrm{B},f} d_f + \delta_{\mathrm{B},k} d_k\right)\right] \end{aligned} \tag{1}$$

or, more generally for *n* rounds of negotiation, the utility functions are

$$\begin{aligned} \mathrm{U_S} &= \sum_{n=1}^{t} E\left[u\left(d_{\mathrm{S}}, d_{\mathrm{S},x}, c, \delta_{\mathrm{S},p,n}, \delta_{\mathrm{S},x}, \delta_{\mathrm{S},f,n}, \delta_{\mathrm{S},k,n}\right)\right] \\ \mathrm{U_B} &= \sum_{n=2}^{t} E\left[u\left(d_{\mathrm{B}}, d_{\mathrm{B},x}, d_f, d_k, \delta_{\mathrm{B},p,n}, \delta_{\mathrm{B},x}, \delta_{\mathrm{B},f,n}, \delta_{\mathrm{B},k,n}\right)\right] \end{aligned} \tag{2}$$

where the buyer's and seller's expected utility is a function of four discount factors. These discount factors reflect respective patience levels and the perceived probability of certain outcomes. From the buyer's and seller's perspective, there are discount factors for the primary negotiation happening presently ($\delta_{p,n}$), for a back-and-forth negotiation that could continue to subsequent rounds (δ_x), for an unknown negotiation that could happen in the future ($\delta_{f,n}$), and for another negotiation happening concurrent to the primary negotiation ($\delta_{k,n}$). In this case, the seller's discount rates for

a buyer's outside option distribution ($\delta_{S,f,n}$, $\delta_{S,k,n}$) are similar to the probability q based on Gantner's work (2008). Only the buyer knows the real distribution of outside options. The cost of rent (c) is relevant only to the seller's utility function; a higher original rent (and higher probability of paying the entire rent, i.e., a 100% loss) decreases total utility for the seller. Utility is also a function of different payoff outcomes. The model includes a payoff outcome for the buyer (d_B) and seller (d_S) if their primary deal is reached, a payoff for a back-and-forth negotiation ($d_{B,x}, d_{S,x}$), a payoff for the buyer for a future deal (d_f), and another payoff for the buyer if they choose the concurrent deal (d_k). Due to the probabilistic nature of the discount factors (δ), which interact with the payoff outcomes (d), total utility is simply equal to expected utility over the course of the entire negotiation (Ausubel, Cramton, and Deneckere 2002). A decision tree showing these outcomes and their payoffs is shown in a later section. The concept behind each type of payoff is detailed below:

For the seller:

When n is odd, representing the seller's offer,
d_S = (current offer price $-$ rent) = $x_n - c$

When n is even, representing the buyer's counter offer,
$d_{S,x}$ = (anticipated counter offer in case of event CO (Counter Offer) – rent) = $x_{n+1} - c$

Where $x_{n+1} < x_n$ because if the buyer counters at $n + 1$, that offer will always be less than the seller's offer at n.

For the buyer:

When n is odd, representing the seller's offer

d_f = (future deal price – current offer price) = $\rho_\alpha - x_n$
d_k = (concurrent deal price – current offer price) = $\rho_z - x_n$
d_B = (current offer price – next best offer (weighted probability)) = $x_n - \bar{\rho}$

where

$$\bar{\rho} = \frac{(\delta_{B,f,n})\rho_\alpha + (\delta_{B,k,n})\rho_z}{\delta_{B,f,n} + \delta_{B,k,n}}$$

Additionally, where n is even (representing the buyer's counter offer) we have

$d_{B,x}$ = (B's counter offer – next best offer (weighted)) = $x_n - \bar{\rho}$

Based on these definitions, the seller's utility increases as d_S is maximized, and the buyer's utility increases as d_B is maximized. The total utility is based on each party's perception of what their utility will be after each round when they account for different variables. With each round that passes for the buyer and seller, this expectation changes; as the start time for the sublease term

nears, each party reassess the risks and rewards of their subsequent actions. As a result, the negotiation process is very haphazard and short-sighted, so the sum of each party's utilities over time has no immediately obvious convergence. If prices, and other information, were perfectly known to the buyer and seller in this marketplace, each could perfectly optimize their utilities in an inherently non-haphazard way. However, in this market, the going price may be vague. Qualitatively and quantitatively, this paper explores the severity of this vagueness and how it disrupts utility maximization.

B. The Discount Rate

The Counter Offer (CO) discount factor for the seller at the n^{th} round of the negotiation ($\delta_{S,x}$) is dependent on:

- ***Time***
  - As the start date of the sublease term nears, sellers may feel the pressure of time influence their patience. Individual's time pressure may be reflected in how early a seller starts looking for buyers, how long they wait to make a deal, and how close that deal was made to the start of the sublease term. Individuals also have an uncertain perception of the best time to begin searching and when they should make a deal.
- ***Number of Sellers vs. Number of Buyers***
  - Sellers may be intimidated by the appearance of more posts from other sellers. This perception, which may vary across individuals, is vague and may lead to heavy, unnecessary concessions.
- ***Friction in Finding Buyers***
  - The structural difficulty of finding buyers is vast. This difficulty could stem from the previous point (Number of Sellers vs. Buyers) as well as the general difficulty of finding a buyer through such a non-centralized market. Many sellers did not know where to find buyers, and thus tried posting on other portals and forums (usually unsuccessfully) to search for a buyer. Additionally, difficulty in matching with buyers is often tricky due to mismatches in specific needs/apartment features. For example, buyers sometimes want two bedrooms so they can sublease with a friend, while sellers will only have one available. Or, a seller may only be comfortable subleasing to someone of the same gender, thus forcing them to reject some buyers and vice versa. Another important issue is pricing; many sellers base their prices on what other sellers post, creating somewhat vague and confused pricing that could require extensive negotiation.
- ***The Seller's Income***
  - Sellers with higher income may be more comfortable making larger concessions because they place more value on simply making a deal sooner. These people might also post later and less frequently.
- ***Reason for Subleasing***
  - More urgent or definitive reasons for subleasing, such as transferring or starting a job/internship, may reduce patience.
- ***Minimum Willingness to Sell***

  - A seller's initial minimum willingness to sell could help reflect a general attitude on stubbornness – or patience. A higher minimum price could indicate greater patience, or greater willingness to wait for a better deal.
- ***Seller's Rent***
  - How much a seller may lose relative to their rent may impact their patience in finding a deal. The rent may also restrict how low a seller is willing to go.
- ***Tenant Friction***
  - Whether or not the property owner/management makes subleasing more or less difficult may impact a person's ability to negotiate a sublease. For example, one complex called "Commons" has subleasing restrictions that make subleasing inflexible and difficult in many cases.
- ***Distance from Home***
  - Being further from home may increase the urgency of needing to ensure a sublease is sorted out, especially if going home depends on plane tickets, train tickets, etc. This is similar to the "Reason for Subleasing" variable.
- ***Buyer Uncertainty***
  - Many sellers had difficulty trusting that buyers would follow through on commitments. Buyers are apprehensive, exit negotiations very suddenly, renege on unofficial agreements, or make strange requests regarding payment (e.g., paying lease difference upfront). There is also general risk with subleasing from a complete stranger, especially if it is done under the table.

These influencing factors are defined primarily to illustrate buyer behavior; however, the main focus of this analysis is on the CO discount rate.

C. Decision-Making and Modeling Behavior

The bargaining process is discrete (rounds of negotiation) and finite (deadlines). Based on the observed behavior in this study, the proposed model assumes the seller makes the first offer (via the initial online post). This assumption is realistic in proposing a generalized model because seller-first-mover circumstances are common in many bargaining situations (Ausubel, Cramton, and Deneckere 2002), including the setup observed in this paper.

Another important assumption I make is that buyers' prices reflect their valuation of apartments and that apartments are generally homogenous goods. These assumptions are reflected in the model's use of price to gauge value and other controls used in the analysis. Many studies will use v to denote the buyer's and seller's valuation of heterogeneous goods (Ausubel, Cramton, and Deneckere 2002; Gantner 2008; Hwang and Li 2017; Pan et al. 2013); however, in this paper, I use actual prices to simplify analysis and increase the practicality of applying the model directly to data.

When a buyer contacts a seller (or vice versa) the buyer typically receives the first offer. Upon seeing this offer, the buyer will either accept the offer (A), reject the offer and completely exit the negotiation for the chance to find a better deal in the future (R_f), reject the offer for a different, better deal they were negotiating concurrently (R_k), or continue the negotiation by making a counter offer (CO). Once the negotiation continues via the CO path, the buyer may repeatedly balance concurrent negotiations each round while the primary negotiation is taking place. Thus, a buyer's decision to choose either A, R_f, R_k, or CO depends on the next best offer they could get

from someone else, either concretely or speculatively. Always, each party's judgments are fuzzy – no one knows for certain what their eventual payoff will be or if that payoff will be better than an alternative.

Below is a decision tree (Figure I) that illustrates the first round of negotiation, how the buyer's decision is relative to alternative outcomes, and the risks of success associated with each of those alternative outcomes. The "B" and "S" subscripts are implied for many of the discount factors depending on whose perspective you are viewing. The seller first advertises their offer of x for the first round (n = 1) to which the buyer must respond in one of four ways in the second round (n = 2):

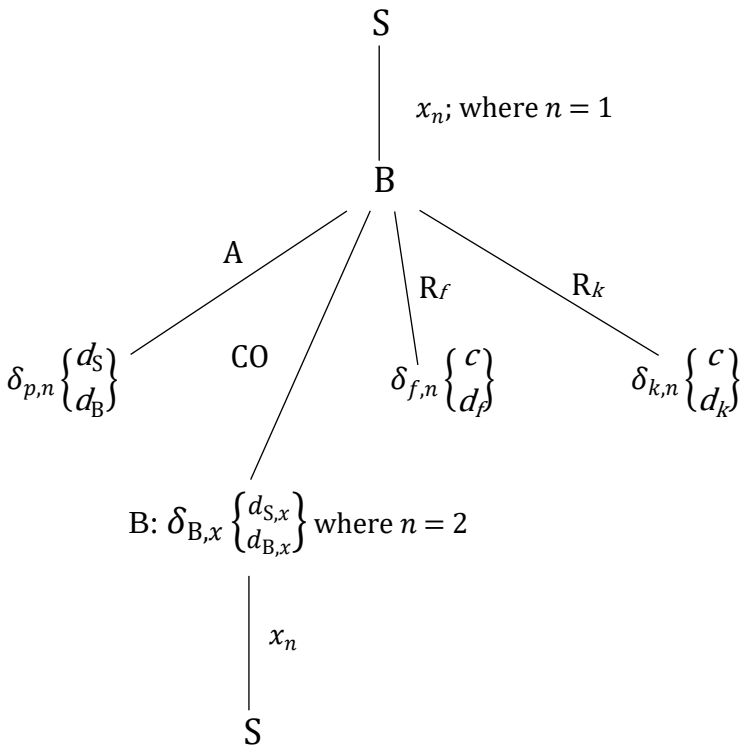


Figure I – Decision tree showing when the seller makes a public post in round n = 1, and the buyer must then respond in round n = 2. The buyer can choose to reject the seller's offer and exit negotiation with this seller. The buyer can also accept the seller's deal, ending both party's search efforts. Lastly, the buyer could propose a counter offer.

With this visual of the different possible outcomes and their respective discount factors, B will choose a rejection route if, at the n^{th} round,

$$\delta_{B,f,n} d_f > \delta_{B,p,n} d_B \text{ or } \delta_{B,k,n} d_k > \delta_{B,p,n} d_B$$

The CO path means that B makes a counter offer of x_n in the n^{th} round. This value then becomes the new x offer calculated in the buyer's utility in (2). Most existing literature view the counter offer as $1-x$, where each party in the negotiation is trying to split the same pie of 1.

(Ausubel, Cramton, and Deneckere 2002; Hwang and Li 2017). However, for the purpose of analyzing a less generalized situation, I use more concrete definitions for different payoffs. In other words, the total value of the "pie" does not equal some objectively complete value; rather, this total value is always different depending on individual price differences. These relative pricing relationships are difficult to gauge due to the negotiation's fluid characteristics.

D. Utility

There should still be a more applicable way to show how the buyer and seller decide which path to choose at each round. This illustration also demonstrates the fluidity of the bargaining process (Gantner 2008).

Referring to (2), each person's cumulative utility increases (or becomes more negative) with each round that passes where no deal is made, that is, until a maximum is reached. Following the CO path, the buyer will accept a seller's counter offer when the buyer's utility is maximized unless the seller has already accepted one of the buyer's lower offers (at probability $\delta_{\mathrm{B},x}$),

$$\mathrm{U}_{\mathrm{B}}^{*}= \max\left\{\sum_{n=1}^{\mathrm{N}} E(u_n)\right\} \tag{3}$$

Given the buyer has had no better alternatives up to this final round, N, and given the seller does not accept the buyer's final counter offer, the buyer accepts the seller's counter offer in round N+1 because any further negotiation will reduce the buyer's total utility. The increased risk of not finding a better deal, combined with a shrinking surplus from continued delay, drags down the buyer's changes in cumulative utility ($E(u_n)$) after this point. This fluctuating marginal utility becomes the main focus for the buyer, who best understands his position from a cumulative-utility perspective. If the seller does not accept the buyer's counter offer at $\mathrm{U}_{\mathrm{B}}^{*}$, the buyer will settle for the seller's previous offer at N – 1.

In understanding how this maximum occurs, I assume following:

> **A1**: the probability of the seller's acceptance from the buyer's perspective ($\delta_{\mathrm{B},x}$) increases as the buyer increases his offering price.
>
> **A2**: as n increases, the buyer feels the probability of finding a better deal ($\delta_{\mathrm{B},f,n}$), or discount factor, begin to fall; this could be due to time pressure, fewer sellers in the market, or other factors.
>
> **A3**: the discount factor for the R_k path ($\delta_{\mathrm{B},k}$) is constant. The n subscript is therefore dropped because the discount factor is not related to the round.

The payoffs are calculated each round as relative differences between offers. Knowing the immediate direction of utility allows the buyer to maximize utility. Although expected utility fluctuates each round, the buyer has some idea whether there will be a more permanent decrease after each round. In the case where the seller rejects the buyer's offer while $\mathrm{U}_{\mathrm{B}} < \mathrm{U}_{\mathrm{B}}^{*}$, the buyer will always counter offer. In the case where the seller rejects the buyer's offer and $\mathrm{U}_{\mathrm{B}} <$

$U_B^* \mid E[u(R_k)] > E[u(CO)]$, the buyer will seek the R_k path, counter offering with this new k person and thus repeating the process. Assumptions A1-A3 are very important since each round could yield different probabilities based on the buyer's changing perceptions. For example, discount factors could theoretically be constant or changing linearly. Establishing predictability is helpful for demonstrative purposes, though this setup does not completely reflect the reality. In reality, the buyer's gauge for risk may change as he cycles through more offers over time.

To demonstrate how variability of discount factors can affect utility for each round, I relax assumption A3 by making $\delta_{B,k,n}$ change linearly or variably. If the buyer can predict his utility levels for at least two rounds ahead, he should know he has passed his maximum utility regardless of the $\delta_{B,k,n}$ discount behavior. This will happen when the buyer realizes ex post that

$$\sum_{n=1}^{N+2} E(u_n) < \sum_{n=1}^{N} E(u_n) \tag{4}$$

The intuition is that, since changes in utility predictably increase and decrease each round, the buyer will know he passed his maximum utility at N+2 because this is when the alternation reveals its new (decreasing) direction. In other words, the rounds of smaller increases outpace the rounds of larger increases at this point.

For the seller, there exists a similar setup. However, since I assume the buyer has a stronger ability to juggle outside options than the seller does, the seller views her own discount factors as the probability of the *buyer* reaching a given outcome ($\delta_{R,n}$), similar to Gantner's setup (2008). As a result, the seller must accept the buyer's complete or conditional rejection as a loss equal to her rent (c). The seller must then make her initial posting price and counter offers based on the risk of losing her whole rent.

E. Model Application: Discount Proxy

To directly apply the model to the data, we can use a proxy for the seller's discount rate. Since discount rate represents patience, or the probability of moving to the next round of negotiation (Ausubel, Cramton, and Deneckere 2002; Gantner 2008; Pan et al. 2013), I look at the amount of price drop per day of deal-searching (Hazard and Singh 2010). Conceptually, this is the average dollars that price drops below rent per day spent searching for a deal. The lower the final price (numerator), the less patient the seller is, since the seller is would rather take a greater loss in exchange for a quicker deal. Likewise, the more time spent searching (denominator), the more patient a seller is. The resultant values for each individual are then indexed between 0 and 1, where values closer to 1 indicate greater patience. The proxy (5) is shown below:

$$\delta_{S,\text{proxy}} = Actual = \text{ODFI (Observed Discount Factor Index)}$$
$$= \frac{-\$(rent - final\ rate)_i}{days(first\ post\ date - end\ of\ search\ date)_i} \tag{5}$$

When the observed difference between rent and the final agreed upon rate becomes more negative in the numerator (or as the agreed upon rate falls further below the seller's rent, causing the seller to lose more money), the total discount proxy value decreases, thus indicating less patience reflected by a greater proclivity to lower the price. Additionally, as the amount of time spent making a deal increases, or the higher the denominator is, the proxy also increases. Figure II below shows the relationship between minimum willingness to sell and *ODFI*. If a seller's minimum price is higher, this may indicate a greater willingness to wait for a better deal.

Figure II– Best fit lines drawn in red. This relationship is significant ($p<0.05$) and represents a slight correlation whereby a $100 greater minimum price represents a 0.04 increase in the ODFI. After dropping an outlier, the relationship is reduced to 0.03 ($p<0.05$).

F. Modeling Relative Performance

How efficient was the sublease market? Did sellers get the best deals possible with the given conditions of the market? How much did sellers lose? To answer these questions, I estimate the following extended model:

$$FINAL_i = \beta_1 POSTPRICE_i + \beta_2 TERM_i + \beta_3 POSTFREQ_i + \beta_4 REASON_i + \beta_5 ISSUE_i + \beta_6 INCOME + \beta_7 SEARCH_i + \beta_8 COMPLEX + \epsilon_i \quad (6)$$

FINAL is the monthly rate sellers agreed to sublease their apartments. If no deal was made, *FINAL* is equal to 0. *POSTPRICE* is the price seller's first posted when advertising for their apartments. *TERM* is a dummy for the sublease term, equal to 1 if subleased for the Spring and equal to 0 if subleasing for Summer (or Fall). *POSTFREQ* is how many times sellers posted per day of searching. *REASON* is a dummy for the reason the seller is subleasing their apartment (e.g., studying abroad, starting a job somewhere else, etc.). *ISSUE* is a dummy that refers to commonly reported problems when trying to reach find/make a deal. *INCOME* is a dummy equal to 1 if the seller's household income is $120,000 or above. *SEARCH* indicates time spent (in days) searching for a deal. This variable assumes that the date of the first post is when searching begins, and, for those who made a deal, the end date is when the deal was made. For those who never made a deal, the end date for searching is when the sublease was suppose to start. *COMPLEX* is the apartment building of the sublease.

IV. Results

This section details data collection methods, provides an overview of qualitative responses, summarizes quantitative data characteristics, and presents the paper's main findings. The end of the section touches on additional relationships and analysis.

A. Collection Methodology

The data was gathered via surveys and questionnaires. There were three subleasing terms: Summer, Fall, and Spring. The "Summer" and "Spring" groups made up the bulk of the observations, therefore I later discuss in detail only these two groups. Responses were gathered online from direct contact based on public Facebook (FB) postings.

There are several FB "pages" and "groups" in which people can use their FB profiles to post advertisements for their sublease. When posting, one can easily click on the poster's name and view their profile. There is generally a group/page for each University of Maryland graduating class (e.g., there is a page titled "University of Maryland Class of 2020" and similar groups for different years). These groups therefore contain thousands of students who may be notified of new posts in the group. There is also a group specifically for students trying to sublease their apartments in College Park/University of Maryland (titled "University of Maryland, College Park (UMD) Housing, Sublets & Roommates"). Sellers and buyers both post in these groups, where sellers publically indicate – with various degrees of transparency – what they have to offer, and buyers respond privately by indicating their basic housing needs.

Posts vary significantly; sellers advertise for housing near or far from campus, at high or low prices, for graduates or undergraduates, with shared or private bathrooms, with or without random roommates, for different lease durations, with included perks (like a parking pass, for example), for Greek houses, regular off-campus houses, private apartments, semi-private apartments (e.g., Commons are "apartments" but are owned by the school and have RAs), and more. Since my research looks at just apartments, I contacted people one by one and requested their participation in my research.

I checked several groups almost every day for months before the sublease start date, saving posts that matched what I needed for the study so I would have a better spread of people who posted early and those who posted at the last second. This spread reached as early as possible, at a point when there was virtually no one posting for that term. Then, I reached out to every poster by

directly messaging them my need for participants. I continued to contact more people until a couple of weeks before the start date for the Summer group, and up until a week past the start date for the Spring group. Most ignored me or never read my messages; however, out of the hundreds of people I contacted, 45 of these people agreed to the study. Based on the number of individuals who posted (and were contacted), the yearly market size is in the couple hundreds; however, this estimation is very rough and is purely based on the number of FB posts I could observe. Additionally, many people do not post in the FB groups, instead opting to use non-university affiliated websites or pages, like Uloop, Craigslist.com, etc. The true market size is far larger than what is reflected by FB posts, and even greater when including other types of subleases, such as off-campus houses. There is an important difference between the Summer and Spring groups in terms of data collection.

For the Summer group, I contacted all participants within the span of a few weeks, then sent out a new survey each week to track the progress of their negotiations based on price changes, reported difficulties, new minimum willingness prices, contacts with buyers, if/when they reached a deal, and for how much was the deal. If they reached a deal, they would no longer receive the weekly follow up surveys. The weekly surveys stopped for everyone several days after the expected start date of the Summer term (when Summer classes officially started). Those remaining are considered to have failed finding a deal on time.

For the Spring group, I contacted old posters and new posters over the span of the final few weeks leading up until the Spring start date (when Spring semester begins). This is similar to the Summer group, however, I did not ask for weekly follow up surveys, only for negotiation descriptions and final price data at that point. As a result, I did not get as detailed a picture of negotiation behavior over time as I did for the Summer group. There was then a problem regarding survey completion date and whether or not a deal was made: some participants completed the survey weeks before they may have struck deal. To fix this, several weeks later (after that group's sublease start date) I contacted those who stated they did not have a deal when they completed the survey. Some of them had indeed found a deal since the survey, while others had not. I compiled the results for the Summer and Spring for an appropriate analysis of all the data. The aggregated data is compatible and reflects the same interpretation.

B. Anecdotal Responses

Presenting descriptive responses frames these results with a more personable insight on negotiation behavior. These responses also helped guide model-building ex post. In the Appendix, these stories make clear that an enormous degree of advertising, searching, and negotiation takes place for many people; subleasing requires effort, effort that ultimately results in rejection much of the time. The back-and-forth communication, along with occasionally strange concessions/perks, is substantial in terms of time, energy, and value. Aside from the fact that there were clearly more sellers than buyers, many people reported difficulty in gauging the market. Participants often think other apartments are selling for cheaper, so they lower their prices — though, no one really knows for certain. Additionally, these people are impacted by time pressure, gradually lowering their price the longer they cannot secure a deal. Interestingly, many of the people who perceived to be out of time and out of options were actually very early in the process. Trust was also a common theme, where people who knew each other had a more pleasant experience than people who were suspicious or needed extra assurance. Friction in the system due to subleasing terms and apartment rules also adds to many people's efforts. These stories highlight interesting factors in negotiation: ability,

ambition, trust, and match-making. Exerting so much effort stems from a vague and inefficient match-making system. Details of individual anecdotes is presented in the Appendix.

C. Summary Statistics

In this subsection is a summary of descriptive responses (Table I). The summary generalizes responses for ease of aggregation, though each response was consistent and therefore fit the assigned categories very well.

Table I – Participant Characteristics

Item	Value	*N*
Male	40%	45
Reached a deal before the sublease start date	72.70%	44
Subleasing for the Spring Term	53%	45
Subleasing for the Summer Term	42%	45
People Who used an Outside Website to Assist (Other than Facebook)	34.10%	44
Percent with High Income ($120,000 or above)	57.10%	42
People Who Found Outside Websites Helpful	30%	10
Average Distance between School and Home	100.5 mins (143.9)	44
Expected Graduation Year		
2018	17.80%	45
2019	40%	45
2020	40%	45
2021	0%	45
2022	2.20%	45
Housing Costs Paid for By:		
Parents/legal guardian only	64.40%	45
The participant only	17.80%	45
Split between parents and the participate	17.80%	45

Item	Value	*N*
Reported Reason(s) for Subleasing		
1. Going to live at home	33.33%	45
2. Moving for a job/internship elsewhere	22.22%	45
3. Study Abroad	15.56%	45
4. Generally moving to live somewhere else (Greek house, etc.)	15.56%	45
6. Roommate Issues	13.33%	45
7. Moving to live somewhere cheaper	11.11%	45
8. Graduating early/late	6.67%	45
Reported Issue(s) in the Subleasing Process		
1. Price Disagreement	36.80%	38
2. Sublease Term Mismatch	31.60%	38
3. Friction with Tenant restrictions	31.60%	38
4. Buyers suddenly exiting negotiation	29.00%	38
5. Gender Mismatch	18.40%	38
6. General Compatability Issues	18.40%	38
7. Difficulty in navigating the sublease market	18.40%	38
8. Wanting to Live with Friend	13.20%	38
9. Time Pressure	10.50%	38
10. Graduate/undergraduate Mismatch	5.30%	38

Below are definitions for “Reported Issues” 1-10, as shown in Table I:

1. Encountered significant disagreements over pricing.
2. People needed the sublease for more or less time than what was offered.
3. Strict constraints on subleasing rules and timelines; general difficulties stemming from the tenant.
4. Buyers were engaged in negotiation but would suddenly stop responding without any reason. Some would exit after saying they suddenly did not have enough money to cover the price. Others left because they found a better deal.
5. Seller was could only sublease to a certain gender and had to reject buyers of the opposite gender, or vice versa.

6. Buyers preferred a better location, access to parking, private bathroom.
7. People in this category reported difficulty finding buyers, knowing where to look for buyers, and meeting specific buyer needs. Others stated their entry to the market was late (even though they were earlier than average, in some cases) and thought they had little time remaining to find someone. Many reported they were intimidated by the volume of seller postings on FB, which left participants with a feeling of hopelessness. Lastly, some stated they had difficulty in gauging the going price, and therefore were very uncertain in setting their own posting price.
8. Buyers needed two rooms when the seller only had one available. This was common because many buyers want to live with someone they know, and hope they can find a better deal by essentially 'buying in bulk.'
9. These sellers felt like they were low on time to make a deal.
10. Some apartments only allowed undergraduates (Commons), and this policy disrupted efforts for sellers who were contacted by graduates or non-UMD students.

Additionally, Table II below provides a brief summary of price data.

Table II – Participant Pricing Characteristics

Item	Value	*N*
Average Rent Paid by Seller	$919 (139)	45
Average Initial Advertised Price	$852 (176)	44
Average Final Price Reached, excluding "no deal"	$808 (202)	32
Average Final Price Reached, where "no deal" equals 0	$587 (402)	44
Average Minimum Willingness to Sell	$781 (176)	45
Average Duration of Search Process	50.4 days (57.8)	44
Average Number of Posts by Seller	6.2 posts (8.1)	44
Days between Search Start and Sublease Start (How early posts were made)	67.5 days (49.3)	44
Percent of People who Subleased for their Initial Advertised Price	40.90%	44
Percent of People who Experienced Loss	62.70%	43

Many items have an *N* that is less than the total number of participants (*N*=45) because some people did not respond to certain questions. In other cases, outliers were identified and therefore dropped.

D. Data

The data illustrates several initial characteristics of this sublease market. Figure III (a) illustrates how certain people first posted starting at a reasonable maximum – their normal rental price. Yet, many people made their very first offer below their rent. These people thought that, before negotiating with anyone, they were wiser to advertise a lower price. This behavior may stem from the seller wanting to make a deal quicker, or these sellers believed they had no choice but to lower their price because there were so many other sellers in the market. As is shown in the following section, neither belief turns out to be particularly true.

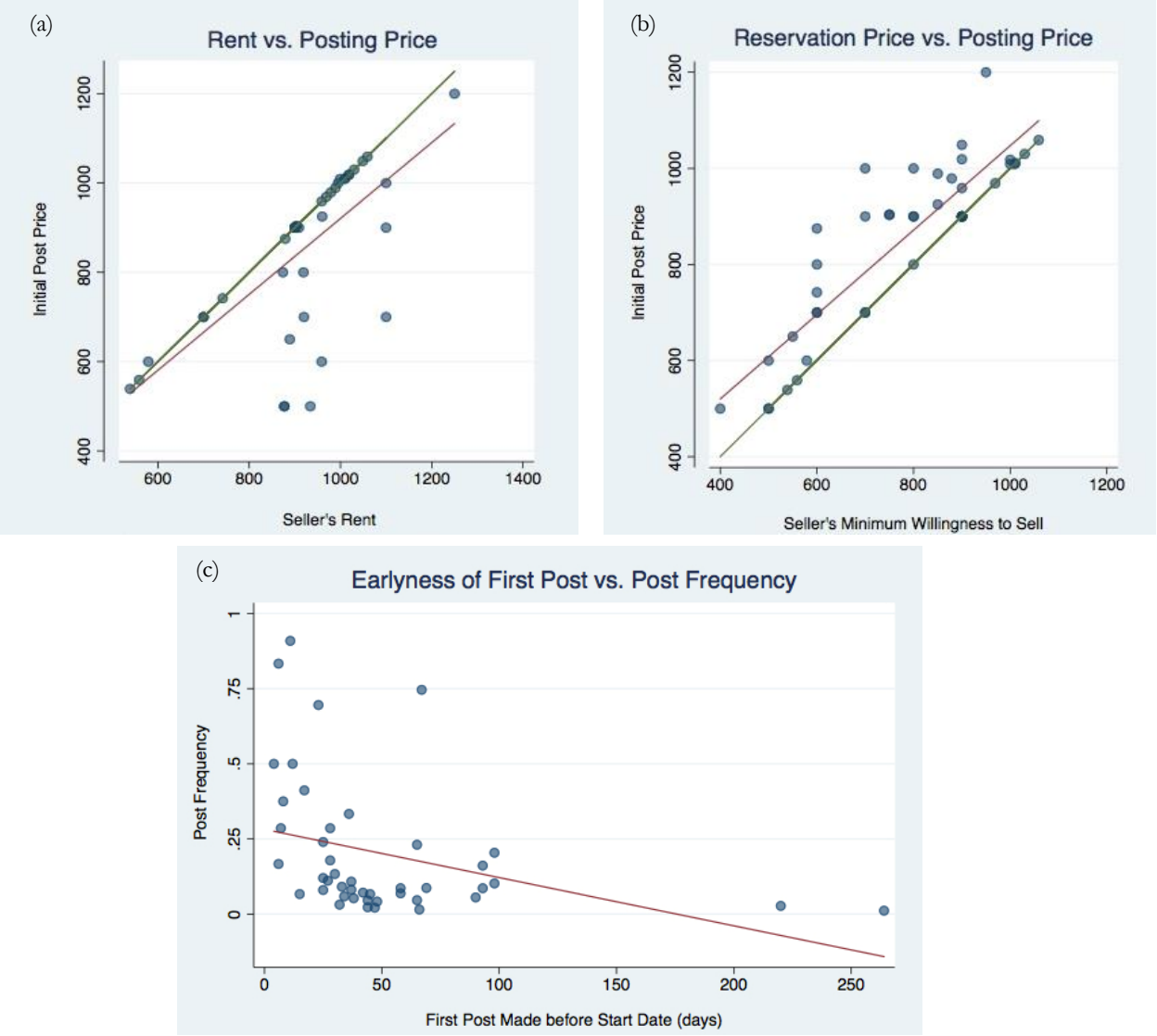


Figure III– Best fit lines are drawn in red, 45-degree lines are drawn in green. Panel (a) shows how many people posted starting at their rent (points on the 45 line), though many posted below. This immediate deviation from rent is greater when the rent is pricier, implying higher prices are perceived as less desirable past a certain point. In (b) a seller will start by posting their absolute minimum much of the time (points on the 45 line), though many post above, hoping to start high and negotiate somewhere in the middle. Panel (c) shows how those who posted earlier posted slightly less frequently, suggesting there may have been a rush to find a buyer for people who gave themselves less time to search.

On the other hand, panel (b) shows that many sellers post at their reservation price, the lowest they would be willing to go. Since many sellers ultimately make a deal below their stated reservation price, this term does not prove completely legitimate per the reality; however, it certainly provides an interesting insight on seller behavior. Most people posted above their reservation price. Panel (c) then shows a slight relationship between post frequency and how early sellers first started searching. Those who started searching earlier tended to post less frequency. This relationship may suggest that those who posted later were in a greater rush, and thus posted more frequently.

Figure IV below illustrates the location and data make-up of each apartment complex. Every apartment is located just along the University of Maryland boundary, lying just within or outside of the campus.

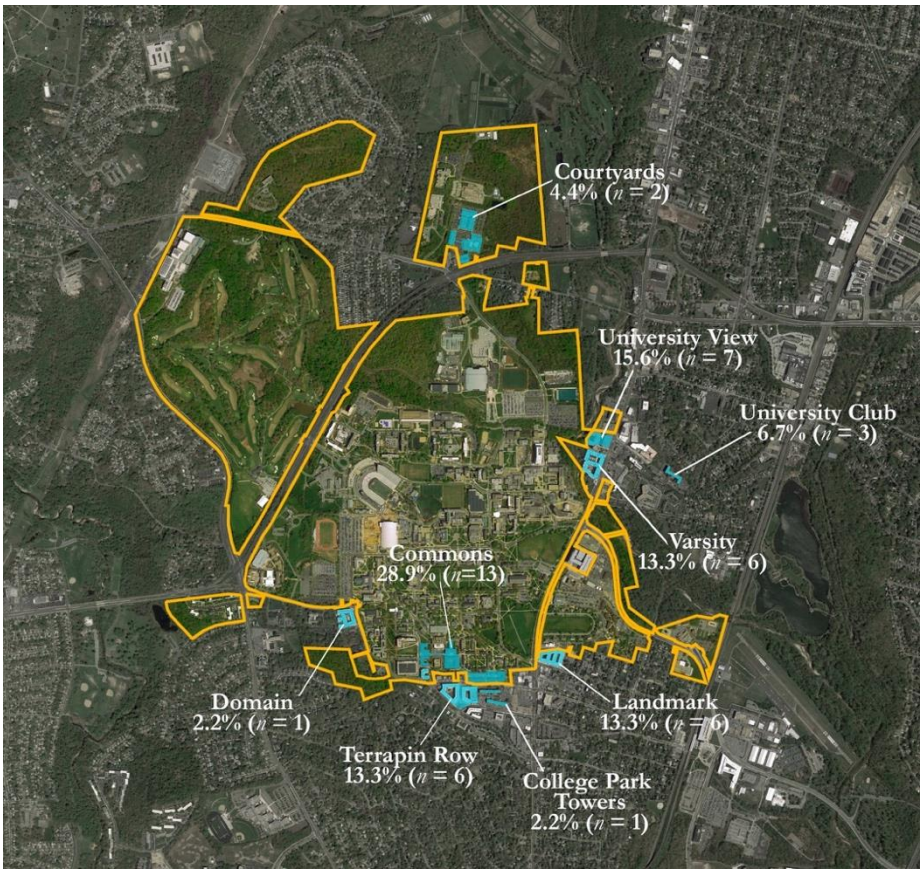


Figure IV – This image shows the University of Maryland boundary (in yellow). Shaded in light blue are the different apartment buildings participants subleased, along with the frequency of each location in the data. "Commons" was by far the most frequently subleased (it also houses the most students). All apartments are on the periphery of the campus boundary or just within it. They are also similar distances to the center of campus.

E. Main Findings

First I estimate (7) in Table III. Many of the terms in (7) are not significant and are therefore dropped from the estimation. In model (1), the results of *REASONS* for subleasing are just above the 10% significance level, so they are dropped in the remaining estimations. Post frequency and search duration are highly significant in all models. For reference, the average post frequency is 0.20 posts per day of searching (s.d. = 0.23). In model (3), if a seller posts an additional 0.10 times per day (half of one standard deviation), they are expected to find a deal that is $90 higher. Additionally, for every additional day the seller spends searching for a deal, they are expected to find a deal that is $3 higher. Although this result may seem small, the average search duration is 50 days. If someone spends an additional 25 days searching for a deal (half of one standard deviation), they would reach a deal that is $75 greater. In this model rent is controlled for to make sure the seller's performance (and the resulting market price) is not skewed by the initial value of the apartment. In other words, including *RENT* ensures that more expensive rent is not the only reason for a higher final price. Controlling for apartment type may also illustrate the role of an apartment's quality or distance to campus (or other appealing characteristics for a buyer). A specific amenity that is often mentioned is the presence of a shared or private bathroom. Table III also shows how having a private bathroom may increase the final price by at least $250 ($p = 0.087$) compared with having a shared bathroom. Rent is controlled for in these estimations because sellers with a private bathroom have a much higher rent. The average original rent for rooms with a private bathroom ($n = 22$) is $163 dollars (19.4%) higher than rooms with shared bathrooms ($n = 23$). The impact on final price must come from a greater subleasing demand for that specific feature, not the inherently higher rent these rooms already have.

Table III – Impact on the final price (Search Duration)

	Agreed Upon Final Price			
	(1)	(2)	(3)	(4)
Post Frequency (posts/day)	769.1**	903.3***	937.7***	928.6***
	(288.10)	(238.60)	(248.60)	(242.20)
Search Duration	2.245*	3.089***	2.670**	3.005**
	(1.24)	(1.11)	(1.13)	(1.12)
Reason: Going home	-248.3*	—	—	—
	(131.60)	—	—	—
Reason: Job/internship elsewhere	-271.8*	—	—	—
	(137.60)	—	—	—
Reason: Trying to save money	-379.0*	—	—	—
	(194.00)	—	—	—
Commons Apartment	323.5**	332.2**	209.3*	309.7**
	(134.90)	(124.20)	(117.90)	(128.30)
Private Bathroom	273.7*	319.8***	—	251.0*
	(143.10)	(109.70)	—	(142.80)
Rent	0.731	—	0.895**	0.363
	(0.51)	—	(0.38)	(0.48)
Observations	44	44	44	44
R-squared	0.513	0.38	0.34	0.39
Adjusted R-squared	0.346	0.317	0.272	0.309

Notes: ***p < 0.01, **p < 0.05, *p < 0.10. Standard errors shown in parenthesis. *Search Duration* is time elapsed between date of first post and date deal was made. If no deal were made, it is the time between first post and sublease start date. *Private Bathroom* is a dummy indicating if the seller had a private bathroom. The following dummy variables were included in the estimate for model (1) but are not shown due to their insignificance: *Reason: roomate issues, Reason: moving elsewhere,* and *Parent Pays.*

Table IV shows the same estimation but with the observed discount factor proxy (ODFI). "Search Duration" *(SEARCH)* is dropped because the term is directly used in calculating the discount proxy and would thus skew β_8.

Table IV – Impact on the final price (discount index – ODFI)

	Agreed Upon Final Price				
	(1)	(2)	(3)	(4)	(5)
ODFI	1460.3***	1285.8***	1264.6***	1070.1***	1091.9***
	(255.90)	(269.20)	(320.80)	(239.60)	(251.90)
Percent Post was Below Rent	1069.5**	—	—	—	—
	(420.10)	—	—	—	—
Spring Term	192.9*	181.3	180.7	—	—
	(109.50)	(118.30)	(136.00)	—	—
Seller-to-buyer frequency	-295.6**	—	—	—	—
	(111.20)	—	—	—	—
Overall Contact Frequency	294.8***	—	—	—	—
	(81.64)	—	—	—	—
Post Frequency (posts/day)	—	494.7**	452.2	374.2*	519.6**
	—	(219.00)	(270.80)	(207.90)	(203.70)
Private Bathroom	—	237.9**	—	281.2***	—
	—	(88.83)	—	(96.81)	—
Percent Minimum Willingness is below Rent	—	784.9*	652.6	—	—
	—	(395.20)	(454.70)	—	—
Rent	—	—	—	—	1.125***
	—	—	—	—	(0.31)
Observations	44	44	41	44	44
R-squared	0.561	0.534	0.457	0.508	0.586
Adjusted R-squared	0.504	0.473	0.342	0.458	0.543

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Standard errors shown in parenthesis. *ODFI* is the observed discount factor (index) calculated previously in the paper. It takes a value between 0 and 1, closer to 0 indicates less patience. *Percent Post Below Rent* is calculated as (Rent-Post)/Rent. *Sublease Term* is a dummy equal to 1 if subleasing for the Spring semester. *Seller-to-buyer Frequency* is calculated as the total number of times the seller reached out to a buyer, divided by search duration. *Percent Minimum Willingness is Below Rent* is calculated as (Rent-MinWill)/Rent. *Income* is a dummy variable equal to 1 if seller's household income is $120,000 or above. *Days Post Before Start Date* is how early the seller first posted (in days) before the sublease term was supposed to start. The following dummy variables were included in these estimates but are not shown due to their insignificance: *Terrapin Row Apartment, Parents Pay, Income* (model (3)), *Commons Apartment* (model (4)), and *Days Before Start Date* (model (5)).

For models (1) – (5) in Table IV, the main measure of patience used is *ODFI*, which shows that greater "patience" by lowering your price at a lower rate will yield a higher final price. Since

ODFI is a value between 0 and 1, a 10-percentage point increase in patience will increase a seller's final rate by more than $110. Neither the apartment complex nor subleasing term are significant.

Alternatively, Table V shows the impact on the percent reduction in final rate (from rent), rather than the nominal final rate.

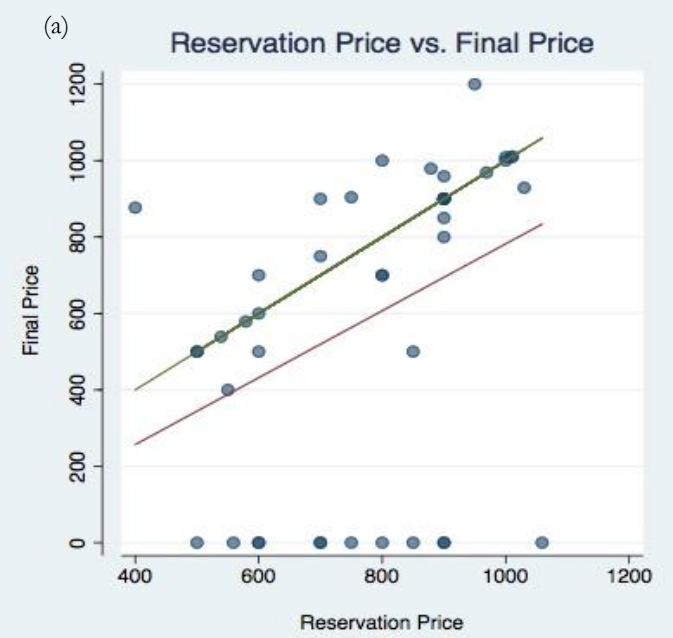
Table V – Impact on the final price (as a percent reduction of seller's rent, with and without ODFI or Search Duration)

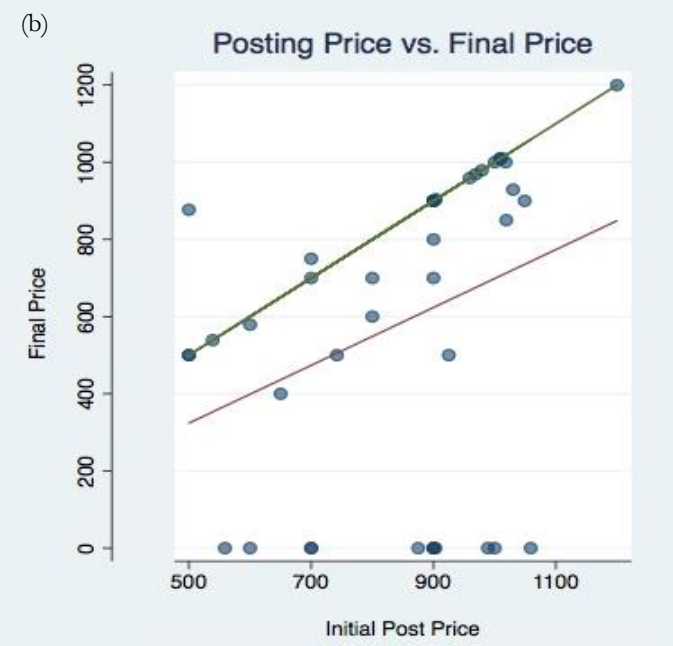
	Percent Reduction in Final Price from Rent (Rent-Final/Rent)				
	(1)	(2)	(3)	(4)	(5)
ODFI	-1.090***	-1.150***	—	—	—
	(0.31)	(0.25)	—	—	—
Post Frequency (posts/day)	-0.685**	-0.669***	-1.203**	-0.846***	-0.872***
	(0.28)	(0.22)	(0.47)	(0.28)	(0.28)
Domain Apartment	-0.624*	-0.595*	-0.341	—	—
	(0.35)	(0.33)	(0.70)	—	—
Rent	-0.000876**	-0.000798**	-0.000789	—	0.00027
	(0.00)	(0.00)	(0.00)	—	(0.00)
Percent Minimum Willingness is below Rent	0.321	—	1.244	0.659*	—
	(0.61)	—	(1.00)	(0.36)	—
Nominal Reservation Price	—	—	—	—	0.000813**
	—	—	—	—	(0.00)
Percent Post was Below Rent	-0.373	—	-0.53	—	—
	(0.69)	—	(1.04)	—	—
Search Duration	—	—	-0.00212	-0.00196	-0.00197
	—	—	(0.00)	(0.00)	(0.00)
Income	—	—	-0.181	—	—
	—	—	(0.21)	—	—
Male	—	—	-0.0889	—	—
	—	—	(0.14)	—	—
Observations	44	44	41	44	44
R-squared	0.543	0.525	0.537	0.322	0.348
Adjusted R-squared	0.439	0.476	0.194	0.271	0.281

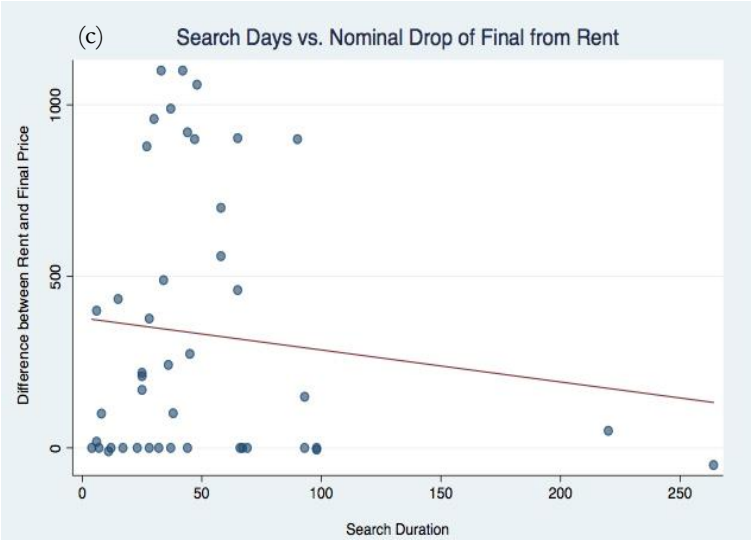
Notes: ***p < 0.01, **p < 0.05, *p < 0.10. Standard errors shown in parenthesis. Models (1) and (2) use *ODFI*, while (3) and (4) use *Search Duration* instead. This is because *ODFI* uses *Search Duration* in its calculation. The following dummy variables were included in these estimates but are not shown due to their insignificance: *Overall Contact Frequency, Reason: Study Abroad* (each in models (1) and (2)), *Spring Term, Year, Seller-to-Buyer Frequency, Parents Pay, Varsity Apartment, Terrapin Row Apartment, Courtyards Apartment* (model (2)).

Models (1) and (2) use the *ODFI* while models (3) – (5) use *SEARCH*. With an additional 1 percentage point of patience (*ODFI*), one could expect a final deal that is 1.1 percentage points closer (higher) to their original rent. Other variables — like income, if parents pay, seller contact effort — are not significant. In (4) and (5), there is an effect from a seller's minimum price, or reservation price; in (4), for each percent the reservation price falls below rent, the seller can expect a deal that is an additional 0.66 percent below their rent. Alternatively, in (5), for every 10 dollars the reservation price increases, the final price becomes 0.81 percentage points higher. Although this impact may seem small, a $100 increase in one's reservation price — a realistic increase from the mean — is associated with an 8.1 percent higher final price. This may imply that goals, expectations, or effort (also reflected by *POSTFREQ*) may impact a seller's eventual success. Since search duration in (4) and (5) is just below the 10% significance level and the coefficient is very small, it is not relevant. Posting frequency is again highly significant in all estimations.

Many of these results do not support previously discussed theories. Controlled experiments by Stuhlmacher and Champagne suggest time pressure forces larger concessions, especially from the weaker party (2002). However, the results presented above suggest waiting longer may yield a better deal for some people. A possible explanation for this difference is that Stuhlmacher and Champagne induce participants, no matter who they are, with time pressure (or the control). The impacts of time pressure in this paper's analysis emphasizes that certain participants *choose* to wait until the last moment. This choice may reflect a greater effort to find a better deal, which would result in a smaller concession and therefore higher final price later in the process. Additionally, in a marketplace with a widely understood time constraint, there may be a busier time in the market if many people happen to have the same preference of when to buy. If the market is flooded during these times, prices may be different, as shown in Figure V(e).


(a)
Reservation Price vs. Final Price
Final Price
0
200
400
600
800
1000
1200
400
600
800
1000
1200
Reservation Price


(b)
Posting Price vs. Final Price
Final Price
0
200
400
600
800
1000
1200
500
700
900
1100
Initial Post Price


(c)
Search Days vs. Nominal Drop of Final from Rent
Difference between Rent and Final Price
0
500
1000
0
50
100
150
200
250
Search Duration

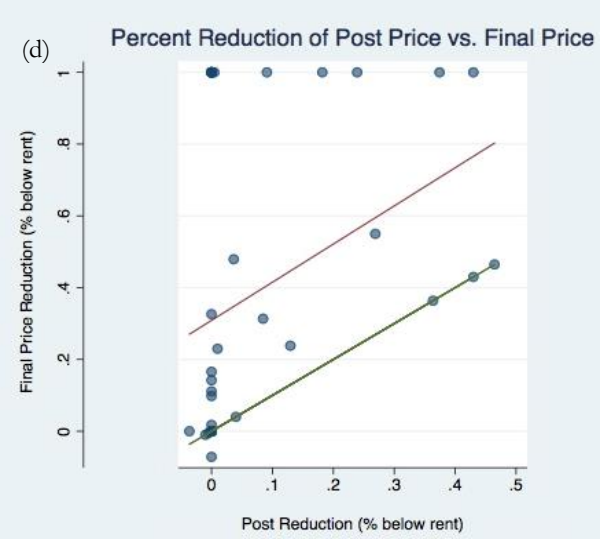

(d)
Percent Reduction of Post Price vs. Final Price
Final Price Reduction (% below rent)
0
.2
.4
.6
.8
1
0
.1
.2
.3
.4
.5
Post Reduction (% below rent)

Figure V – Best fit lines are drawn in red, 45 degree lines are drawn in green. Panel (a) shows the importance of a seller's reservation price and differences in ability: those with higher reservation prices received better deals, and some people received deals better than their reservation price. Excluding those who failed to make a deal (final price = 0), the final prices are close to the sellers' reservation prices. Panel (b) shows how higher posting prices relate to higher final prices. Sellers below the green line experienced some form of negotiation and/or concession. Panel (c) shows there is a weak relationship between just Search Duration and success. Panel (d) is similar to (b), though it shows post as a reduction of rent. The x-axis in panel (e) shows the number of days between the deal date (for those who did make a deal) and the start date of the sublease term. This is plotted against the percent reduction of the final price. This graph shows that people who made a deal extra early and very last second reached better deals than those who settled on a deal within the 15 to 30-day range.

Effort, in the form of post frequency, price resistance, and timing, does appear to have an impact. However, there are many caveats to this result. People who post more frequently have a higher chance of finding a better deal because they increase their chances of finding a "better" buyer. This result, however, may also reflect an overall greater ability from the seller, which may take other forms of effort not fully captured in this study. The variation in seller performance may also stem from availability of buyer's outside options and simple luck. For every person who posts early is a person who wants to secure housing early, and for every seller who waits until the last second is a buyer who scrambles for housing at the last second. Additionally, there are several possible sources of error from survey responses. For example, a seller may not truly care about subleasing, but decides to post in case they can find someone to agree to the rent price. This same person will not try very hard to find a deal, despite posting the rental price. These true intentions are very difficult to capture, especially with a limited sample size. Participants also answered with varying degrees of effort and thoroughness. Many sellers stated they made significant concessions for lease term flexibility or other perks, which is difficult to capture from the final price alone. The value of these concessions and perks is not fully captured in the pricing data. Although the survey did ask about seller's perks and other offers, these questions were not sufficient and were not phrased in an easily quantifiable and testable way. As a result, future studies would benefit greatly from an increased sample size and refined, more thorough survey methodology.

F. Additional Results

There is also some measurable impact on negotiation success and the probability of making a deal. Model (1) in Table VI shows the impact on the final price drop from the original posting price (as a percent of the post). Posting 0.10 times more frequently shrinks this percent reduction by 8.9 percentage points, meaning those who post more frequently tend to negotiate a final price closer to their original post. Search duration also has a slight impact, where each additional day of searching reduces the percent loss by 0.24 percentage points. Searching longer also yields a deal closer to the seller's original ask price.

Table VI – Impact on Negotiation from Post & Probability of a Deal

	(1) Percent Reduction from Post	(2) Pr(deal)
Post Frequency (posts/day)	-0.887***	0.924***
	(0.299)	(0.269)
Search Duration	-0.00242*	—
	(0.001)	—
Commons Apartment	-0.281*	—
	(0.143)	—
Days Posted Before Start Date	—	0.00316**
	—	(0.001)
Male	—	0.240*
	—	(0.121)
Observations	44.00	44.00
R-squared	0.23	0.304
Adjusted R-squared	0.172	0.252

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Standard errors shown in parenthesis. Model (1) shows the effect on the magnitude of how much the final price is below the post price (as percent of post). Model (2) shows the impact on the probablity of making a deal at all.

Model (2) shows the impact on the probability of making a deal. Compared with a total success rate of 73% for the entire population, model (2) shows that posting 0.10 times more frequently increases the probability of making a deal by 9.2 percentage points. Additionally, for each additional day earlier searching begins, the seller increases their chance of finding a deal by 0.31 percentage points (where the mean is 67 days early (s.d. = 43.3)). Searching longer and posting more frequently increases the chances of finding a deal. However, these people may generally just have more drive to find a deal, which may be reflected in other variables not collected in this study. These regressions are run with further controls for available variables; other possibly relevant variables are insignificant and therefore dropped. Interestingly, being male increases the chances of making a deal by 24 percentage points ($p = 0.053$).

An additional result worth observing is illustrated in Figure V(e) and Figure VI. Knowing that rent and sublease term may not inherently matter, how early or late a deal was made – relative to the sublease start date – may impact final price in a nonlinear fashion.

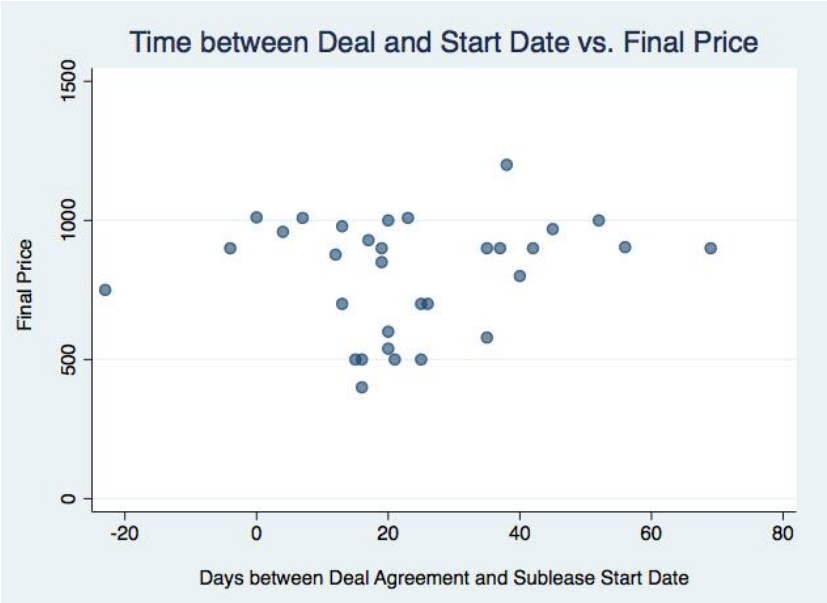


Figure VI –The x-axis in panel (e) shows the number of days between the deal date (for those who did make a deal) and the start date of the sublease term. This is plotted against the final price (n=32). This graph shows that people who made a deal early or last second reached deals better than those who settled on a deal within the 15-30 day range.

A deal made 13 days before the start date has an average price of $918 (s.d. = 89, n = 6), and a deal made more than 30 days before the start date averaged to $905 (s.d. = 155, n = 10). Deals made between 13 and 30 days (inclusive) were an average of $707 (s.d. = 210, n=16). For sellers who made a deal in this mid-range, the price was lower and had greater variance. A t-test comparing the two tail-end groups shows they are statistically equal to one another. Additionally, the two tail-end groups are statistically different from the mid-range group (p = 0.017 for the early range; p = 0.030 for the late range). This drop in prices at the mid-range is represented by the dip in data points in Figure VI. Lastly, the mid-range group is comprised primarily of Summer term subleases, thus blurring the idea that time alone is an important variable. However, since most regression analyses in the previous section shows that sublease term does not impact price, it may be reasonable to further rule out the summer term's relevance. There may have simply been a time (the mid-range period) during each subleasing season in which a) more sellers flooded the market at around the same time, and/or b) sellers collectively felt pressured to reach a deal.

G. "True Value"

Since there is loss of money, time, and energy associated with subleasing an apartment, these students must value their apartments at a price greater than their monthly rent. The following is a

simple breakdown in calculating the "true value" (TV) of an apartment based on the loss incurred and the sublease duration:

$$\text{TV} = \frac{Total\ Yearly\ Cost(Rent * 12)\ +\ (Monthly\ loss * Months\ of\ sublease)}{12}$$

This shows the total monthly cost a seller was originally willing to rent the apartment, and may reflect the added value for the flexibility to sublease if needed. For those who subleased for the Summer term, months of sublease is equal to two, otherwise this term is equal to 3.5. It is uncertain if the renter originally understood how difficult or easy it would be to sublease later on. As a result, this true value may also indicate uncertainty or risk. The average difference between rent and the TV is $71 (s.d. = 91), though this result varies greatly. Additional information on data characteristics and analysis is featured in the Appendix.

V. Conclusion

Selling or buying a sublease can be a vague process that therefore requires great effort. The sublease market is not very liquid, especially for transactions conducted under the table. If negotiation is present, there is some variance in pricing behavior. This paper explores differences in observed negotiation behavior based primarily on patience, effort, and trust. A variety of factors impact how sellers behave and the ultimate pricing they receive. Information asymmetry and the availability of outside options impacts how much (and what type of) effort sellers must exert to get a better deal. The results show that, even when controlling for rent, those who posted advertisements more frequently received higher final prices, a smaller price reduction from their original rent, and increased their probability of making a deal in time. Additionally, people who posted earlier increased their chances of making a deal on time. Results also show that people who spent more time searching for a deal settled on prices that were nearly $3 higher per additional day spent. Lastly, those who exhibited greater patience, or greater resistance to lower their price as time went on, also received higher final prices.

The results of this paper build on existing works by demonstrating the inefficiency of information asymmetry. This market would benefit from increased liquidity because then participants could put forth less effort. Such a system would build trust between participants, make ongoing pricing information more transparent, and consolidate listings more effectively. Someone with a less developed Facebook profile may appear less trustworthy, thus creating an incentive for individuals to more fully develop their Facebook profiles. Since Facebook has gained enough prominence for this marketplace to naturally form haphazardly, this Facebook-trust dynamic places the company in a unique opportunity to facilitate marketplace transactions for its own benefit. Future studies should explore in greater detail, and with a larger sample size, what influences seller behavior and why final prices differ from market prices.

Appendix A: Anecdotal Responses and Further Analysis

A1. Questionnaire and Survey Prompts

Regarding *descriptive* information, participants were asked to state:

- The reason(s) they were subleasing their apartments.
- For which term they were subleasing their apartment. In the data, I then imply the start date of the sublease term based on this response.
- Which apartment complex they were subleasing from.
- Their expected graduation year.
- The distance their permanent residence is from the school (minutes of driving).
- Who pays for their housing (parents, themselves, or both).
- Whether their bathroom is shared or private.
- The main obstacles they faced during the entire search/negotiation process and the reasons their past negotiations failed.
- Details and descriptions of exactly how their negotiations progressed. This includes specific information on back and forth offers for successful and unsuccessful negotiations. Participants were also asked to include dates and prices of counter offers.
- The websites they used (other than FB) to advertise and find buyers.

There were varying degrees of applicability and thoroughness for each person's responses. Regarding more *quantitative* information, participants were asked to state:

- The monthly rent they currently pay (excluding utilities).
- The minimum price they would be willing to sublease.
- The very first price for which they posted their apartment.
- The date they first posted for their apartment.
- The number of times they posted online.
- How many prospective buyers they reached out to.
- How many buyers reached out to them.
- The final price they agreed to sublease their unit for, given they made deal.
- The date this deal was reached.

As mentioned earlier, participants for the Summer term were asked some questions weekly, most notably what the going price was each week after they failed to secure a deal. Few participants (n = 10) mentioned whether outside websites they used were helpful or not.

A2. Anecdotal Evidence

Presenting descriptive responses frames this issue with a more personable insight on negotiation behavior. These responses can also help guide model-building ex post. The following points are some directly quoted responses about the issues people had and why they adjusted their prices:

1. "I said 1049 they could only do 900 and **I had no other options it was end of semester** so I agreed-December 13th"
2. "she asked for the lowest price, and I said $900, to which she countered $850. I accepted."
3. "**Many people needed a sublease that was longer than the end of July and also did not want to formally complete the sublease through Terrapin Row**. Additionally, on 5/8/2018 someone said that they found a better deal at The Varsity."
4. "I lowered [my price] because I realized no one is willing to pay the full prices, especially since there are better offers."
5. "The deal failed due to them wanting to sublease the apartment longer, which is not possible."
6. "The deal failed because I found out the next day that commons doesnt legally allow non-umd students to sublet. I told [the buyer] this. I didn't pursue this much further because I had other people who were also interested in my Facebook [private messages] already."
7. "April 21, 2018: One guy asked if I was still releasing and I said yes and gave the details and told him he only had to pay $1100 total for 6 weeks during the summer, which is all he wanted. He never complained about the price."
8. "For the very first price agreement I came to: All happened on March 26, 2018:
    a. Post was listed in Facebook group for 'around $800' for Commons 4 4x2 room
    b. Contacted by a law school student who did not attend UMD. He wanted to stay from early May, to end of August. I told him that May 19th was the earliest I could do and he said that was fine. He would live with his family in the area for the first few weeks of May.
    c. Back and forth questions 'is there a kitchen?', 'utilities?', 'metro and transportation to DC?', 'is parking included?'
    d. I told him all the information (yes kitchen, all utilities included, free shuttle from campus to metro...30 min metro ride into DC). Also told him parking wasn't included and that parking was $284 if you buy from university over the summer.
    e. He said that was fine. Then asked 'I noticed that you set the rent at 'around' $800. Is there some kind of variable to the rent?'
    f. I told him I payed $874 each month for rent. [The] building forces students to pay all year round and I wasn't living there in the summer so I didn't need the place. I also told him 'I don't expect you to pay the full $874 tho, I'm just looking to negotiate a price around $800 or so.'
    g. (I did not tell him that my parents actually pay my rent. Also worth noting that I didn't have much of an idea for how much commons summer leases go for besides the prices I saw other people post in the group. I just wanted to ease the financial burden on my parents. Might as well since I don't plan on living on campus for the summer)

   h. He said ‘I gotcha. I'm looking at another place that's $785 ish too. Is that within your ballpark?’ (Obviously seemed like a negotiation tactic but honestly, I was more than happy with this price)
   i. I said ‘I can consider $785’
   j. He then proceeded to ask me if he could use the university gym. I told him no, b/c hes not a student and I don't think they offer non-umd affiliate to become members
   k. Also asked me some questions about the shuttle bus route and frequency it comes. I gave him the [Department of Transportation Services] schedule.
   l. We then came to the agreement of $785/month for the 3 months of June July and August.
   m. I told him I would get back to him the next day on the whole re-leasing process (I didnt know how commons re-leasing worked at this point).”
9. “I lowered [my price] because I realized no one is willing to pay the full prices, especially since **there are better offers**.”
10. “I posted using the portal on southcampuscommons.com, and had one person reach out to me from there. The person who ended up taking the lease was from Facebook though.”
11. “On 12/23/18, he offered $750 per month, I countered with $800. He accepted. **It turned out that he was a grad student and couldn't live in commons anyways**. Aside from the person who is going to sublease my place, no one else who contacted me even got to the price negotiation stage.”
12. “**Actually finding people in the first place was hard, it took a lot of reposting on Facebook**. Then even the smallest things would turn people away once you were in contact with them. Someone asked about my roommates and when I said they were quiet, he just stopped responding, for example. The biggest issue is actually exclusive to Commons. You cannot sublease, only release. Most people who messaged me were looking to rent out the room for only the Spring semester and not the summer. This is not possible with commons, **you have to sign over the entire lease. That turned the most people away.**”
13. “I think there are a lot of cheaper places for people to rent. I also think that the spring semester has a **higher number of people trying to release than people trying to lease. I struggled just knowing where to look for someone to take over the lease**.”
14. “From late october to mid-november **I was set on $900. As the deadline for me to sign my lease over approached, I was offering $700 to people.”**
15. “[multiple] people jsut [sic] stopped communicating with me”
16. “South campus commons has an official releasing forum that looks like it was built in the 90s and unchanged since. It's a generally horrible to navigate site, but I posted there twice and I got two responses out of it. Nothing came of either.”
17. “12/24 I offered to pay for the month of January, which I was going to have to do anyways, and he accepted the offer at the full price of $900 per month.”
18. “**Many people simply asked the price and did not try to negotiate at all.** A failed negotiation was when someone asked for $650, and I said no (12/18/18). A second failed negotiation was when someone asked me for $750, and I said no (12/23/18). The last failed offer was when someone asked for $700, and I said no (1/6/19). The exchanges all happened within one day.”
19. “**I ended up finding a girl I went to high school with who offered to pay my full rent without any negotiation** (12/20)”

20. “Some people did not have the budget, some people were of the opposite gender to that of my roommates, some people were allergic to cats (my roommate has a cat), **some people were difficult and asked for the difference in the money up front**.”
21. I'd pay for part of Jan (apprx $250), subleasee could share the room with their friend. They are international students. One is taking over my lease + another took over my roommate's lease. **Also, my roommate is picking them up from the airport.**
22. “many people were looking for a room with $600-$700 which I thought was much too low- would leave me paying 259-359 per month plus utilities. For these people, I tried to get them up to 900 in the first few weeks, then around the end of December I started negotiating for 875. In the start of January I began to look for someone willing to pay 850 and then 800 in the last week before school. Many people did not want to get close to my price range at all, but about 10 people I had more serious interest with. **I gave a personal tour to one girl- she almost signed and just said she couldn't later on with no reasoning.** The second girl I got the building staff to assist with the tour and it made a big impression- she signed.”
23. “The girl was looking for a place with two open bedrooms. I messaged her first and asked if she needed a place. She asked what it was like. I told her the number of bedrooms, the layout, the amenities offered. She said she needed a room for two people not one. I said, " I know there are a few other people in the building with an open space. If you don't find a place with two rooms, you could at least be in the same building with your friend" Jan 11. On Jan 19th she messaged me asking if the room was still available. She asked the price and I said 959 but negotiable. She did not ask for a lower price but did ask if she could have a shorter lease which I agreed to. So she is paying the full price per month plus utilities and I will have to find another person for summer. **I gave her a tour using the building's tour guide which helped increase professionalism.** She was the only one I used the building tour guide for and the only one who signed. We finished the deal days before school starting- Jan 24th.”

These stories make clear that an enormous degree of advertising, searching, and negotiation takes place for many people; subleasing requires effort, effort that ultimately results in rejection much of the time. The back and forth communication, along with occasionally strange concessions/perks, is substantial in terms of time, energy, and value. Aside from the fact that there were clearly more sellers than buyers, many people reported difficulty in gauging the market. Participants often think other apartments are selling for cheaper, so they lower their prices — though, no one really knows for certain. Additionally, these people are impacted by time pressure, gradually lowering their price the longer they cannot secure a deal. Interestingly, many of the people who perceived to be out of time and out of options were actually very early in the process. Trust was also a common theme, where people who knew each other had a more pleasant experience than people who were suspicious or needed extra assurance. Friction in the system due to subleasing terms and rules also adds significantly to many people’s efforts. These stories highlight interesting factors in negotiation: ability, ambition, trust, and match-making. Exerting so much effort stems from a vague and inefficient match-making system.

A3. Further Data Analysis

This section of the Appendix walks through a series of correlated relationships to understand how sellers behave based on time allowance, and how this relationship results in greater options and faster deal-making. This analysis is fairly limited, therefore exposing some opportunities for omitted variable bias.

First, Figure A1, panel (a), shows the relationship between how much time sellers allot themselves (by posting earlier, they give themselves more time) versus how much time it takes them to make a deal. The positive relationship here implies those who allow for more time, make use of that extra time by waiting longer. Then, panel (b) of Figure A1 shows how posting more frequently results in less time to make a deal, suggesting those who post more frequently get more options and can find something they like more quickly. Why might posting more reduce time spent? Did sellers who posted more receive more contact from buyers? And did receiving more contact result in making a deal more quickly? Panels (c) and (d) illustrate these ideas. Panel (c) shows how posting more frequently helps a seller's prospects by attracting more buyers. The more frequently a seller posts, the more frequently buyers reach out to the seller. Finally, panel (d) shows how greater buyer outreach resulted in less time spent making a deal. When buyers contacted sellers more frequently, sellers reached a deal more quickly.

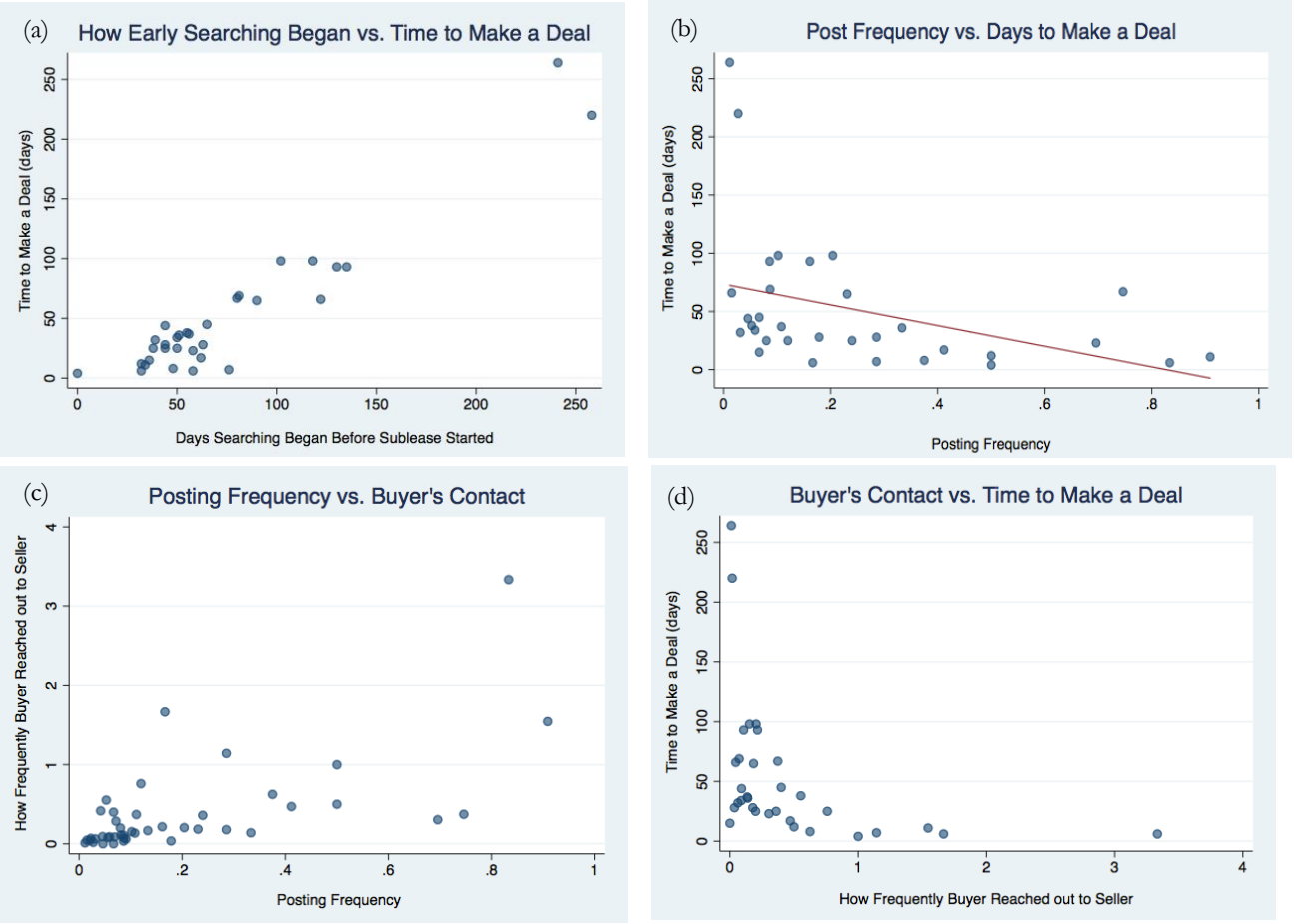


Figure A1 – Panel (a) has a nearly 1-to-1 relationship with a significance of $p = 0.000$ ($n = 32$). Panel (b): $p = 0.029$ ($n = 32$). Panel (c): $p = 0.000$ ($n = 44$). Panel (d): $p = 0.029$ ($n= 32$).

VI. References

Ausubel, Lawrence M., Peter Cramton, and Raymond J. Deneckere. "Bargaining with incomplete information." *Handbook of game theory* 3 (2002): 1897-1945.

Bülow, Anne Marie. "The Double Monologue Principle: Argumentation in Email Negotiation." *Available at SSRN 1899225* (2011).

Gantner, Anita. "Bargaining, search, and outside options." *Games and Economic Behavior* 62, no. 2 (2008): 417-435.

Harding, John P., John R. Knight, and C. F. Sirmans. "Estimating bargaining effects in hedonic models: Evidence from the housing market." *Real estate economics* 31, no. 4 (2003): 601-622.

Hazard, Christopher J., and Munindar P. Singh. "Intertemporal discount factors as a measure of trustworthiness in electronic commerce." *IEEE Transactions on Knowledge and Data Engineering* 23, no. 5 (2010): 699-712.

Hwang, Ilwoo, and Fei Li. "Transparency of outside options in bargaining." *Journal of Economic Theory* 167 (2017): 116-147.

McCabe, Kevin A., Stephen J. Rassenti, and Vernon L. Smith. "Reciprocity, trust, and payoff privacy in extensive form bargaining." *Games and economic behavior* 24, no. 1-2 (1998): 10-24.

Pan, Li, Xudong Luo, Xiangxu Meng, Chunyan Miao, Minghua He, and Xingchen Guo. "A two-stage win–win multiattribute negotiation model: optimization and then concession." *Computational Intelligence* 29, no. 4 (2013): 577-626.

Stuhlmacher, Alice F., and Matthew V. Champagne. "The impact of time pressure and information on negotiation process and decisions." *Group Decision and Negotiation* 9, no. 6 (2000): 471-491.

[i] I would like to thank Dr. Hossein Abbasi, University of Maryland, Economics Department. He has given me significant guidance for this research project, initially encouraged me to explore research, and answers my many emails and questions. I also thank Dr. Emel Filiz-Ozbay for her insight. I am also very thankful for the funding provided by the Maryland Summer Scholars program from the University of Maryland.