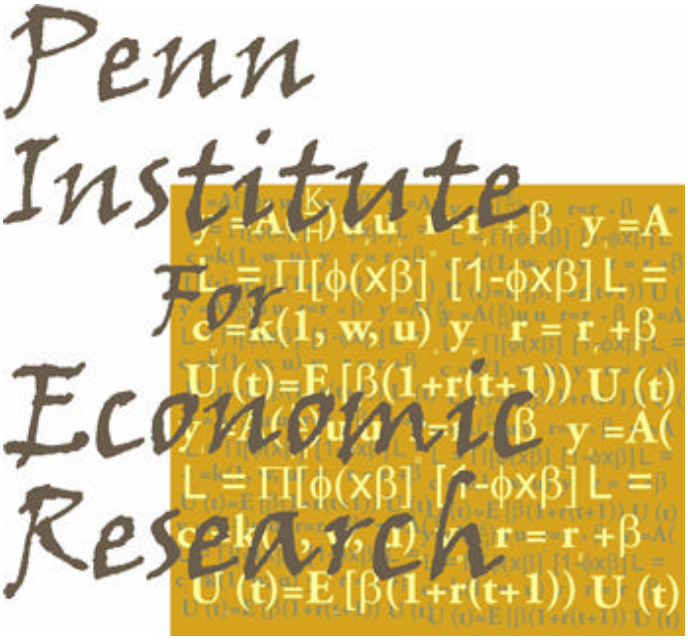

Penn Institute for Economic Research
Department of Economics
University of Pennsylvania
3718 Locust Walk
Philadelphia, PA 19104-6297
pier@econ.upenn.edu
http://www.econ.upenn.edu/pier

PIER Working Paper 04-020

"Bargaining over Residential Real Estate:
Evidence from England"

by

Antonio Merlo and François Ortalo-Magné

http://ssrn.com/abstract=547722

Bargaining over Residential Real Estate: Evidence from England ⋆

Antonio Merlo [a]

[a] *Department of Economics, University of Pennsylvania, 3718 Locust Walk, Philadelphia, PA 19104*

François Ortalo-Magné [b]

[b] *School of Business, Department of Real Estate and Urban Land Economics, 975 University Avenue, Madison, Wisconsin 53706*

Abstract

This paper presents a new data set of individual residential property transactions in England. The main novelty of the data is the record of all listing price changes and all offers made between initial listing and sale agreement. We establish a number of stylized facts pertaining to the sequence of events that occur within individual property transaction histories. We assess the limitations of existing theories in explaining the data and discuss alternative theoretical frameworks for the study of the strategic interactions between buyers and sellers.

1 Introduction

The sale of a house is a typical example of a situation that entails strategic interactions between a seller and a set of potential buyers. When a house is put on the market, the seller posts a listing price and waits for potential buyers to make offers. When a match between the seller and a potential buyer occurs, bargaining takes place, leading possibly

⋆ We thank Halifax Estate Agencies for giving us access to their transaction records. The Editor and two anonymous referees provided helpful comments and suggestions. We benefited from the comments of David Genesove, Hide Ichimura, Peter Linneman, Chris Mayer, John Rust, Bill Wheaton, and seminar and conference participants at several institutions. This project is funded by ESRC grant number R000237737 and STICERD, LSE. The patient research assistance of Christos Tsakonas, Fernando Goni, and Andrei Romanov was very much appreciated.

Email addresses: merloa@econ.upenn.edu (Antonio Merlo), fom@bus.wisc.edu (François Ortalo-Magné).

Revised *11 May 2004*

to a sale agreement. At any point in time while a house is still on the market, the seller has the option of revising the listing price.

This paper presents and investigates a new data set of individual residential property transactions in England. The main novel features of our data are the record of all listing price changes and all offers ever made on a property since initial listing. In addition, we have a complete record of visits by potential buyers, called viewings, for a subset of the transactions in our sample. We are therefore in a unique position to analyze the behavior of buyers and sellers within individual transaction histories and the extent to which the sequence of events leading to a transaction affect the sale price. [1]

The picture of the house transaction process that emerges from the data can be summarized as follows. The listing price influences the arrival of offers, which ultimately determines the timing of the sale. As time on the market increases, the arrival rate of potential buyers decreases and the probability of a listing price revision increases. The longer the time the property remains on the market, the lower the level of offers relative to the listing price, the higher the probability a match is successful, and the lower the sale price relative to the listing price.

A relatively high initial listing price results in a higher sale price but also a longer time on the market. Listing price reductions concern primarily properties that have not received any offer while being on the market for a substantial period of time (in fact, a period equal to the average time to sale). Proportionally, decreases in listing price are also substantial (in fact, greater than the average percentage difference between the sale price and the initial listing price).

Almost 40 percent of sales occur at the first offer ever received. One third of the potential buyers whose first offer is turned down walk away from the negotiation. The remaining two thirds continue bargaining with the seller and are observed to make up to four consecutive, increasing offers before either they succeed in purchasing the property or the negotiation terminates without an agreement.

One third of all matches between a seller and a potential buyer are unsuccessful. The vast majority of sellers whose first match is unsuccessful end up selling at a higher price; a few end up accepting a lower offer. The higher the number of matches in a transaction

[1] Since our data set was constructed from sales records, it does not include unsold properties that are withdrawn from the market. We describe the main features of our data in detail in Section 2.

history, the higher the sale price. These are just a few of the salient features observed in the data.

To date, the lack of adequate data has limited the scope of empirical research on housing transactions. [2] Existing data sets typically include property characteristics, time to sale, initial listing price, and sale price. They do not contain information on the buyer's side of the transaction (e.g., the timing and terms of offers made by potential buyers), or on the seller's behavior between the listing and the sale of a property (e.g., the seller's decision to reject an offer or to revise the listing price). This explains why most of the empirical literature on housing transactions has either focused on the determinants of the sale price or on the role of the listing price and its effect on the time to sale. [3]

Recent attempts to overcome some of the data limitations by supplementing conventional data sets with additional information have generated valuable insights. For example, Genesove and Mayer [13] build a data set for the Boston condominium market where they are able to uncover the financial position of each seller. They find that sellers with high loan-to-value ratio tend to set a higher initial listing price, have a lower probability of sale but, if and when they sell, obtain a higher price. Glower et al. [15] conduct a phone survey to obtain information on each seller's motivation (e.g., whether or not they have a planned moving date), for a real estate transaction data set for Columbus, Ohio. The evidence suggests that sellers convey information about their willingness to sell (i.e., their reservation value), through the listing price. [4]

In addition to providing a valuable resource for empirical research on housing transactions, our data raises new challenges for theoretical research on the strategic interactions between buyers and sellers. [5] We assess the limitations of existing theories in explaining the data and discuss alternative frameworks that are consistent with the empirical evidence. Our analysis highlights the importance of accounting for incomplete information in the matching and bargaining environment where buyers and sellers interact in

---

[2] This is also true for other markets where the transaction process involves search, matching and bargaining, since the lack of data on rejected offers is pervasive.

[3] See, e.g., Horowitz [18], Miller and Sklarz [24], and Zuehlke [35].

[4] Similar evidence is reported, for example, in Anglin et al. [2], Genesove and Mayer [14], Knight et al. [20], and Knight [31].

[5] For existing theoretical models of the behavior of buyers and sellers in the housing market see, e.g., Arnold [3], Chen and Rosenthal [6] and [7], Coles [10], Horowitz [18], Krainer [22], Taylor [32], Yavaş [33], and Yavaş and Yang [34].

order to explain the sequence of events in the housing transaction process as well as its outcomes.

The remainder of the paper is organized as follows. Section 2 describes our data set and provides institutional details of the residential real estate market in England. Section 3 reports the results of our descriptive empirical analysis of the process leading to the sale of a property, from its initial listing to a sale agreement. In Section 4, we summarize our main findings, discuss the limitations of existing theories, and suggest alternative theoretical frameworks that are consistent with the data. We conclude with Section 5.

2 Data

In England, most residential properties are marketed under sole agency agreement. This means that a property is listed with a single real estate agency that coordinates all market related activities concerning that property from the time it is listed until it either sells or is withdrawn.

Agencies represent the seller only. Listing a property with an agency entails publishing a sheet of property characteristics and a listing price. [6] The listing price may be revised at any time at the discretion of the seller. Potential buyers search by visiting local real estate agents and viewing properties. A match between the seller and a potential buyer occurs when the potential buyer makes an offer. Within a match, the general practice is for the seller to either accept or reject offers. In the event the seller rejects an offer, the potential buyer either makes another offer or walks away. If agreement occurs, both parties engage the administrative procedure leading to the exchange of contracts and the completion of the transaction. This procedure typically lasts three to eight weeks. During this period, among other things, the buyer applies for mortgage and has the property surveyed. Each party may cancel the sale agreement up to the exchange of contracts. [7]

For each property it represents, the agency keeps a file containing a detailed description of the property, its listing price, and a record of listing price changes, offers, and terms

[6] Although not legally binding, the listing price is generally understood as a price the seller is committed to accept.

[7] Cancelling a sale agreement does not cost anything per se. However, the later a cancellation occurs after sale agreement, the more each party will have spent on lawyer and administrative fees. These payments cannot be recovered.

of the sale agreement, as required by law. The information contained in each individual file is also recorded on the accounting register that is used by each agency to report to the head office. Although all visits of a property by potential buyers are arranged by the listing agency, recording viewings is not required either by the head office or by law. However, individual agencies may require their agents to collect this information for internal management purposes.

Our data set was obtained from the sales records of four real estate agencies in England. [8] Three of these agencies operate in the Greater London metropolitan area, one in South Yorkshire. Our sample consists of 780 complete transaction histories of properties listed and sold between June 1995 and April 1998 under sole agency agreement. [9] Each observation contains the property's characteristics as shown on the information sheet published by the agency at the time of initial listing, the listing price and the date of the listing. If any listing price change occurs, we observe its date and the new price. Each match is described by the date of the first offer by a potential buyer and the sequence of buyer's offers within the match. When a match is successful, we observe the sale agreed price and the date of agreement which terminate the history. In addition, for the properties listed with one of our Greater London agencies (which account for about a fourth of the observations in our sample), we observe the complete history of viewings. Since events are typically recorded by agents within the week of their occurrence, we use the week as our unit of measure of time.

Our data spans two geographic areas with different local economic conditions and two different phases of the cycle in the housing market. While the local economy in Greater London has been experiencing a prolonged period of sustained growth, this has not been the case in South Yorkshire. Furthermore, from June 1995 to April 1998, the housing market in the Greater London metropolitan area went from a slow recovery to a boom. While this transition occurred gradually, for ease of exposition we refer to 1995-96 as the recovery and to 1997-98 as the boom.

Table 1 contains an overview of some of the features of our data. Column 1 refers to the properties in our sample located in South Yorkshire. Columns 2 and 3 refer to

---

[8] These agencies are all part of Halifax Estate Agencies Limited, one of the largest network of real estate agents in England.

[9] Each entry in our data was validated by checking the consistency of the records in the accounting register and in the individual files. Observations with inconsistent or incomplete records were dropped.

TABLE 1

Overview

	Yorkshire 95-98	London 95-96	London 97-98	Overall 95-98
Number of observations	343	239	198	780
Average initial listing price(£)	40,665	86,783	99,820	69,812
% transactions with a price change	35.28	17.99	8.59	23.21
Average number of matches	1.26	1.62	1.53	1.44
Average number of offers	1.73	2.91	2.38	2.26
Average sale price(£)	37,989	83,524	97,168	66,964
Sale price/listing price (%)	93.4	96.2	97.3	95.9
Average weeks to sale	15	10	7	11

properties located in Greater London that were listed during the recovery and the boom, respectively. Column 4 refers to the overall sample. Several observations are noteworthy. First, more active housing markets (e.g., Greater London *vs.* South Yorkshire) appear to be characterized by higher sale price relative to listing price, fewer listing price changes, more offers, and more matches. Most of these observations hold true when we compare booming markets to dull markets (e.g., Greater London in 1997-98 *vs.* 1995-96). On average, properties in our sample sell at about 96% of their listing price after being on the market for 11 weeks. More than three quarters of all properties sell without any revision of their listing price. The average number of matches and the average number of offers indicate that most properties are sold to the first potential buyer who makes an offer on the property, but not necessarily at their first offer. In addition to the information reported in Table 1, note that for the sub-sample of 200 properties for which viewings records are available, the average number of viewings per property is equal to 9.5 and the average number of viewings per week on the market is equal to 1.7.

Table 2 contains descriptive statistics of the main characteristics of the properties in our sample.[10] The variables FLAT, TERR, SEMI, and DET are dummy variables for the

[10] These characteristics are only a subset of the ones listed in the information sheet published by the agency at the time of initial listing. The additional variables were excluded from our analysis since they appear to have no significant effects on prices.

TABLE 2

Property Characteristics

	Yorkshire 97–98		London 95–96		London 97–98		Overall 95–98	
Variable	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
FLAT	0.026	0.16	0.264	0.442	0.439	0.498	0.204	0.403
TERR	0.318	0.466	0.222	0.416	0.263	0.441	0.274	0.446
SEMI	0.464	0.499	0.389	0.489	0.202	0.403	0.375	0.484
DET	0.192	0.395	0.125	0.332	0.096	0.295	0.147	0.355
TOTA	66.1	17.5	59.0	22.1	53.93	18.07	60.8	19.8
NBATH	1.24	0.576	1.42	0.615	1.29	0.519	1.31	0.579
GARAGE	0.426	0.495	0.377	0.486	0.263	0.441	0.369	0.483
APPL	0.793	1.190	1.250	1.500	0.949	1.170	0.973	1.306
B1	0.006	0.076	0.184	0.388	0.263	0.441	0.126	0.332
B2	0.306	0.462	0.31	0.463	0.323	0.469	0.312	0.463
B3	0.592	0.492	0.364	0.482	0.353	0.479	0.461	0.499
B4	0.096	0.295	0.142	0.35	0.061	0.239	0.101	0.302

type of property. They denote flats, terraced, semi-detached, and detached properties, respectively. The variables B1, B2, B3, and B4 are dummy variables which stand for one, two, three, and four or more bedrooms, respectively. GARAGE indicates whether the property has a garage. TOTA is the total area measured in square meters, NBATH is the number of bathrooms, and APPL is the number of appliances listed on the characteristic sheet published by the agent.[11] As we can see from column 7, most properties in our sample have either two or three bedrooms (77 percent). Semi-detached properties are the most represented (38 percent). Terraced properties, detached houses, and flats, account for 27, 15, and 20 percent of the sample, respectively. The remainder of the table illustrates the type of housing sold in each of the local markets we consider.

Before turning our attention to the analysis of the data, a few remarks are in order. First, our data refers to complete transaction histories only, from initial listing to sale

[11] Agents typically list the major appliances to be left with the property. The number of such appliances was the only information recorded in the data set.

agreement. In particular, properties that are listed and then withdrawn from the market before a sale agreement are not in our sample. For this reason, the emphasis of the paper is on the events leading to the sale of a property and on the behavior of buyers and sellers during this process. [12]

Second, while none of the properties in the data set were sold at a formal auction, it is nevertheless possible that two or more buyers found themselves bidding on the same property at the same time. Sifting through the records of transaction histories, we detect the occurrence of about 30 *de facto* auctions out of 780 transactions. The properties concerned sold at a higher than average price relative to effective listing price. In fact, such *de facto* auctions account for all instances in the data where the sale price is above the listing price (except for small differences due to rounding up). All the qualitative and quantitative findings of our analysis are robust to the exclusion of these transaction histories from the data set.

Third, the cancellation of a sale agreement is not a rare phenomenon. In our sample, 1 out of 5 agreements is cancelled. Agents' records indicate that cancellations are usually due to the arrival of new information such as a bad inspection outcome or failure to obtain mortgage. A sale agreement may also be contingent upon the successful completion of other transactions (e.g., the purchase of a house by the seller). Hence, cancellations may also be induced by the failure of related transactions. Here we implicitly assume that parties bargain in earnest. That is, we assume that the right to cancel a sale agreement does not distort the behavior of the parties involved in a housing transaction and that the object of a negotiation is the sale of a house.

3 Descriptive Empirical Analysis

In this section, we analyze the details of the process leading to the sale of a property, from its initial listing to a sale agreement. The first step in this process is the setting of the listing price on the part of the seller. In section 3.1, we analyze the choice of the initial listing price and whether, when, and to what extent sellers revise their decision. The next step is the occurrence of matches between the seller and the potential buyers who choose to make offers on a property. We describe the occurrence of matches in section 3.2 and the sequence of offers within and across matches in section 3.3. The final step of the transaction process is the sale of a property. In section 3.4, we analyze

[12] Withdrawals are not infrequent. Based on a preliminary investigation we estimate that as many as 25 percent of all listings may end up being withdrawn prior to a sale.

the timing and terms of the sale agreement. Restricting attention to the sub-sample of properties for which information on viewings is available, we analyze the role played by viewings in the process leading to the sale of a property in section 3.5.

To investigate the effects of local market conditions on transaction histories, throughout our analysis we use agency-specific dummy variables, labelled AGENCY1, AGENCY2, AGENCY3, and AGENCY4, where AGENCYi is equal to 1 if the property is located in the local market where agency i operates and 0 otherwise ($i = 1, 2, 3, 4$). Note that agencies 1, 2, and 3 list properties located in different communities within the Greater London metropolitan area, while agency 4 operates in South Yorkshire. Hence, the agency dummies effectively capture the effect of a London location, while at the same time measuring differences across the London agencies.

To account for aggregate dynamics in the English housing market, we specify a linear trend for the month in our sampling period when each property was listed, MONTH, and an additional linear trend for the properties located in Greater London, MONTHGL. In our analysis, we also considered alternative, more flexible specifications that would capture aggregate changes over time in the housing market, such as polynomial trends, or dummy variables for each quarter or each year. Such (more elaborate) specifications, however, yield only a marginal improvement in fitting the data over the simpler linear trend specification considered here, and are therefore omitted.

Before presenting our results, it is important to stress that the purpose of our empirical analysis is primarily descriptive. That is, the main goals of our study are to establish new stylized facts (based on the novel aspects of our data), and to uncover interesting correlations in the data, without attempting to assess whether these correlations can be interpreted as causal relationships. Hence, several correlations we reveal in our analysis are between endogenous variables (e.g., variables that describe the behavior of the seller and the potential buyers in a transaction history), and should be interpreted accordingly.

3.1 Listing Price

We begin our analysis by investigating the relationship between the initial listing price of a property and its observable characteristics. The results of a regression of the initial listing price, ILISTP, on the property characteristics, agency dummies, and the trend

TABLE 3

Initial Listing Price

Variable	Coef.	Std. Err.
FLAT	−16687**	2932
TERR	−7486**	1762
DET	20787**	2287
TOTA	522**	56
NBATH	6256**	1384
GARAGE	6377**	1609
APPL	3801**	532
B2	14380**	2490
B3	11748**	2945
B4	19205**	4510
AGENCY1	24997**	3694
AGENCY2	58303**	4107
AGENCY3	46357**	3652
MONTH	158	117
MONTHGL	861**	159
INTERCEPT	−24739**	4097
R^2	0.80	

variables MONTH and MONTHGL are reported in Table 3.[13] Note that the default property is a one bedroom semi-detached house located in South Yorkshire (i.e., the local market where agency 4 operates).

All of the parameter estimates associated with the property characteristics included in the regression are statistically significant at conventional levels and have the expected sign and reasonable magnitudes.[14] The variables included in our regression jointly

[13] In this table, as for all other estimations below, we indicate whether each parameter estimate is significantly different from zero either at the 5 percent or at the 10 percent level. We indicate each of these occurrences with the superscripts ** and *, respectively.

[14] Given the size of its estimated coefficient, the variable APPL must be capturing more than the monetary value of what it accounts for.

account for 80 percent of the observed variability in the initial listing price. Hence, initial listing prices depend to a large extent on the observable characteristics of the properties.

The estimates reported in Table 3 also allow us to usefully decompose the initial listing price of each property in our sample into two components. Using the regression results, let ILISTPHAT be the predicted listing price of a property based on its observable characteristics, and ILISTPRES the residual (clearly, ILISTP = ILISTPHAT + ILISTPRES). Hence, ILISTPHAT can be interpreted as the "normal" listing price of a property (given its location, characteristics, and time of listing), and ILISTPRES captures the extent to which a property is either over-priced or under-priced relative to other, similar properties. In what follows, we use these variables to investigate the relationship between the initial listing price of a property and the events that lead to its sale. In particular, this decomposition of the initial listing price allows us to assess whether there are any noticeable differences between the transaction histories of expensive (or inexpensive) properties and over-priced (or under-priced) properties.

The first novelty of our data set is the information on listing price changes. This information is summarized in Table 4. About one fourth of all sellers change their listing price at least once. [15] Before a first price change, they wait 11 weeks on average. Recall from Table 1 above that the average time to sale is also 11 weeks. This observation suggests that sellers who change their listing price wait a significant amount of time before doing it. In more active markets price changes are less frequent.

In the vast majority of cases, sellers who decrease their listing price have no prior response from prospective buyers: in 86 percent of the cases, price changes occur before an offer was ever received. To explore whether this finding is indicative of a robust relationship between the lack of offers and the probability of a listing price reduction, we estimate a Cox proportional hazard model for the probability of a first listing price revision in any given week since initial listing. [16] The set of time-invariant variables we consider includes the two components of the initial listing price, ILISTPHAT and

[15] Only 9 transactions involved 3 listing price changes, the maximum observed in our sample.

[16] The Cox proportional hazard model is a standard tool for the analysis of duration data (see, e.g., Greene [16] and Miller [25]). The main advantage of this non-parametric approach is that it provides a method of estimating the effects of covariates on duration without requiring estimation of the baseline hazard function.

TABLE 4

Listing Price Changes

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
Price change distribution:				
% properties with 0	65	82	91	77
% properties with 1	26	14	8	18
% properties with 2+	9	4	1	5
First price change:				
Average % price decrease	6.3	3.4	2.6	5.3
Average weeks since listing	12	10	9	11
% properties with no offer yet	92	71	80	86
Second price change:				
Average % price decrease	4.8	2.6	—	4.4
Average weeks since first price change	9	7	—	8
% properties with no offer yet	72	67	—	70

ILISTPRES, agency dummies, MONTH and MONTHGL. Our specification also includes a time-varying variable denoting, for each week since initial listing, the total number of potential buyers who have made at least one offer on the property up to that week, NMATCH. [17]

The estimation results are reported in Table 5. Note that, following convention, the table contains the estimated hazard ratios associated with each variable (as opposed to the estimated coefficients), where a hazard ratio greater than one indicates that the variable increases the probability of a price revision, and a hazard ratio smaller than one indicates that the variable decreases the probability of a price revision.

Several interesting observations emerge from Table 5. Sellers who receive offers on their property are less likely to revise their listing price than sellers who do not. In particular, the probability of a listing price revision decreases with the number of potential buyers

[17] Since not all sellers revise their listing price before selling their property, some observations are censored. We correct for censoring in the estimation which is carried out by maximum likelihood.

TABLE 5

Probability of First Listing Price Change

Variable	Haz. Ratio	Std. Err.
ILISTPHAT$\times 10^{-4}$	0.940*	0.030
ILISTPRES$\times 10^{-4}$	0.987	0.048
AGENCY1	2.946*	1.205
AGENCY2	1.858	0.836
AGENCY3	1.423	0.588
MONTH	1.039**	0.010
MONTHGL	0.957**	0.018
NMATCH	0.710**	0.113

who have made offers on a property. Price revisions are relatively less likely the more expensive a property is (as measured by ILISTPHAT). The extent to which a property is over or under priced (as measured by ILISTPRES), however, does not seem to have any relationship with the probability of a price revision.

Virtually all price changes are price decreases. [18] As shown in Table 4, the drop in price is typically substantial. [19] It is equal to 5.3 percent on average, which is greater than the average sale price discount relative to initial listing price (4.1 percent). In more active markets listing price reductions are smaller on average. To investigate which factors are systematically related to the size of listing price reductions, we run a regression of the first listing price revision (as a percentage of the initial listing price) on the two components of the initial listing price, ILISTPHAT and ILISTPRES, agency dummies, MONTH, MONTHGL, the number of weeks between initial listing and the price change, WTFPC, and a dummy variable equal to one if no offers were made on the property prior to the listing price revision, NOOFF. The results are reported in Table 6. [20] The longer the time on the market before the change, the larger the drop. Also, the more a property is over-priced (as measured by ILISTPRES), the smaller the listing price

[18] Of the three cases of listing price increases, one is minor, less than one percent. The other two are more substantial: one is an adjustment within a few days of initial listing, the other occurs three months after initial listing.

[19] Using data from Stockton, California, Knight [21] also finds that when sellers change their listing price, the listing price at the time of sale is substantially below the initial listing price.

[20] The number of first listing price changes in our data is 181.

TABLE 6

Size of First Listing Price Change

Variable	Coef.	Std. Err.
ILISTPHAT$\times 10^{-4}$	0.181	0.138
ILISTPRES$\times 10^{-4}$	-0.549^{**}	0.229
AGENCY1	-2.383	1.863
AGENCY2	-0.897	1.923
AGENCY3	-1.903	1.974
MONTH	0.011	0.053
MONTHGL	-0.176^{**}	0.081
WTFPC	0.088^{*}	0.045
NOOFF	0.150	0.972
INTERCEPT	5.705^{**}	1.707
R^2	0.17	

revision in percentage terms. The lack of offers, on the other hand, does not seem to have any relationship with the magnitude of listing price changes.

3.2 Matches

The second novelty of our data set concerns the record of all matches that occur between each seller in our sample and the potential buyers who choose to make offers on her property.[21] This information is summarized in Table 7. Approximately 72 percent of all transactions occur within the first match. Only 10 percent of all sales occur after 3 or more matches.[22] About a third of all matches are not successful. On average, the success rate of first matches is higher than that of later matches. About three quarters of the sellers are matched with a potential buyer within ten weeks of putting their property on the market; more than ten percent within one week. Looking at differences across local markets, columns 1-3 in Table 7 illustrate that more active markets and

[21] Recall that, according to our definition, a match occurs when a potential buyer makes an offer on a property.

[22] Only 10 transactions occur after 5 or more matches and the maximum number of matches in the sample is 7.

TABLE 7

Matches

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
Matches per sale:				
Average	1.2	1.6	1.5	1.4
% properties with 1	79.0	64.0	68.1	71.7
% properties with 2	17.2	20.9	17.7	18.4
% properties with 3	2.6	8	9.1	5.9
% properties with 4+	1.2	7.1	5.1	3.9
Time to first match (weeks)				
Average	12	7	5	9
Median	8	5	3	5
% with match within 1 week	3.5	16.3	16.7	12.6
% with match within 10 weeks	61.2	80.3	87.4	73.7
Success rate:				
All matches	79.4	61.6	65.6	69.5
First match	81.6	66.5	72.2	74.6
Second match	70.8	58.1	54.0	61.1
Third match	69.2	47.2	50.0	51.9

booming markets are characterized by greater turnover: matches occur sooner, they are more frequent, and their success rate is lower.

Figure 1 plots the average number of matches per week for all properties still on the market. This measure of the rate of arrival of matches increases from the first to the second week. Following this rise, the rate of arrival gradually decreases over time. [23]

To explore whether there are systematic relationships between listing prices and the rate of arrival of matches, we estimate a Cox proportional hazard model for the probability

[23] Note that the slight increase in the rate of arrival of matches for very long durations is a consequence of the fact that our data only contains properties that are sold and very few properties are on the market for a very long time.

TABLE 8

Probability of First Match

Variable	Haz. Ratio	Std. Err.
ILISTPHAT$\times 10^{-4}$	1.006	0.014
CLISTPRES$\times 10^{-4}$	0.982	0.021
AGENCY1	1.795**	0.358
AGENCY2	1.467*	0.304
AGENCY3	1.576**	0.320
MONTH	1.025**	0.006
MONTHGL	1.004	0.008
DPC	1.556**	0.166

of the first match occurring in any given week since initial listing. The set of time-invariant variables we consider includes the predicted (or "normal") component of the initial listing price, ILISTPHAT, agency dummies, MONTH, and MONTHGL. Our specification also includes two time-varying variables denoting the occurrence of listing price changes, DPC, and the extent to which the current listing price in any given week is different from its normal level, CLISTPRES (which captures the extent to which a property is relatively over-priced or under-priced over time). [24]

The estimation results are contained in Table 8, where again we report the estimated hazard ratios associated with each variable. [25] Holding everything else constant, the probability of arrival of the first match increases with a listing price revision, but does not vary with the listing price (regardless of whether a property is more or less expensive per se, or whether it is over or under priced). Also, more active markets are associated with a higher probability of arrival of the first match.

[24] DPC is a time-varying indicator variable that takes the value 0 prior to a listing price change and 1 from the occurrence of a listing price change on. In any given week, CLISTPRES is equal to CLISTP, the current listing price, minus ILISTPHAT. Note that as long as a seller does not revise the listing price, CLISTP is equal to ILISTP.

[25] Recall that a hazard ratio greater than one indicates that the variable increases the probability of a match occurring, and a hazard ratio smaller than one indicates that the variable decreases the probability of a match occurring.

TABLE 9
Offers

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
Number of matches	432	388	302	1122
Distribution of offers per match:				
Average	1.4	1.8	1.6	1.6
% matches with 1	69.9	44.6	56.0	57.4
% matches with 2	23.4	34.5	33.1	29.9
% matches with 3	6.5	18.0	9.6	11.3
% matches with 4	0.2	2.8	1.3	1.4
First offer relative to listing price	92.4	94.3	95.6	94.0
Increments within match:				
First to second offer	5.2	2.6	2.3	3.3
Second to third offer	3.2	2.0	1.5	2.1
Percent negotiations terminated				
After one unsuccessful offer	36.6	28.3	31.1	31.5
After two unsuccessful offers	31.0	34.1	50.0	38.1
After three unsuccessful offers	50.0	65.6	71.4	66.7

3.3 Offers

When a match occurs, the seller and the potential buyer engage in a bilateral bargaining process characterized by a sequence of buyer's offers that the seller either accepts or rejects. The third novelty of our data set is that it contains detailed information on all offers ever made on a property. This information is summarized in Tables 9, 10, and 11.

Table 9 reports the main features of observed sequences of offers within matches. Potential buyers make up to four consecutive offers. On average, successive offers within a sequence increase at a decreasing rate. In more than half of the matches only one offer is exchanged. Almost 40 percent of sales occur at the first offer ever received, 54 percent occur at the first offer of a match. Upon rejection of their first offer, 68 percent of all potential buyers make a second offer. The remaining 32 percent walk away, hence terminating the negotiation. The incidence of separations increases with the number of

Table 10

Spread of Offers, Unsuccessful Matches

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
2 offers in match				
First offer relative to listing price	85.0	93.5	93.2	92.1
Last offer relative to listing price	88.6	96.6	95.9	95.2
3 offers in match				
First offer relative to listing price	—	90.9	92.3	91.1
Last offer relative to listing price	—	95.6	95.9	96.1

Table 11

First Offer Relative to Listing Price

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
First match	92.2	93.9	95.3	93.5
Second match	93.2	94.7	96.6	94.7
Third match	92.2	95.5	97.3	95.6
Fourth match	93.4	97.1	97.2	96.6

rejected offers. That is, the fraction of potential buyers who terminate a negotiation after having their first offer rejected is smaller than the fraction of potential buyers who do so after a second or third rejection.

In Table 10, we restrict attention to the sequence of offers in unsuccessful matches (i.e., negotiations that terminate with a separation rather than a sale agreement). The higher the number of offers in a match the lower the first offer relative to the listing price. In general, the higher the number of offers in a match, the higher the last offer relative to the current listing price. It therefore appears that the more offers there are in a match, the broader the interval spanned by the offers. As we can see from columns 1-3 in Tables 9 and 10, in more active markets we observe a larger number of offers and offers that are on average closer to the current listing price. Within offer sequences, however, we observe smaller increments.

TABLE 12

First offer relative to current listing price

Variable	Coef.	Std. Err.
ILISTPHAT$\times 10^{-4}$	0.223**	0.077
CLISTPRES$\times 10^{-4}$	−0.192*	0.099
AGENCY1	1.967*	1.080
AGENCY2	−0.925	1.083
AGENCY3	1.743	1.087
MONTH	0.034	0.036
MONTHGL	0.010	0.044
DPC	1.299**	0.515
WTMATCH	−0.092**	0.021
MATCHONE	−1.287**	0.410
INTERCEPT	92.519**	0.972
R^2	0.11	

In Table 11, we compare the first offer in a match across different matches within a transaction history. On average, the first offer relative to the listing price is increasing in the number of matches in a transaction history. In particular, both in the aggregate as well as in each local market, the first offer in the first match is on average farther away from the listing price than the first offer in successive matches.

To investigate which factors are systematically related to the level of the first offer in a match, we regress the first offer in a match as a percentage of the current listing price at the time of the match, PERFOCLP, on the predicted listing price, ILISTPHAT, the extent to which the property is currently over-priced or under-priced, CLISTPRES, a dummy variable denoting whether the seller revised the listing price prior to the match, DPC, agency dummies, MONTH, MONTHGL, the number of weeks between initial listing and the occurrence of the match, WTMATCH, and a dummy variable equal to one if it is the first match and zero otherwise, MATCH1. The results are contained in Table 12. [26]

[26] We report robust standard errors which account for the fact that observations are independent across properties but not across matches within the same transaction history.

TABLE 13

Sale Price and Time to Sale

	Yorkshire 95–98	London 95–96	London 97–98	Overall 95–98
Sale price vs current listing price:				
Average as percent of listing price	95.0	96.8	97.6	96.2
% with prices equal	13.4	8.4	26.8	15.3
% with sale price greater	5.0	2.5	4.6	4.1
Time to sale				
Average	15	10	7	11
Median	10	7	5	7
Within 2 weeks	3.2	18.0	23.2	12.8
Within 20 weeks	75.8	89.1	93.9	84.5
Maximum	69	69	42	69

Ceteris paribus, the level of the first offer in a match relative to the current listing price is lower the longer a property has been on the market and if it is the first offer ever made on a property. Interestingly, the level of the first offer in a match relative to the current listing price is higher the more expensive a property, but is lower the more a property is currently over-priced. Also, the level of the first offer in a match is closer to the current listing price after a price revision.

3.4 Sale Agreement

The timing and terms of sale agreements for the properties in our sample are summarized in Table 13. In the table, the current listing price denotes the listing price at the time of the sale agreement. Overall, properties in our sample sell at about 96% of their current listing price and 13 percent of the properties sell at the listing price. The mean and median time to sale are 11 and 7 weeks, respectively. In a booming housing market sale prices are on average closer to the effective listing prices, a larger fraction of sales occur at the listing price, and properties sell considerably faster.

Since variables describing the timing and terms of sale agreements are commonly available also in other data sets, here it suffices to say that our analysis of these aspects of our data produces results that are similar to the ones in the existing empirical literature on housing transactions.

Table 14

When First Match Unsuccessful

	Yorkshire 95-98	London 95-96	London 97-98	Overall 95-98
Additional weeks to sale	8	6	3	6
Gain as percent of max offer first match	5.1	3.2	3.8	4.0
Percent sales below max offer first match	13.9	19.8	3.2	13.1
Percent sales at max offer of first match	20.8	14.1	23.8	19.5

Focusing instead on what is unique in our data set, in Table 14 we summarize information relative to sale agreements that follow an unsuccessful first match. In 13 percent of the cases properties sell at a price below the maximum offer in the first match, 20 percent sell for the same amount, and the remaining two thirds of the properties sell at a price above. On average, after an unsuccessful first match, sellers wait 6 weeks before reaching a sale agreement and realize a 4 percent gain relative to the best offer in the first match. [27]

3.5 Viewings

For a sub-sample of 200 properties located in the local market within the Greater London metropolitan area where one of our agencies operates, our data set contains complete viewing records. A viewing is recorded each time a potential buyer visits a property. On average, there are 9.5 viewings per transaction. Only 9 properties sell after one viewing. The median number of viewings is 7, the maximum is 51. The average number of viewings per week on the market is 1.7.

As illustrated in Figure 2, the arrival rate of viewings over time displays a monotonic decreasing pattern that is similar to the one observed for the arrival rate of matches. The viewing rate gradually decreases with time on the market. [28]

[27] This gain is large relative to the gain to the real estate agent who earns less than 2 percent of the incremental profit.

[28] In particular, the data does not display a discrete drop in the arrival rate of viewings after a week or two. Such a drop would suggest the presence of a sizeable stock of potential buyers waiting for new properties to be listed and going to view them upon listing.

TABLE 15

Number of Viewings

Variable	Coef.	Std. Err.
ILISTPHAT$\times 10^{-5}$	0.469**	0.077
ILISTPRES$\times 10^{-5}$	−0.570**	0.150
MONTHGL	0.020**	0.002
INTERCEPT	−0.753**	0.085
Pseudo R^2	0.08	

To investigate whether there is a systematic relation between the rate of arrival of viewings and the listing price, we run a Poisson regression of the number of viewings per week, on the two components of the initial listing price, ILISTPHAT and ILISTPRES, and MONTHGL. [29] The results are reported in Table 15. Holding everything else constant, relatively more expensive properties (i.e., properties for which ILISTPHAT is relatively high) have a higher rate of arrival of viewings. On the other hand, properties that are relatively over-priced (i.e., properties for which ILISTPRES is relatively high) have a lower rate of arrivals of viewings. [30]

Using the additional information on viewings we revisit some of the issues we addressed earlier and investigate the role played by viewings in the process leading to the sale of a property. In particular, we investigate the relationship of viewings with listing price revisions and the arrival of matches. For each week a property is on the market, we define two variables that measure the number of viewings in the week and the cumulative number of viewings from initial listing. We include these two additional variables in our econometric analysis of the probability of a first price change and the probability of the first match occurring. The results of these estimations can be summarized as follows. On the one hand, we find no relationship between the occurrence (or the lack) of viewings and the probability of observing a price change. On the other hand, we find

[29] The estimation procedure controls for the fact that properties differ in their exposure time (weeks on the market).

[30] These result also obtain if instead of a Poisson model we consider more flexible functional forms for the stochastic process of the arrival of viewings.

that the more viewings in a week and the greater the total number of viewings since initial listing, the higher the probability of receiving an offer that week. [31]

Overall, the results in this section indicate that, holding everything else constant, overpriced properties tend to have low arrival rates of viewings, which in turn decrease the arrival rate of offers. Thus, the listing price affects the arrival of offers indirectly, by affecting the arrival of viewings.

4 Discussion

In the previous section, we investigated a number of issues pertaining to the details of the process leading to the sale of a property, from its initial listing to a sale agreement. This process can be thought of as a combination of a dynamic optimization problem faced by the seller and a sequence of bargaining problems between the seller and each potential buyer who initiates a match by making an offer on the property. In this section, we summarize our key findings, compare them with the predictions of existing theories, and discuss alternative theoretical frameworks that are consistent with the empirical evidence.

4.1 Listing Price

The solution of the dynamic optimization problem faced by the seller yields an initial listing price and an intertemporal decision rule specifying whether, when, and to what extent she should revise the listing price as time goes by. The evidence shows that a sizeable fraction of sellers revise their listing price at least once. Those who do typically reduce it by a substantial amount after waiting a substantial period of time without receiving any offer. These findings are in stark contrast to the predictions of most existing theories of sellers' behavior in the housing market, but are fairly consistent with individuals' behavior in other economic situations.

With respect to the choice of the optimal listing price, it is typically assumed that the seller faces a trade-off between the rate of arrival of buyers and the sale price: a low listing price increases the arrival rate of buyers but precludes the possibility of sales at a high price (e.g., Haurin [17]). This assumption is consistent with our empirical evidence. Most existing theoretical models, however, imply that in equilibrium, either

[31] The maximum likelihood estimates of Cox proportional hazard models for these probabilities which include the additional variables on viewings are not reported here to economize on space.

the seller never revises the listing price (e.g., Arnold [3], Chen and Rosenthal [6] and [7], Horowitz [18] and Yavaş and Yang [34]), or she gradually lowers the listing price over time in a continuous fashion (e.g., Coles [10]). [32] Taylor [32] proposes a two-period model where it may be optimal for the seller to post an inordinately high initial listing price in order to "complicate" the inference problem faced by uninformed potential buyers if the property does not sell in the first period. Hence, the seller may choose to over-price her property when entering the market, and then revise the listing price downward in the second period if the property is still unsold.

The observation that price revisions are both infrequent and sizeable, however, is not unique to real estate. For example, individual investors typically update their portfolio decisions rather infrequently, and they tend to have focal points in the percentages allocated to stocks and bonds (see, e.g., Ameriks, Caplin and Leahy [1], Lusardi [23]). "Sticky" prices and behavior also arise in many other economic contexts, and several models have been proposed that can account for these observations. [33]

4.2 Matching, Bargaining and Sale Agreement

We now turn our attention to the matching and bargaining aspects of the process leading to the sale of a property. The terms of a sale agreement are the outcome of a negotiation between the seller and the (ultimate) buyer of the property. The evidence shows that the majority of sales does not occur at the first offer. Buyers whose first offer is turned down either increase their offer or walk away. A substantial fraction of matches are unsuccessful. The vast majority of sellers who fail to reach an agreement within their first match end up selling at a higher price. However, a significant fraction end up eventually accepting a lower offer. These findings directly contradict the predictions of existing matching and bargaining theories of housing transactions.

With respect to the bargaining process between the seller and each potential buyer, it is typically assumed that when a negotiation begins, the value of the surplus to be divided (that is, the difference between the buyer's willingness to pay for the house and the minimum price at which the seller is willing to sell the house) is known to both parties (e.g., Nash [26], Rubinstein [29]). Based on this assumption, existing theoretical

[32] To be more precise, in Coles' stock-flow matching model, a seller first invites offers above an endogenously determined reserve price in an auction setting. If no bids are received, she then gradually lowers her asking price over time.

[33] See, e.g., Reis [27] and the references therein

models of housing transactions imply that agreement is reached on the first offer ever received and all matches between the seller and a potential buyer result in a sale (e.g., Arnold [3], Chen and Rosenthal [6] and [7], Krainer [22], Yavaş [33] and Yavaş and Yang [34]).

The results of our empirical analysis clearly point out the limitations of complete information bargaining models to study housing transactions, and suggest appealing to an alternative class of bargaining models that can account for salient features of the data. In a bargaining environment where the seller and the potential buyer of a property possess some private information about how much they value the property, the occurrence of delays in reaching agreement and the possibility of a negotiation terminating with a separation rather than an agreement are common features of an equilibrium. [34]

Consider, for example, a bilateral bargaining environment where the potential buyer makes all the offers (which is the case in our data) and after any rejection there is a positive probability of an exogenous negotiation breakdown (e.g., because the potential buyer finds another property). In this environment, it may be optimal for the buyer to make a relatively low initial "screening" offer that is accepted only if the seller's valuation is relatively low. If the offer is rejected, the buyer updates his beliefs about the seller's valuation and may either walk away or increase his offer, unless of course the negotiation breaks down for exogenous reasons. Note that although a rejection may be followed by a higher offer, it may still be optimal for a seller with a relatively low valuation to accept the buyer's initial offer because of the risk of negotiation breakdown. [35]

Combining this bargaining framework with the long-term optimization problem faced by the seller, we can also analyze the behavior of sellers across negotiations over time. When some sellers face a time constraint for the sale of their property, their continuation value declines over time. As a result, the minimum offer they are willing to accept also declines over time. Hence, it may be optimal for a seller to reject an offer from a potential

[34] See, e.g., the survey by Kennan and Wilson [19] and the references therein.

[35] The strategies described here correspond to the unique perfect Bayesian equilibrium of a finite-horizon sequential bargaining game with one-sided incomplete information where the uninformed player makes all the offers (e.g., Sobel and Takahashi [30]). This equilibrium would also exist in an environment with two-sided incomplete information, where other equilibria would also arise (e.g., Cho [9] and Cramton [11]).

buyer early on and then accept a lower offer from another potential buyer at a later time. [36]

In addition to providing an explanation for the empirical findings mentioned above, a theoretical framework like the one described here has interesting, additional implications that can be addressed using our data. First, holding everything else constant, the probability of success of a negotiation should decrease with the number of previous (unsuccessful) negotiations, and increase with time on the market. Obviously, the probability a negotiation is successful also increases with the level of the offers. Second, the sale price should decrease with time on the market, and increase with the number of negotiations.

Ceteris paribus, the bargaining model we described implies that the probability a seller accepts any given offer is increasing and hence the sale price is decreasing over time. Furthermore, consider two sellers who list identical properties in the same market at the same time. Given the same time on the market, the model implies that the seller who previously experienced more unsuccessful negotiations is more likely to have a higher valuation of her property than the other seller. Hence, her current negotiation is more likely to be unsuccessful. However, if it is successful, the sale price is more likely to be higher.

Alternative theories that abstract from matching and bargaining would likely be silent with respect to many of these implications. Complete information bargaining models would predict no relationship between the number of matches and either the probability of success of a negotiation or the sale price. Nevertheless, there are many alternative models of search, matching, bargaining and learning that would generate similar predictions. [37] Attempting to formally test the predictions of specific models, or to compare alternative theoretical frameworks with respect to their ability to fit various aspects of the data is beyond the scope of this paper. However, we conclude our analysis by

[36] A similar result would also obtain if the seller is uncertain about the distribution of buyers' willingness to pay for her property and learns it over time (see, e.g., Burdett and Vishwanath [5] and Dubra [12]), or if the buyers' willingness to pay for a property declines with time on the market (as in Taylor [32]).

[37] For example, a standard result in the search literature is that a higher reservation price typically leads to a longer search time, but also to a higher sale price (see, e.g., Burdett and Judd [4] and the survey by Rogerson, Shimer and Wright [28]). The same argument is also made in the empirical real estate literature (see, e.g., Genesove and Mayer [13]).

TABLE 16

Probability of Success of a Negotiation

Variable	Coef.	Std. Err.
ILISTPHAT$\times 10^{-4}$	-0.108^{**}	0.026
CLISTPRES$\times 10^{-4}$	-0.036	0.032
AGENCY1	-0.901^{**}	0.429
AGENCY2	-0.701	0.436
AGENCY3	-1.040^{**}	0.438
MONTH	-0.007	0.015
MONTHGL	0.023	0.017
DPC	-0.731^{**}	0.157
WTMATCH	-0.040^{**}	0.009
MAXOCLP	10.966^{**}	1.581
NPMATCH	-0.479^{**}	0.079
INTERCEPT	-8.306^{**}	1.528

assessing whether the stylized predictions of a general class of models where incomplete information and bargaining play a central role are supported by the data.

We begin by analyzing the relationship between the probability of success of a negotiation and the history preceding that negotiation since initial listing. We define the variable SUCCESS as a binary variable that equals one if bargaining within a match leads to a sale agreement and zero if it terminates with a separation. The results of a logit estimation where SUCCESS is the dependent variable and the set of independent variables includes the predicted listing price, ILISTPHAT, the extent to which the property is currently over-priced or under-priced, CLISTPRES, a dummy variable denoting whether the seller revised the listing price prior to the match, DPC, agency dummies, MONTH, MONTHGL, the number of weeks between initial listing and the occurrence of the match, WTMATCH, the maximum offer in the match as a percentage of the current listing price at the time of the match, MAXOCLP, and the number of previous (unsuccessful) matches, NPMATCH, are reported in Table 16.[38] As we can see from this table the estimation results are generally consistent with the implications

[38] We report robust standard errors which account for the fact that observations are independent across properties but not across negotiations within the same transaction history.

TABLE 17
Sale Price

Variable	Coef.	Std. Err.
ILISTPHAT$\times 10^{-4}$	0.978**	0.004
CLISTPRES$\times 10^{-4}$	0.948**	0.006
AGENCY1	−110.048	594.304
AGENCY2	−1562.038**	605.983
AGENCY3	−105.496	605.277
MONTH	10.717	18.868
MONTHGL	33.642	24.459
DPC	206.828	274.420
WTSALE	−21.709*	11.223
NMATCH	447.212**	125.091
INTERCEPT	−1353.986**	468.774
R^2	0.99	

of the theoretical framework described above. In particular, the probability of success of a negotiation decreases with the number of previous negotiations and increases with time on the market. [39]

Turning our attention to the relationship between the sale price and the events preceding the sale, we regress the sale price, SALEP, on the predicted listing price, ILISTPHAT, the extent to which the property is over-priced or under-priced at the time of the sale, CLISTPRES, a dummy variable denoting whether the seller revised the listing price prior to the sale, DPC, agency dummies, MONTH, MONTHGL, the number of weeks from initial listing to sale agreement, WTSALE, and the number of matches since initial listing, NMATCH. The results are contained in Table 17. Again, the estimation results by and large support the general predictions of the class of models described above. *Ceteris paribus*, the longer the time on the market, the lower the sale price. This is a well known empirical finding which is also consistent with other existing theories of housing transactions (e.g., Miller [25], and Yavaş and Yang [34]). The finding that the

[39] Also note that the the probability of success of a negotiation increases with the level of offers.

sale price increases with the number of matches, however, is new and points to the role of incomplete information and bargaining in the transaction process.

The estimation results reported in Table 17 also reveal an additional, interesting result concerning the relationship between listing price and sale price. On average, £100 in the predicted listing price (ILISTPHAT) translate into £98 in the sale price (with a 95% confidence interval between £97 and £99). However, £100 above the predicted listing price (CLISTPRES) only translate into £95 in the sale price (with a 95% confidence interval between £94 and £96).

5 Concluding Remarks

In this paper, we have analyzed a new data set of housing transactions in England. The main novelty of the data is the record of all listing price changes and all offers ever made on a property. This data has enabled us to provide a more accurate picture of the process by which residential properties are transacted and to discuss the implications of our empirical findings for theoretical research on the strategic interaction between buyers and sellers in the housing market.

Our main findings can be summarized as follows. First, listing price reductions are fairly infrequent; when they occur they are typically large. Listing price revisions appear to be triggered by a lack of offers. The size of the reduction in the listing price is larger the longer a property has been on the market.

Second, the level of a first offer relative to the listing price at the time the offer is made is lower the longer the property has been on the market, the more the property is currently over-priced, and if there has been no revision of the listing price. Negotiations typically entail several offers. About a third of all negotiations are unsuccessful (i.e., they end in a separation rather than a sale). The probability of success of a negotiation decreases with the number of previous unsuccessful negotiations.

Third, in the vast majority of cases, a property is sold to the first potential buyer who makes an offer on the property (i.e., within the first negotiation). The vast majority of sellers whose first negotiation is unsuccessful end up selling at a higher price, but a few end up accepting a lower offer. The higher the number of negotiations between initial listing and sale agreement, the higher the sale price.

In an attempt to further improve our understanding of the interactions between buyers and sellers in the housing market, our future research will focus on developing a theoretical framework capable of explaining all of the qualitative features of the data and estimating this model using our data set. We will then use the estimated structural model to quantify the effects of various policies on the behavior of buyers and sellers in the housing market, and to study the potential effects of institutional reforms of the housing market.

References

[1] J. Ameriks, A. Caplin and J. Leahy, Wealth accumulation and the propensity to plan, Quarterly Journal of Economics 118 (2003) 1007-1047.

[2] P.M. Anglin, R. Rutherford, and T.A. Springer, The trade-off between the selling price of residential properties and the time-on-the-market, Journal of Real Estate Finance and Economics 26 (2003) 95-111.

[3] M.A. Arnold, Search, bargaining and optimal asking prices, Real Estate Economics 27 (1999) 453-482.

[4] K. Burdett, and K.L. Judd, Equilibrium price dispersion, Econometrica 51 (1983) 955-970.

[5] K. Burdett, T. Vishwanath, Declining reservation wages and learning, Review of Economic Studies 55 (1988) 655-666.

[6] Y. Chen, and R.W. Rosenthal, Asking prices as commitment devices, International Economic Review 36 (1996) 129-155.

[7] Y. Chen, and R.W. Rosenthal, On the use of ceiling-price commitments by monopolists, Rand Journal of Economics 27 (1996) 207-220.

[8] P. Cheshire, and S. Sheppard, Hedonic perspectives on the price of land: Space, access, and amenity, London School of Economics, mimeo 2000.

[9] I.-K. Cho, Uncertainty and delay in bargaining, Review of Economic Studies, 57 (1990) 575-595.

[10] M.G. Coles, Stock-flow matching, University of Essex, mimeo 1998.

[11] P.C. Cramton, Bargaining with incomplete information: An infinite–horizon model with two–sided uncertainty, Review of Economic Studies 51 (1984) 579-593.

[12] J. Dubra, Optimism and overconfidence in search, Review of Economic Dynamics 7 (2004) 198-288.

[13] D. Genesove, and C.J. Mayer, Equity and time to sale in the real estate market, American Economic Review 87 (1997) 255-269.

[14] D. Genesove, and C.J. Mayer, Loss aversion and seller behavior: Evidence from the housing market, Quarterly Journal of Economics 116 (2001) 1233-1260.

[15] M. Glower, D.R. Haurin, and P.H. Hendershott, Selling time and selling price: The influence of seller motivation, Real Estate Economics, 26 (1998) 719-740.

[16] W.H. Greene, Econometric Analysis, Upper Saddle River, NJ: Prentice Hall 1997.

[17] D. Haurin, The duration of marketing time of residential housing, Journal of the American Real Estate and Urban Economics Association 16 (1988) 396-410.

[18] J.L. Horowitz, The role of the list price in housing markets: Theory and econometric model, Journal of Applied Econometrics 7 (1992) 115-129.

[19] J. Kennan, and R. Wilson, Bargaining with private information, Journal of Economic Literature 31 (1993) 45-104.

[20] J.R. Knight, C.F. Sirmans, and G.K. Turnbull, List price information in residential appraisal and underwriting, Journal of Real Estate Research 15 (1998) 59-76.

[21] J.R. Knight, Listing price, time on market, and ultimate selling price: Causes and effects of listing price changes, Real Estate Economics 30 (2002) 213-237.

[22] J. Krainer, A theory of liquidity in residential real estate markets, Journal of Urban Economics 49 (2001) 32-53.

[23] A. Lusardi, Information, expectations, and savings for retirement, in: H. Aaron (Ed.), Behavioral Dimensions of Retirement Economics, Brookings Institutions/Russell Sage Foundation, Washington, D.C. 1999, pp.81-115.

[24] N.G. Miller, and M.A. Sklarz, Pricing strategies and residential property selling prices, The Journal of Real Estate Research, 2 (1987) 31-40.

[25] R.G. Jr. Miller, Survival Analysis, John Wiley & Sons, New York 1981.

[26] J.F. Nash, The bargaining problem, Econometrica 18 (1950) 155-162.

[27] R. Reis, Inattentive consumers, Harvard University, mimeo 2003.

[28] R. Rogerson, R. Shimer and R. Wright, Search-theoretic models of the labor market: A survey, University of Pennsylvania, mimeo 2004.

[29] A. Rubinstein, Perfect equilibrium in a bargaining model, Econometrica 50 (1982) 97-109.

[30] J. Sobel, and I. Takahashi, A multistage model of bargaining, Review of Economic Studies, 50 (1983) 411-426.

[31] T.M. Springer, Single family housing transactions: Seller motivations, price and marketing time, Journal of Real Estate Finance and Economics, 13 (1996) 237-254.

[32] C.R. Taylor, Time-on-the-market as a sign of quality, Review of Economic Studies 66 (1999) 555-578.

[33] A. Yavaş, A simple search and bargaining model of real estate markets, Journal of the American Real Estate and Urban Economics Association 20 (1992) 533-548.

[34] A. Yavaş, and S. Yang, The strategic role of listing price in marketing real estate: Theory and evidence, Real Estate Economics 23 (1995) 347-368.

[35] T.W. Zuehlke, Duration dependence in the housing market, The Review of Economics and Statistics 69 (1987) 701-704.

Figure 1: Matches per property on the market, per week

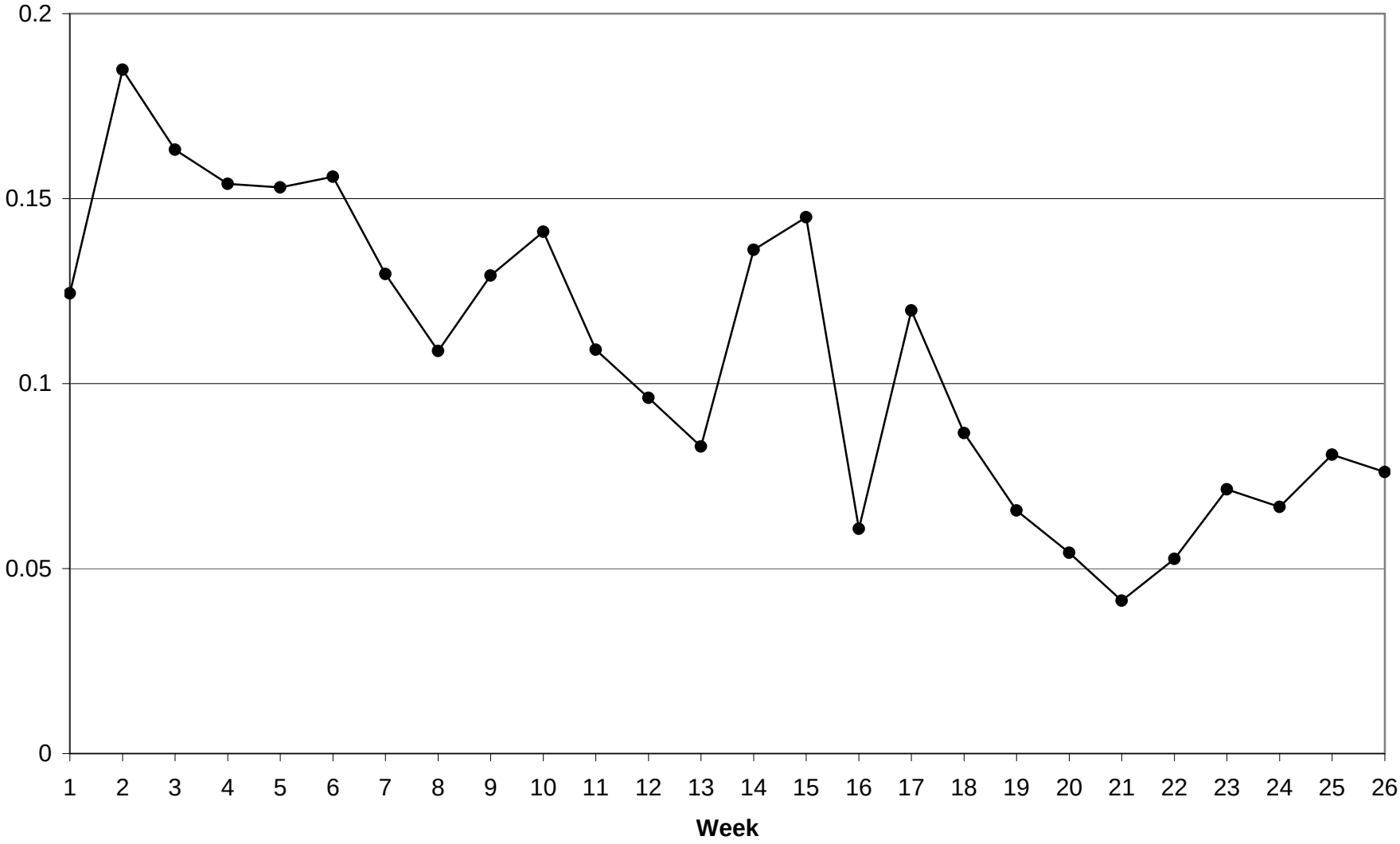

Figure 2: Viewings per property on the market, per week