Market Distortions when Agents are Better Informed:

The Value of Information in Real Estate Transactions*

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Abstract

Agents are often better informed than the clients who hire them and may exploit this informational advantage. Real-estate agents, who know much more about the housing market than the typical homeowner, are one example. Because real estate agents receive only a small share of the incremental profit when a house sells for a higher value, there is an incentive for them to convince their clients to sell their houses too cheaply and too quickly. We test these predictions by comparing home sales in which real estate agents are hired by others to sell a home to instances in which a real estate agent sells his or her own home. In the former case, the agent has distorted incentives; in the latter case, the agent wants to pursue the first-best. Consistent with the theory, we find homes owned by real estate agents sell for about 3.7 percent more than other houses and stay on the market about 9.5 days longer, even after controlling for a wide range of housing characteristics. Situations in which the agent's informational advantage is larger lead to even greater distortions. Other possible explanations, such as a lower effort on the part of agent when serving clients, lower discount rates on the part of agents, or unobserved differences in housing quality, appear less likely to account for the observed differences.

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I. Introduction

Because of specialization, individuals rely heavily on the advice of experts in making decisions. For activities as varied as medical treatment, automobile repair, legal matters, planning for retirement, or selling a home (to name just a few), there are experts with particular skills, knowledge, and experience willing to provide their services.

A defining characteristic of transactions involving the hiring of an expert is the informational advantage enjoyed by the expert relative to the client seeking advice. As a result of this private information, expert agents may mislead their clients by exaggerating the costs or difficulty of a solution, providing unneeded services, or otherwise distorting the information to maximize the expert's own payoff. For example, a lawyer may argue that his services are necessary in preparing a simple will, even though the lawyer would use the same off-the-shelf software a client could buy. An auto mechanic may suggest overhauling the entire engine when only a small part needs replacing. A travel agent may only mention flights on airlines which pay the highest commission rates to travel agents for booking.

In this paper, we focus on the relationship between a real estate agent and a home seller. The real estate agent is likely better informed about the value of the house and the state of the local housing market than is the seller. (More formally, this information advantage might be thought of as the agent having a more accurate signal of the distribution of likely offers on the house.) Typical residential real estate contracts have the real estate agent receiving only a small fraction of the purchase price of a home, but bearing much of the cost of selling the house (for example, showing the home to prospective buyers, hosting open houses, and often advertising and marketing expenditures). This induces a misalignment of incentives between the seller and agent.[1] The agent has strong incentives to sell a house quickly, even at a substantially lower price, and thus may encourage clients to accept sub-optimally low offers too quickly. A rational

[1] An interesting question to which we turn in Section VI is why existing contractual arrangements persist in light of this distortion.

homeowner will take the agent's distorted incentives into account and, as in Crawford and Sobel (1982), discount appropriately the agent's advice regarding whether a particular offer should be accepted or rejected. Nonetheless, as we formally derived in an earlier version of this paper (Levitt and Syverson 2002), if the agent is sufficiently better informed, the agent's optimal strategy is to advise the homeowner to accept any offer that is in the best interest of the agent to accept, and the homeowner's actions may be influenced by the agent's advice.[2] It is rational for the homeowner to sometimes follow this advice, despite being fully cognizant of the agent's desire to mislead, because home seller's and agent's incentives are well-enough aligned *on net* so that the seller can benefit from the agent's superior information in some instances, at the cost of the agent distorting information in a way that hurts the home seller in other instances.[3] Thus, the primary predictions of the theory are that (1) for two identical houses, one owned by a real estate agent and the other owned by a client of the real estate agent, the real estate agent's home will stay on the market for a longer period of time and sell for a higher price, and (2) the greater the informational advantage of the real estate agent, the larger these two differences will be.

The extent of the distortion induced by misaligned agent incentives may be considerable. Real estate agents typically bear a substantial fraction of the marketing costs involved with a home sale: advertising, accompanying potential buyers on visits to the home, conducting open

[2] This older version is available at home.uchicago.edu/~syverson. Note that in the formal model used in the earlier version, the agent cannot credibly convey any information beyond a simple recommendation to either accept or reject the offer. Any message that attempted to further signal the intensity of the agent's preferences is cheap talk. For any offer that is high enough that the agent would like the seller to accept, the agent will have the incentive to falsely portray the offer as being extremely high, even if it is just above the acceptability cutoff. As consequence, the seller will ignore such information (Crawford and Sobel 1982). If we were to allow cash transfers from the agent to the seller, this would provide the agent a way to convey more information about the attractiveness of the offer. When a really good offer arrives, the agent could credibly signal this by offering to make an additional payment to the seller if the offer is accepted.

[3] Since Crawford and Sobel (1982), a rich theoretical literature has developed that analyzes strategic information transmission. Theory that is particularly relevant to our analysis includes recent work on the role of experts by Taylor (1995), Krishna and Morgan (2001), Levy (2004), and Fong (2005). For surveys of the broader literature, see Kennan and Wilson (1991) and Riley (2001). There is also a great deal of work addressing how contracts are structured to encourage agents to exert the optimal amount of effort (e.g., Grossman and Hart 1983, Sappington 1991). Prendergast (2002) argues that the empirical evidence supporting the hypothesized tradeoff between risk and effort is tenuous.

houses, and negotiating offers. Typically, however, the agent receives only a small percentage of each marginal dollar of the price for which the house sells. (In the U.S., this is usually about 1.5 percent: a total commission of 6 percent of the sales price is split evenly between the buyer's and seller's agents, both of whom then give half to their firms, leaving 1.5 percent for each agent.) If the combined financial and opportunity cost to an agent of selling a house were $200 per week, then an agent earning 1.5 percent on the margin would be indifferent between selling the house today and waiting one more week and receiving an offer $13,333 higher with certainty. The homeowner, on the other hand, would much prefer to wait a week and take the higher offer. On a $300,000 house, the homeowner's one-week return from waiting would be over four percent.[4]

Real estate transactions provide an unusually attractive setting to test the impact of information distortion by experts. Unlike many experts (e.g. surgeons), real estate agents not only provide their services to clients, but also sell their own homes. When a real estate agent sells his own home, he is residual claimant on the full surplus from the sale and thus has optimal incentives. By comparing sale prices and time on the market for homes where the agent is hired by a client versus when the agent sells his or her own home (and controlling for other factors), we have a simple test of the distortions induced by the private information on the part of agents.

Using a data set of nearly 100,000 home sales, of which roughly 3,300 are agent-owned, we find that, even after controlling for a wide array of house and neighborhood characteristics, agent-owned homes sell for about 3.7 percent (or roughly $7600 at the median sales price) more than comparable houses and stay on the market an extra 9.5 days (about 10 percent) longer, even after controlling for a wide array of house and neighborhood characteristics. Although a price difference of $7,600 is large for the consumers, the real estate agent's personal share of that sum

[4] Another way of putting into perspective just how distorted are agents' incentives is to compare real estate to sharecropping, where some have argued that the contractual form leads to important distortions (e.g. Shaban 1987). In the typical sharecropping arrangement, output is split 50-50 between the land owner and the sharecropper; in real estate, the seller's agent receives a much smaller share of the marginal profit.

is only $114. It does not seem unreasonable that a self-interested agent would be willing to forego $114 to avoid having a client's home on the market an additional ten days.

This basic result is consistent with information distortion on the part of agents, but also with other competing hypotheses. For instance, real-estate agents own homes that systematically differ from those of their clients in ways that make them sell slowly, but at high prices. While it is always difficult to rule out stories about unobservables, we present below a number of arguments against such an explanation.

Two other explanations for the results are that real estate agents have lower discount rates than their clients or are less risk averse.[5] The gap we observe between agent-owned and client-owned homes, however, is too large to be explained by either divergent discount rates or differences in risk aversion. The implied annual interest rate associated with waiting an additional 9.5 days to obtain a 3.7 percent higher price is 140 percent. It is difficult to believe that even relatively impatient homeowners would willingly forego such a high expected return. Further, as we detail below, even a conservative estimate of the coefficient of relative risk aversion necessary to make a seller indifferent between a certain current offer and a risky future offer implies levels of risk aversion generally considered hard to reconcile with observed choices.

A final alternative model that could plausibly generate our empirical findings is one where shirking by the agent leads offers to be drawn at a lower rate or from a worse distribution than if the agent were selling the identical home for himself. However, theoretical results from the job search literature suggest for many common distributional forms, agent shirking that lowers offer arrival rates or results in a poorer distribution of offers would increase the expected time until a seller accepts an offer. This is inconsistent with the fact that we see non-agent-owners selling sooner than agents.

[5] While we are unaware of any empirical evidence documenting risk tolerance of agents, the fact that real-estate agents have chosen a profession with a highly variable income stream argues in favor of greater risk tolerance on the part of agents. On the other hand, shocks to home values in a market not only affect the

Beyond our basic result, we find additional evidence that is consistent with an agent information distortion explanation, but would not be predicted by these alternative hypotheses. Namely, the gap between agent-owned homes and client homes is largest in instances where agents are likely to enjoy the greatest informational advantage. We examine such differences along three dimensions. First, we stratify the sample as a function of how heterogeneous the housing stock is on a particular city block. Greater heterogeneity is likely to increase the agent's informational advantage by reducing the availability to the non-agent homeowner of directly comparable prior home sales. We find that on houses on blocks in the upper-third of our sample in terms of heterogeneity, agents get 4.3 percent more for their houses and stay on the market an extra 9.5 days. In contrast, in the third of the sample where houses on the block are most alike, agents obtain only 2.3 percent more for their houses and time on the market is not significantly different. Second, the rise of the internet has made it much easier for sellers to directly observe the characteristics of other houses on the market and to find recent transaction prices, reducing the informational advantage or realtors. Consistent with the theory (although perhaps not entirely convincing because of its reliance on time series variation), in the period 1992-1995, observationally equivalent agent homes sold for 4.9 percent more than those of their clients and stayed on the market over two weeks longer. From 2000-2002, in contrast, agents obtained only 2.9 percent more for their houses and stayed on the market 2.5 days longer. Finally, in the case where the *buyer* is not represented by a realtor, the seller's realtor may have a greater ability to determine the sale price. We find that the absence of a buyer's agent has no impact on the sale price of client homes, but is associated with a 1.7 percent-higher sale price when the realtor sells his own house. This finding suggests that the realtor successfully exploits uninformed buyers when selling his or her own house, but does not reap the available gain for clients (perhaps because tough bargaining might jeopardize a deal being reached).

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price an agent receives for his own home, but also affect the agent's income stream (both because agent commissions are tied to sale prices and because the volume of home sales tends to fall as prices fall).

Our paper builds on a small empirical literature in this area. Hubbard (1998, 2002) analyzes data from the California vehicle inspection emission market and finds that inspection suppliers tend to let vehicles pass inspections, even though they would incur a short-run benefit from repairing those that fail—the reason being that lenient inspections are rewarded with repeat business. Gruber and Owings (1996) provide tantalizing evidence of how physicians may distort decisions to further their own interests. Doctors in areas with declining birth rates are found to be much more likely to perform caesarian sections than are doctors in growing areas. Gruber and Owings interpret this result as possible evidence that excess capacity leads doctors to induce demand for more expensive services from their clients. The research most similar to ours is Rutherford, Springer, and Yavas (2005), who, in independent work, find that agent-owners earn higher selling prices on their homes, but see no time-on-market difference. Their focus is on the effort exerted by the agent, rather than information distortion. Consequently, they do not test, as we do here, if agent-owners do systematically better in market subsets where one might expect they hold a greater information advantage.[6]

The structure of the paper is as follows. Section II introduces the data used. Section III presents the basic empirical analysis. Section IV discusses the competing theoretical explanations and undertakes additional analysis of the data in an attempt between the alternatives. Section V discusses the results and concludes.

II. Data Used in the Analysis

The data we use encompass nearly 100,000 home sales in suburban Cook County, Illinois (the county contains the city of Chicago). The source of the data is the Multiple Listing Service of Northern Illinois (MLSNI), the clearinghouse through which realtors in the Chicago

[6] Germaise and Moskowitz (2004) analyze a different type of information asymmetry in commercial real estate transactions. Our results also contribute to growing literatures on time on the market (e.g. Genesove and Mayer 1997; Taylor 1999; Merlo and Ortalo-Magné 2004) and the impact of agency form on sales

metropolitan area notify other realtors (and, more recently, the public) of properties for sale.[7] These data have numerous strengths. First, they cover virtually every house put up for sale in which a seller's agent is hired, regardless of whether the house is eventually sold. Most of the analysis presented below focuses on homes that actually sell, but we are also able to explore whether or not listed homes sell as a check on possible selection biases. Second, the data contain extremely detailed information about every house on the market, including the address, a wide range of housing characteristics, the list price and sale price of the home, a written description of the house's attributes used by the real estate agent in marketing the house, and the key dates regarding the home sale (e.g., when the house goes on the market, the date a contract is signed with a buyer, etc.). Third, the data report whether the real estate agent has an ownership interest in the house, which is critical to our identification strategy.

The MLSNI data do, however, have a number of important flaws and limitations. First, the dataset does not provide any information about homes that are for-sale-by-owner (FSBO). Second, the information in the database is entered by the real estate agents themselves. There is no independent check on the accuracy of the description of the home's attributes.[8] Also, there are few restrictions on what agents can type into a field in the data base and no requirement that all fields be completed. As a consequence, there are substantial amounts of missing data for some variables (e.g. approximate square footage), some evidence of obvious errors, and a lack of uniformity in the way fields are coded.[9]

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outcomes (e.g., Munneke and Yavas 2001; Hendel, Nevo, and Ortalo-Magné 2007; Bernheim and Meer 2008; and Levitt and Syverson 2008).

[7] Further details about MLSNI can be found at www.mlsni.com. The archived data we utilize in this paper are not publicly available, but can be obtained by any licensed realtor who is part of MLSNI.

[8] For some entries such as listing prices and addresses, there are strong incentives for the agent to enter the correct numbers, since this database is the primary mechanism through which other agents learn what properties are currently for sale.

[9] For instance, we observe over fifty different entries for the field asking the presence or absence of "air conditioning," corresponding to different conventions for abbreviating responses and different types of systems such as wall units, central air, zoned central air, space-pacs, or a combination thereof.

Our primary sample is made up of single-family homes that were listed for sale in 34 Cook County suburbs during the period 1992-2002. These suburbs are the 34 largest municipalities in the county in which the majority of properties listed for sale are detached single family homes (this excludes the city of Chicago, for which a notably smaller share of real-estate transactions are detached single family homes) and in which sales of newly constructed homes represent a small fraction of overall sales.

We impose a number of restrictions on the data. We use county tax identification numbers to link listing and sales activity on a given property over time. Properties that are missing tax identification numbers, or have errors in these numbers (for instance, two properties listing the same tax ID number but located in different cities) are dropped from the sample. The ability to link separate listing episodes for a given house is important when we measure time-to-sale, because houses are sometimes strategically de-listed and quickly re-listed in order to reset the "days on market" field in the MLS listing. We therefore compute time-to-sale by summing across all of a house's listing periods that are separated by fewer than 180 days. Additionally, we drop from the sample any home that is sold twice within a three-year period. This is due to concerns that the house has been purchased and rehabbed for resale. In the presence of imperfect measures of a house's quality, these repeat transactions may yield particularly misleading results, especially if real estate agents are more likely to be rehabbers than other sellers.[10]

After these initial exclusions, we are left with listings for just under 127,000 homes. About 22 percent of these homes are withdrawn from the market before a sale ever occurs, and hence are not used in our sample. (This raises sample selection issues that will be discussed below.) We also eliminate a small number of properties with either very low or high listing prices or sale prices (less than $50,000, more than $3,000,000, or a price more than five times the median value in that city), and properties with suspicious entries such as those reporting no

bathrooms, no kitchen, etc. Finally, in order to estimate all models with a common sample, about 450 listings are removed because of missing data for one or more of the variables included in the hedonic model. This leaves us a final data set with roughly 98,000 home sales. About 3.4 percent of the observations in our data—3330 sales—involve a real estate agent selling his or her own home.

Table 1 presents selected summary statistics for the key variables in the data set.[11] The first two columns report the mean and standard deviation of these variables over the entire sample. Columns 3-5 show a set of three statistics regarding data variations within city-year cells. Column 3 contains the standard deviations of the variables' within-city-year components; that is, the standard deviation of the residual when the variable is regressed on a set of city-year dummies. Column 4 shows differences between the means of the agent-owned and non-agent-owned home sales within each city-year, and column 5 reports the p-value of a test for equality of the means. Columns 6-8 report data that parallels the information in columns 3-5, but present within-block, rather than city-year comparisons.

The top panel of the table shows our primary variables of interest: sale price (in levels and logs), time on the market, and whether a listed home ever sells. Consistent with the prediction of the model, even on a given block, agent-as-seller homes sell for substantially more ($48,445 on average, or 18 percent of the mean sales price)[12] and conditional on a sale occurring, remain on the market for almost 15 days longer than other homes. We also find that a smaller

[10] A rehabber can get better access to properties and can collect commissions on property transactions by becoming a real estate agent. Thus most rehabbers are likely to also have real estate licenses. It is worth noting, however, that our empirical results are not sensitive to excluding repeat sales.

[11] The full set of summary statistics for all variables in the empirical specifications can be found in Levitt and Syverson (2005).

[12] The skewness of the house price distribution may exaggerate the size of a typical difference. The mean difference in logged sales prices—the primary difference we focus on below—suggests a 12-percent difference in sales prices.

fraction of the agent-owned homes that are put on the market eventually sell.[13] This reinforces the fact that agent-owned homes take longer to sell. If one computes the average number of days on the market per home sale, including properties that never sell in the numerator, agent-owned houses are on the market 135 days per sale, compared to only 111 for non-agent-owned houses, or 22 percent longer.

It is clear from the remainder of the table, however, that the attributes and locations of homes owned by agents are systematically different from the non-agent-owned homes. Real estate agents tend to live in homes that are larger, even compared to other houses on the same city block. Further results shown in Levitt and Syverson (2005) indicate that agent-owned homes are also newer and have greater numbers of amenities like master baths and fireplaces. These systematic differences in housing characteristics highlight the importance of controls in the analysis we carry out. Although we have an extremely rich set of covariates, the possibility remains that realtor-owned properties might be correlated with unobservable characteristics of the housing.

III. Core Empirical Estimates

The empirical specification we estimate to predict sale prices and time-on-market that is most fully saturated takes the following form:

$$y_{htc} = \beta * AGENT\_OWNED_{ht} + X_{ht}\gamma + \kappa_{ct} + \lambda_b + \varepsilon_{ht},$$

where *h*, *t*, *c*, and *b* correspond respectively to house, year, city, and city block. The dependent

[13] Agent-owned homes that never sell remain on the market an average of 182 days, compared to 176 days for non-agent-owned homes. The results that we present in our tables are restricted to properties that actually sell, raising sample selection issues. We do not model the delisting decision; if agent-owners make systematically different decisions about pulling their houses off the market, some of the differences we find among houses that are sold may reflect delisting behavior. If agents with idiosyncratically lower quality houses are more likely to delist than non-agent owners, for example, this could explain our finding below that agent-owners receive higher sales prices. We cannot completely rule out such selection effects on price, but we are able to address the time-on-market differences. We have estimated a hazard model on the probability a particular home sells as a function of observables. This allows us to directly account for the

variable y is either a house's logged sales price or days on the market. The full set of housing characteristics included in X_{ht} is listed in the Appendix. These include categorical measures of numbers of rooms of different types, numbers of garage stalls and fireplaces, dummies for the presence of certain amenities like master baths, twenty-one indicator variables corresponding to the style of the house (e.g. bungalow, cape cod, colonial, tudor), five indicators describing the home's exterior (e.g. brick, wood, vinyl siding), and nearly 100 indicators for keywords included in the written description of the home (e.g. spacious, amazing, granite, youthful). In addition, we allow for city-specific variation in annual prices (κ_{ct}), and fixed-effects for each city block (λ_b).

Table 2 presents a series of regression results in which the set of control variables is expanded as one moves from left to right. The logged sales price coefficients on agent-owned houses are presented in the top row of numbers, and the corresponding coefficients for days on the market are shown in a lower row. Heteroskedasticity-consistent standard errors are in parentheses. In addition, the bottom row of the table reports the "excess returns" accruing to the realtor, computed as the additional sale price they receive minus the cost of waiting longer to sell. We use an annual discount rate of 20 percent in these calculations—a number that is high, but consistent with the previous research of Genesove and Mayer (1997).

Column 1 includes fixed effects for each city-year pair as well as controls for the subset of our observed housing characteristics that reflect the *scale* of the house (e.g., number of bedrooms, number of bathrooms, how many cars the garage can hold). Controlling for house scale substantially reduces the estimated impact of agent ownership from the simple within-city mean differences in Table 1. The sales price difference between agent-owned and non-agent-owned homes is 4.8 percent, almost two-thirds less than the within-city difference obtained before conditioning on scale. Thus the fact that agents live in their cities' larger-than-average homes, as seen before in Table 1, is in part responsible for the observed differences in sales prices

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fact that certain listing episodes are truncated (i.e., pulled off the market) before a sale is ever made. We found, reassuringly, that the hazard model results are close to the simpler OLS specifications.

and time on the market. The difference in time on the market is about 17 days, one-third less than the unconditional value in Table 1. Adjusting for the longer time on the market, realtors achieve an extra return of 3.9 percent on their houses. The coefficients on the control variables (not shown) indicate that as expected, more is better.

A particular concern in testing the hypotheses of the model is that agents live in houses that are especially attractive along dimensions that are difficult for us to observe or quantify. For instance, agents may have good taste, take better care of their houses, or live in houses that have more features desired by potential home buyers (e.g., master bedroom suites, modern kitchens, and so on). The specifications in columns 2 and 3 of Table 2 attempt to control for possible differences in quality in two ways.

In column 2, a wide range of housing characteristics are added such as the a variable for the presence of a master bathroom, the number of fireplaces, the presence of air conditioning, the house's age (category), the exterior material (brick, stucco, etc.), and the house's architectural style (colonial, bungalow, etc.). We also control for the listing agent's total number of sales as a proxy for reputation and experience effects. When these controls are added, the agent-owned coefficient in the sale price equation drops slightly, from 0.048 to 0.042, while the estimated difference in days on the market falls from 16.89 to 11.03. Because the gap in time on the market shrinks between column 1 and column 2, the implied excess return accruing to agent-owned homes falls only half as much as the sale-price gap (i.e., from 3.9 percent to 3.6 percent).

In column 3, we add dummy variables for a large set of keywords and phrases used in the written marketing description of the house. When these descriptors are added, neither coefficient changes by more than 10 percent. This is despite the fact that many descriptors enter into the regression significantly. Systematic quality differences appear to be responsible for part of the gap between agent-owned and non-agent-owned homes sales prices and times-on-market, although most of the difference is explained by broad indicators of age and style rather than by more subtle characteristics picked up by the agents' descriptions.

A way to further remove possible biases due to unobservables is to include block fixed effects so that identification of the parameters comes from a comparison of sale prices of different homes on the same block, rather than from homes in different areas of a city. Homes on the same block are nearly identical in terms of school quality, crime, proximity to public transportation and parks, etc. As demonstrated in column 4, the R^2 of the regressions—and particularly those for time-on-market—jump noticeably when block affects are added, suggesting the presence of important differences across blocks within a city. The estimated sales price and time-on-market impacts of a home being agent-owned, however, see only small and statistically insignificant drops with the inclusion of block fixed effects. The implied price gap between agent-owned and non-agent-owned home sales is 3.7 percent, with agent-owned homes staying on the market 9.5 days longer.[14]

The results of Table 2 suggest that the primary dimension along which agent-owned houses differ from other homes is in terms of scale and readily identifiable amenities such as master baths. Controlling for these basic factors dramatically lowers the gaps between agent-owned and other houses, relative to the means of the raw data. Including a wide range of controls in addition to these basic ones does account for much of the residual variance in sale prices, but has a relatively small impact on the measured impact of agent-ownership.

The estimated realtor-owned-home coefficient has a plausible magnitude. A 3.7-percent divergence in sales price for the median-priced non-agent-owned home in our sample ($206,000)

[14] If we push the data even further, adding block-year interactions so that we only identify the coefficients off of variation across multiple homes on the same block which have an original listing date in the same calendar year, we find that agent-owned homes sell for 3.5 percent more (standard error of 0.5 percent) and stay on the market 11.2 days longer (standard error of 3.7 days). Forty percent of the homes in our sample are on blocks with multiple sales in that year.

Merlo and Ortalo-Magné (2004) find that lower list prices trade off the possibility of selling at a higher price for a higher arrival rate of potential buyers. When we re-estimate the specification of column 4 using original listing prices rather than sales prices, we find list prices of agent-owned homes are 3.4 (s.e. = 0.3) percent higher than those of comparable non-agent-owned homes.

Since real-estate agents tend to own homes that are better than the average house on a block, we have also estimated specifications limiting the sample to the twenty percent of houses on the block that have the highest predicted sale price based on our hedonic regression. The results are very similar to those for the whole sample.

implies a $7600 higher sales price for an equivalent agent-owned home. The additional time on the market spent by agent-owned homes is roughly 10 percent of the average listing time. Even if one uses an extremely high annual discount rate of 20 percent (but one that is consistent with the behavior of home sellers in Genesove and Mayer 1997), then adjusting for the longer time on the market, agent houses sell for the equivalent of 3.2 percent more than the homes of their clients, as shown in the bottom row of Table 2.[15]

Table 3 reports the parameters for a subset of the control variables included in the regression with block fixed effects.[16] While these are not the primary focus of our analysis, it is reassuring that the coefficients on these characteristics are sensible. For example, all else constant, a house with four bedrooms sells for 6.1 percent more than one with three bedrooms, going from 1.5 to 2.0 baths is worth 1.4 percent, central air is worth 6.8 percent relative to no air conditioning, brick houses sell for an 3.6 percent premium over those with siding, and colonials sell for 8.5 percent more than otherwise identical ranch-style home.

Although not shown in tabular form, the coefficients on the words used in the written descriptions of the properties are also of some interest. Words that indicate obvious problems with a house, such as "foreclosure," "as-is," "handyman special," etc. are associated with substantially lower sale prices.[17] Words that correspond to well-defined and desirable attributes of the house that are not otherwise communicated in the property listing, e.g. "granite," "maple," "gourmet," etc., are related to higher sale prices. Among the words that have zero or even negative correlations with prices are some that are superficially positive, but in effect damn with

[15] Indeed, our results may provide a partial explanation for Genesove and Mayer's (1997) finding that home sellers in their sample have a high implied discount rate. If our analysis is correct, sellers sell too quickly not only because of impatience, but also because agents convince them to do so.

[16] Only a subset is shown for space reasons. Full results are available in Levitt and Syverson (2005).

[17] Our basic findings regarding agent-owned homes are robust to excluding these problem properties. If we drop any property that has one of the keywords that might indicate a property in unusual disrepair (there are a total of 15,232 such homes in our sample), the estimate on the agent-owner dummy in the sales price regression is 0.036 (0.003), essentially the same as that for the full sample. The coefficient in the time-on-market regression is 9.20 (2.44), also very close to the full-sample result.

faint praise (like “clean,” “quiet,” and “youthful”); words and phrases that do not describe particular characteristics of the house (e.g., “fantastic,” “charming,” and “!”); and those that characterize features of the house already covered by other information available in the listing sheet (e.g. “spacious”).

IV. Can theories that do not involve real-estate agent shirking or information distortion explain the observed patterns in the data?

A number of different theories can, in principle, produce the basic pattern of results we observe in the data. In this section, we attempt to distinguish between these competing hypotheses. We begin with a discussion of how such results could be generated within competitive markets without either informational frictions or agency problems. In Section V we then turn to stories involving information distortion or shirking on the part of agents.

There are three potential reasons why agent-owned homes might sell for more and remain on the market longer than the homes of clients, even if agents provide the same level of service and advice to clients as when they sell their own homes: unobserved differences between the characteristics of agent-owned homes and those of their clients, greater patience on the part of agents, and less risk aversion on the part of agents. We consider these three explanations in turn.

a) Unobserved differences between agent-owned and client homes

Despite our best attempts to control for housing characteristics, it remains a possibility that agents own homes that systematically differ from those of non-agents on dimensions that we cannot observe. Our results are not easily reconciled with either a model in which real-estate agent houses are more attractive on unobservable dimensions such as good taste in choices of décor; if that were the case, one would expect agent homes to sell more quickly than client homes, rather than less quickly. If, instead, agent-owned homes are decorated in an expensive but idiosyncratic fashion, these houses may sell slowly because they appeal to a small subset of buyers, but fetch a high price because within this set of buyers the home is especially highly

valued. A wide array of anecdotal evidence, however, argues that real estate agents advocate decorating choices that will give their homes the broadest appeal possible.[18]

Nonetheless, we attempt to quantify the potential importance of unobserved heterogeneity in two ways, neither of which is definitive. First, following the methodology of Murphy and Topel (1990), under the assumption that the unexplained variation in our outcome variables is related to our agent-owned variable in the same way as the variation that we can explain, we can estimate the true coefficients, even if some bias due to unobservables remains in our specifications. Moving from column 2 to column 4 of Table 2, the sale price coefficient falls from 4.2 percent to 3.7 percent as the R-squared of the regression rises from .886 to .958. Extending that trend over the remaining unexplained variation yields an estimate of 3.4 percent on the agent-owned variable in the sale price regression. The time on the market results, because the R-squared is lower, are slightly more sensitive, yielding an estimated true underlying coefficient of 5.7 extra days on the market, compared to our estimate of 9.5 days.

A second approach to eliminating unobserved heterogeneity is the inclusion of agent fixed effects in the specification. To the extent that the unobserved characteristics of an agent's own home are correlated with the unobserved characteristics of that agent's clients' homes, this specification will reduce bias due to unobserved heterogeneity.[19] With agent fixed effects included, the coefficient on the agent-owned variable in the sale price regression is 2.9 percent

[18] On its website, the National Association of Realtors (2007) suggests preparing a home for sale by "…repainting dingy, soiled or strongly colored walls with a neutral shade of paint, such as off-white or beige. The same neutral scheme can be applied to carpets and linoleum." In an interview in *Realtor Magazine* (Evans [2002]), a home stager—an individual hired to prepare homes for showings—described the duties involved as, "A stager goes in and furnishes as neutrally as possible to appeal to the widest audience." The large Canadian real estate company Royal Lepage (2007) offers the following tip to homeowners preparing a home for sale: "Don't be too unique. Keep your décor simple and modern with neutral wall colours. Unusual accessories and strong wall colours will limit your pool of buyers."

[19] Agent fixed effects will also deal with possible bias arising if the set of agents who sell their own homes is not representative of agents as a whole.

(standard error of 0.3 percent) and in the time on the market regression the coefficient is 6.5 days (standard error of 2.3 days).[20]

Based on these two approaches, it appears that unobserved heterogeneity may explain some small portion of our findings, but cannot explain the overall patterns.

b) Lower discount rates on the part of agents

If real-estate agents have systematically lower discount rates when selling their own homes than their clients, the agents will tend to receive a higher price for an otherwise identical home, offset by a longer time to sale, just as we observe in the data. Real-estate agents may be more patient than clients if, for instance, agents are less likely to be making job-related moves that are time sensitive. Agents may also appear more patient if they suffer less disutility from maintaining their home in the state required for home showings.

The required differences in discount rates needed to explain our results are unrealistically large, however. A 3.7 percent higher sale price in return for a waiting an additional 9.5 days is an expected annual return rate of 140 percent.[21] While Genesove and Mayer (1997) found evidence of unusually high implied discount rates on the part of home sellers (20 percent annually), this is still just one-seventh of would be needed to explain our findings as being driven solely by differences in discount rates.

c) Less risk aversion on the part of agents

If agents are less risk averse than their clients, they will place a lower value on an offer in hand today relative to the uncertain prospect of a higher future offer. The fact that the income stream accruing to a real estate agent is far more variable than that of the typical American is consistent with greater risk tolerance on the part of agents. Arguing in the opposite direction, however, is the fact that real estate agent wealth is more sensitive to housing price shocks than is

[20] Because of computational limits, we are unable to estimate specifications that include both agent fixed effects and block fixed effects. The results we report with agent fixed effects therefore correspond to the specifications in column 3 of Table 3 rather than column 4.

[21] If $(1 + r/365)^{9.5} = 1.037$, then $r = 1.399$.

that of the typical client. While housing shocks affect the housing wealth of both agents and clients, they have an additional impact on real-estate agents, since their earnings are also affected. Negative housing shocks impact agent earnings through price effects, since commissions are a relatively fixed proportion of the sale price (although free entry into the profession dampens this effect; see Hsieh and Moretti [2003]), and perhaps even more so through quantity effects due to the decline in the volume of sales.

To put further perspective on the degree of risk aversion necessary to explain the agent-owner gap, consider the following back-of-the-envelope calculation. Suppose an individual with constant relative risk aversion utility is able to obtain a payoff X with certainty. This could be, for example, an offer-in-hand for a house. For this person to prefer this payoff to one equal to kX, where k is normally distributed with mean 1.037 and standard deviation 0.1145, he would have to have a coefficient of relative risk aversion greater than 5.5.[22] A risk aversion coefficient of 5.5 is at the top end of values typically used in the literature; see the discussion in Kocherlakota (1996), for example. This calculation, however, greatly overstates the risk associated with waiting because it assumes the seller must accept the next offer, no matter how low. If we instead assume sellers only need to accept offers lower than X with 50 percent probability (say because some exogenous factor forces a sale), then a seller must have a coefficient of risk aversion above 9.8 to prefer X with certainty.

V. Distinguishing between shirking and information distortion on the part of agents

To the extent that the explanations discussed above do not appear sufficient to explain the magnitude of our findings, there appears to be room for the role of agent distortions, either via shirking on effort or exploiting an informational advantage.

[22] The level of X is inconsequential here because of the CRRA assumption. The standard deviation of k was calibrated as the standard deviation of logged house price residuals from our benchmark specification in Table 3, column 4. We take this as a rough approximation of random dispersion in the offer distribution.

There are a number of pieces of evidence that persuade us that informational asymmetries are more likely to explain the results than shirking. From a theoretical perspective, shirking is unlikely to lead clients to pull their houses off the market more quickly. Agent shirking can affect offers in two ways: by reducing the rate at which offers arrive, or by generating offers from a lower price distribution. Burdett and Ondrich (1985) show in a labor market setting that if the offer distribution is logconcave (i.e., the log of the density function is concave; many standard distributions exhibit this property, including for example the uniform, normal, beta, exponential, and extreme value distributions), then lower offer arrival rates, a lower mean of the offer distribution (holding variance constant), or lower offer variance (holding the mean constant)—each possible consequences of agent shirking—imply longer expected times until an offer is accepted. These predictions contrast with our findings that non-agent owners sell sooner than do agents.

Secondly, for shirking to be important it must either be difficult for clients to observe their agent's effort, or impossible to verify, so that contracts cannot be conditioned on this information. Many of the tasks performed by an agent, however, are readily observed by the homeowner (e.g. the placement of advertising, conducting open houses and showings, generating a written description of the home's attributes).

Third, there is some evidence that the gap between agent-owned homes and those of their clients systematically vary with the agent's informational advantage. We examine this issue along three different dimensions, reporting the results in Table 4.

The first dimension we analyze is the degree of heterogeneity in the housing stock on the city block where the home is located. In areas with nearly identical homes, sellers can learn much about their own homes' values simply by noting nearby sales prices. When housing stock in an area is very heterogeneous, however, other sales prices convey less information to sellers about their own homes' values. We proxy heterogeneity by constructing a Herfindahl index of home styles among houses sold on the block in our sample period. (That is, we sum the squared

shares of each housing style on the block.) In order to be included in the analysis, we require at least 3 homes to be sold on the block. Houses are classified into 21 different styles (e.g., ranch, colonial, American four square, prairie, contemporary) using the MLS listing descriptions. We then divide blocks into three equally sized groups according to the Herfindahl measure. The estimates of the impact of an agent-owned home are reported in the panel A of Table 4. We also report the implied "excess return" of the realtor as above, where we adjust the agent-owner price gap for differences in time on the market using an annual discount rate of 20 percent.

As can be seen in the table, the sales price difference between agent-owned homes and other homes is indeed highest on blocks where the houses are most different. Here, the price difference is 4.3 percent. The gap is smaller in the moderate-heterogeneity blocks (3.9 percent), and smaller still on the low-heterogeneity blocks (2.3 percent—roughly half that of the most dissimilar blocks), all in accordance with the notion that neighborhoods with dissimilar houses present a larger information advantage for realtors. We can reject at the five percent level that both the high- and medium-heterogeneity subsample effects equal the low-heterogeneity effect, though we cannot statistically distinguish between the former two. The time on the market differences reflect similar contrasts. Agents on the more heterogeneous blocks clearly keep their houses on the market for a longer period than non-agents, while there is no statistically significant time-to-sale gap on those blocks with the most similar houses. (Statistical imprecision does cloud these results somewhat, however. The point estimate for the moderate-heterogeneity blocks is slightly higher than for the high-heterogeneity blocks, and we cannot reject equality of the three estimated agent-owner effects across the subsamples.) Finally, the sizes of agents' implied excess returns in the three sub-samples are in accordance with expectations: it is largest for the most dissimilar blocks but gets progressively smaller as heterogeneity falls.[23]

[23] We have also attempted to measure heterogeneity of housing based upon the measured heterogeneity in the overall observable characteristics of homes sold on the block. To obtain that block-level measure of house heterogeneity, we first regress logged sales prices on a set of city-year dummies and block effects. The residuals from this regression are that portion of home sales prices not driven by temporal or spatial

The second dimension along which we expect to see systematic differences in agents' information advantage relates to the introduction of the internet. In recent years information about house sale prices have become readily available to the general public on the Chicago Tribune website. In addition, sellers can now directly access a limited version of the MLS. There are also web-based services that will predict the market value of a home based on econometric models (e.g., Case and Shiller [1990]) and information the seller enters into the program. Because of the improved information dissemination, we expect that the information advantage of realtors has fallen over time. We report in panel B of Table 4 the results from estimating our full hedonic specification on three sub-samples of the data stratified by time period (1992-1995, 1996-1999, and 2000-2002).

As expected, the largest average sales price difference between agent-owned and non-agent-owned homes—4.9 percent—is in the earliest period. This falls by about one-third, to 3.2 percent, when the internet is starting to widely diffuse during 1996-1999. We can reject equality of this estimate with that from earlier period at the five percent level. The point estimate drops again slightly in the last period, though not significantly (however, it is also significantly lower than the earliest period's estimate). The time-on-market differences echo these patterns. Agent-owners wait more than two weeks longer before 1996, just over a week longer in the middle period, and two-and-a-half days longer in 2000-2002. These estimates are less precise, however; while we can reject equality of the time-on-market differences across the earliest and latest period at the 10 percent level, the two other pairwise subsample comparisons are not significantly different. The implied excess return for agent-owned homes, shown in the final column, is roughly 50 percent higher in the first part of the sample than in the latter parts, although indistinguishable between the middle and end periods. There are, of course, many other changes

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differences in average price levels. These residuals therefore embody between-home differences in observable characteristics, such as the number of rooms, the age of the home, and so on. We use the average squared residual on each block as our measure of block heterogeneity. The results are similar to those obtained using the Herfindahl index based on housing styles.

in the real estate market over time (e.g. price levels, availability of low down payment loans, etc.) besides increasing information availability for consumers.[24] Nonetheless, the time-series pattern is at least consistent with our prediction regarding information.

The third dimension along which the informational advantage may vary is with respect to the presence of a buyer's agent. In most transactions, the sellers and buyers are represented by different agents. In some transactions, only the seller has an agent, or the same agent represents both the seller and the buyer. There are at least two channels through which the absence of an independent agent representing the buyer could enhance the information advantage of the seller's realtor. First, the selling agent would communicate directly with potential home buyers, providing an additional channel through which to affect outcomes (perhaps without the seller's complete knowledge). If a buyer has a realtor, on the other hand, the two realtors talk to each other instead of the opposing clients. Second, when buyers do not have agents, the selling realtor's commissions double since fees do not have to be split with a buyer's agent. Therefore sell-side agents have strong incentives to sell to buyers without agents; when realtors sell their own homes, however, the incremental gain of 1.5 percent from making a sale with no buyer's agent is only a small portion of the total value of the house.

To test these hypotheses, we re-run our basic specification for the sales price of the home, but add to the specification an indicator variable for the presence of a buyer's agent (a value of

[24] As with many other urban areas in North America and Western Europe, the Chicago metro area saw accelerated house price growth in the late 1990s after several sluggish years (though the magnitudes were relatively modest compared to some other cities—median prices in our sample never rose more than 11.6 percent per year). The timing of this acceleration raises the possibility that our results in this particular test confound information diffusion with changes in aggregate market conditions. While we cannot explicitly rule this out, it does not line up quantitatively with the facts that the sales price, time-on-market, and implied information gaps tightened most between the first and second periods, while on the other hand aggregate market conditions changed much more between the second and third periods than between the first two (e.g., the median sales price grew 8.4 percent between the 1992-1995 and 1996-1999 periods but fully 35.3 percent between the second and third periods).

zero implies only the seller's agent is involved in the transaction), as well as an interaction of this indicator with the agent-owned dummy.[25]

The results, presented in the panel C of Table 4, fit nicely with the theoretical predictions. The absence of a buyer's agent has a negligible impact on sale price when a selling agent is representing a client; the logged price effect (not reported in the table) is 0.0005 with a standard error of 0.002. When the agent is selling his or her own home, on the other hand, the absence of a buyer's agent is associated with a statistically significant 1.9 percent increase in the sale price, raising the agent-owned gap from 3.3 percent to 5.2 percent. One interpretation of this result is that buyers without agents are less well informed and susceptible to paying higher prices if the seller's realtor wishes to extract the surplus. But, since the selling agent earns twice as much by selling to a buyer without an agent, they do not attempt to extract the surplus for their client at the risk of the deal failing to go through. When the agent sells his or her own home, however, buyers without agents are exploited to the full extent possible since the agent is the residual claimant.

VI. Conclusion

Experts hold valuable information. This information is helpful to those who hire them, but can also be a source of welfare-reducing distortions. In this paper, we examine economic interactions between experts and their clients in a particular industry, residential real estate. The empirical estimates suggest the distortions are non-trivial: agents sell their own homes for 3.7 percent (roughly $7,600) more than they sell their client's homes, and leave their houses on the market roughly 10 days (10 percent) longer. While this pattern of results is directionally consistent with other explanations such as differences in discount rates or risk aversion across agents and their clients, the magnitudes of the coefficients are not easily reconciled with such explanations. Agent shirking on client homes also seems unlikely to be driving our results, given

[25] Time-on-the-market regressions will not provide meaningful information in this context, since time on the market is a function of the entire history of the house's listing experience, and has little to do with

that for many plausible offer distributions, shirking would tend to cause non-agent-owned homes to stay on the market longer than agent-owned homes. Further, none of these otherwise plausible alternatives would explain our findings that situations where agents are likely to have greater information advantages are associated with larger sales price and time-on-the-market differences between agents and their clients. Our favored interpretation of the data is that the combination of real estate agents' information advantage and the form of the commission received combine to create distortions from first best. Homeowners are induced by their agents to sell too quickly and at a price that is too low.

Our results raise a number of important questions. First, why do reputation concerns not more effectively discipline agents? One reason is that repeat business with a given client is far from certain; homeowners do not sell very frequently and often move out of the area after doing so. Perhaps an even more compelling reason for weak reputation effects, however, is that homeowners do not observe the counterfactual outcome. That is, they never see what their house would have sold for had they waited the extra time that agents do when selling their own homes. As List (2006) shows, verification (being able to observe the true quality of the good or service exchanged) is a complement to reputation; its absence makes reputation less able to reduce the impact of information asymmetries. In terms of empirical patterns, when we divide the sample according to how many homes an agent sells in total over the sample, we find no evidence that the most prolific agents obtain higher sales prices for their clients or sell these homes more quickly, but these prolific agents *do* sell their own homes for 4.0 percent more than their clients' homes, controlling for other factors, compared to a difference of only 2.2 percent for agents with fewer listings. The difference in sales price when selling their own homes is statistically significant at the .05 level; there are no significant differences in time on the market for these two groups of agents. These results are inconsistent with reputation being an effective force in

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precise identity of the final purchaser and whether that person is represented by an agent.

disciplining agents. Rather, it appears that the most experienced agents have the ability to achieve higher returns for their clients—as evidenced by their success with their own homes—but fail to deliver this extra value to their clients.

A second puzzle that arises is why a contractual form that so badly misaligns agent and home-seller incentives arose and persists. One might imagine a better alternative would be one similar to that in the used automobile market: an intermediary purchases used cars for resale at a markup to buyers with higher valuations. By purchasing the used cars outright, the intermediary then earns the full markup, rather than a small percentage as with houses. Such a system, however, would appear to be even less efficient than the current set-up for home sales because the carrying costs of a home are so great. The implied interest payments on a $200,000 home are roughly $1,000-$1,500 per month at reasonable interest rates. If it took, say, an average of 3-6 months for an intermediary to turnover a home, this holding could well exceed the distortion we estimate under the current system. Moreover, from a social welfare standpoint, having the house sit empty would be more costly than the distortion created by the current structure, which is merely a transfer from seller to buyer. Thus, giving the intermediary the full marginal benefit is unlikely to be a superior alternative, although intermediate systems that capture elements of both have been proposed (Jares, Larsen, and Zorn 2000).[26]

Another possible contractual arrangement would involve nonlinear commission structures, where the share paid to the agent would grow in the sales price. However, such a structure would be difficult to implement, precisely because the homeowner is less informed than the agent. It is not easy to see how sellers can set effective breakpoints in a nonlinear contract if they have imperfect information about home values and the state of the market. Nonetheless, for price levels that are well below the minimum threshold of the home's value, there is no obvious

[26] Interestingly, consignment used car lots exist in some locales. That is, the real estate model has been applied toward used cars, instead of the other way around. These lots usually specialize in low-value automobiles that would otherwise be ignored by traditional used car sellers. It would be interesting to examine why such selling models sometimes arise.

rationale for paying the agent a commission, except for the simplicity of the linear contract. Why, in spite of the obvious flaws, has the current contractual form in real estate remained so pervasive and resistant to change, even as parallel improvements in information have so radically altered the markets and commission structures for travel agents and stock brokers?

Auctions offer a method for extracting private information (though in this case the information will more likely come from potential buyers directly rather than through an agent). While auctions are becoming more popular as a method for selling homes, still only a small fraction of houses are sold this way. This may be due in part to the fact that the fees involved—which can range from 6 to 10 percent (Wollam [2005])—greater than traditional commissions paid to agents, eating into any gain due to reduced information distortions.

Finally, if the information agents provide to home sellers is an important part of the service they provide, it is surprising that more sellers don't more frequently hire an independent appraiser to inform them of the value of their home. An appraiser is disinterested in the final transaction price, which would eliminate the distortions created by the agent's contractual form (but could induce moral hazard problems). Furthermore, appraisers can provide this information at a fairly low cost. It may be that appraisers, in their current form, are actually less skilled at valuing homes in a particular area than are local real-estate agents. Nonetheless, this begs the question why this market niche has not arisen. Alternatively, it may be the case that agents provide a bundle of services besides just valuation information, and these services are worth the commission cost despite the distortions highlighted above.

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Table 1. Summary Statistics

Variable	(1) Full sample: Mean	(2) Full sample: Standard deviation	(3) Within city and year: Standard deviation	(4) Within city and year: Mean agent-owned minus mean non-agent-owned	(5) Within city and year: p-value of equality in column (4)	(6) Within block: Standard deviation	(7) Within block: Mean agent-owned minus mean non-agent-owned	(8) Within block: p-value of equality in column (7)
Outcome variables								
Sale price, if the home sells	271,405	216,797	151,330	57,591	< 0.01	108,960	48,445	<0.01
Sale price (logged), if the home sells	12.33	0.577	0.335	0.128	< 0.01	0.246	0.117	<0.01
Days to sale, if the home sells	93.62	118.6	113.3	24.18	< 0.01	97.18	14.83	<0.01
Whether the home ever sells	0.78	0.42	0.41	-0.07	< 0.01	0.36	-0.04	< 0.01
Basic housing characteristics								
Number of bedrooms	3.315	0.84	0.788	0.168	< 0.01	0.587	0.11	<0.01
Number of baths	1.818	1.295	1.242	0.196	< 0.01	1.108	0.14	<0.01
Number of other rooms	4.041	1.166	1.082	0.246	< 0.01	0.832	0.181	<0.01
Capacity of garage in cars	1.69	0.655	0.601	0.065	< 0.01	0.504	0.075	<0.01

Notes: Summary statistics reflect our sample of roughly 98,038 single-family home sales over the period 1992-2002 in 34 Cook County, Illinois suburbs. Homes sold without real-estate agents are excluded from the sample, as are homes that are listed on the Multiple Listing Service but do not sell, and Multiple Listing Service entries with data errors or inconsistencies. All variables included in the data are self-reported by the real-estate agent listing a home for sale. Columns 1 and 2 report information for raw data covering the whole sample. Columns 3-5 present information after removing city fixed effects and year fixed effects. Columns 6-8 remove year fixed effects and city-block fixed effects. The basic housing characteristics listed represent a small subset of the control variables used in the analysis' see the appendix for a full listing.

Table 2. The Impact of Agent-Ownership Status on Sale Price and Time to Sale

	(1)	(2)	(3)	(4)
	Dependent variable: ln(sale price of home)			
Coefficient on agent-owned home	0.048	0.042	0.038	0.037
(standard error)	(0.004)	(0.004)	(0.004)	(0.003)
R^2	0.856	0.886	0.896	0.958
	Dependent variable: days to sale			
Coefficient on agent-owned home	16.89	11.03	10.25	9.47
(standard error)	(2.42)	(2.40)	(2.39)	(2.25)
R^2	0.123	0.130	0.139	0.384
Controls included:				
City*year interactions	Yes	Yes	Yes	Yes
Basic house characteristics	Yes	Yes	Yes	Yes
Indicators of house quality	No	Yes	Yes	Yes
Keywords in description	No	No	Yes	Yes
Block fixed effects	No	No	No	Yes
"Excess return" of agent assuming a 20% annual discount rate	0.039	0.036	0.032	0.032

Notes: Regression coefficients are reported in the table, along with standard errors in parentheses. Results are based on a sample of 98,038 single-family home sales in 34 Cook County, Illinois suburbs over the period 1992-2002. The dependent variable in the top panel of the table is the natural log of the sale price; the dependent variable in the bottom panel is the number of days on the market. Each coefficient reported in the table is from a separate regression. The other variables included in each specification are noted in the table, but the coefficients on these other variables are not reported here (Table 3 presents a subset of coefficient estimates for these controls). See the appendix for a complete list. The table's bottom row reports the implied "excess return" accruing to agents selling their own homes, computed as the additional price received for a home adjusted for the extra time on the market, under the assumption of a 20 percent annual discount rate. .

Table 3. Sample of Coefficient Estimates on Control Variables
(Specification Including Block-Level Fixed Effects)

Dependent variable:	ln(sale price)		Days to sale	
Explanatory variable	Coeff.	S.E.	Coeff.	S.E.
Bedrooms (1 bedroom omitted):				
2 bedrooms	0.177	0.013	5.02	10.77
3 bedrooms	0.264	0.013	13.85	10.76
4 bedrooms	0.325	0.013	25.10	10.81
5 bedrooms	0.378	0.013	36.64	10.95
6+ bedrooms	0.422	0.014	38.70	11.46
Rooms (not bed or bath, 7 or more omitted):				
1 additional room	-0.216	0.006	-30.09	4.60
2 additional rooms	-0.196	0.005	-27.56	4.29
3 additional rooms	-0.158	0.005	-22.23	4.21
4 additional rooms	-0.126	0.005	-16.54	4.20
5 additional rooms	-0.090	0.005	-10.76	4.29
6 additional rooms	-0.054	0.006	-10.44	4.80
Bathrooms (4 or more omitted):				
1.0 bath	-0.384	0.005	-48.79	4.05
1.5 baths	-0.333	0.005	-46.40	3.89
2.0 baths	-0.319	0.005	-44.53	3.77
2.5 baths	-0.234	0.004	-38.52	3.52
3.0 baths	-0.239	0.005	-32.32	3.78
3.5 baths	-0.115	0.004	-25.79	3.45
Style:				
American four square	0.028	0.005	-0.06	3.95
Bungalow	-0.030	0.003	-1.86	2.18
Cape Cod	-0.015	0.003	-3.68	2.20
Colonial	0.056	0.002	4.97	1.92
Cottage	-0.049	0.006	4.65	4.50
English	0.057	0.004	1.14	3.26
French provincial	0.111	0.008	14.61	6.36
Georgian	0.031	0.004	3.16	2.95
Prairie	0.089	0.006	16.16	5.13
Quad-level	-0.001	0.007	-5.30	5.39
Ranch	-0.029	0.002	-0.20	1.70
Tri-level	-0.013	0.003	6.99	2.46
Tudor	0.066	0.006	15.05	4.49
Victorian	0.054	0.005	8.90	3.97
Siding:				
Brick	0.033	0.002	10.07	1.94
Aluminum or vinyl	-0.001	0.002	11.59	1.98
Wood	-0.003	0.003	8.94	2.48
Stucco	0.010	0.003	3.15	2.82
Misc. quality:				
Central air conditioning	0.068	0.002	0.58	1.41
Other air condition	0.030	0.002	4.20	1.70
Master bedroom bath	0.044	0.002	1.83	1.41
Agent sales (logged)	0.003	0.000	-2.03	0.31

Notes: This table reports a subset of the coefficients on the control variables in the specifications shown in column 4 of Table 2. See the notes to Table 2 and the appendix for further details.

Table 4. The Impact of Agent Ownership by Sub-sample
(Values in table are coefficient on agent-owned indicator variable)

Sub-sample	Magnitude of predicted agent-owned distortion	Dependent variable: ln(sale price)	Dependent variable: days to sale	Implied "excess return" (20% annual discount rate)
A. Heterogeneity of housing stock on the block				
High heterogeneity	High	0.043	9.45	0.038
		(0.005)	(3.68)	
Moderate heterogeneity	Medium	0.039	11.92	0.032
		(0.005)	(3.82)	
Low heterogeneity	Low	0.023	5.09	0.020
		(0.005)	(4.24)	
B. Time period				
On the market 1992-1995	High	0.049	15.20	0.041
		(0.007)	(6.11)	
On the market 1996-1999	Medium	0.032	7.99	0.028
		(0.005)	(4.14)	
On the market 2000-2002	Low	0.029	2.47	0.028
		(0.006)	(3.98)	
C. Buyer's agent presence				
Buyer's agent absent * agent-owned home	High	0.052	N/A	N/A
		(0.007)		
Buyer's agent present * agent-owned home	Low	0.033	N/A	N/A
		(0.003)		

Notes: All coefficients in the table correspond to variations on the specification reported in column 4 of Table 2. Panels A and B divide the sample into mutually exclusive, exhaustive sub-samples. The heterogeneity of a city block's housing stock is computed based on the Herfindahl index of styles of houses sold on the block in our sample period (e.g. Victorian, Georgian, colonial, etc.). Blocks with fewer than three home sales over the course of the sample are excluded from the analysis in Panel A. The remaining sample is divided into equally sized groups based on the Herfindahl measure. Panel B divides the sample according to the year that a house is originally listed for sale. Panel C adds interactions between whether a buyer's agent is part of the transaction and the agent-owned variable to the baseline specification.

Appendix: Observed House Attributes Included in the Analysis

Basic measures of house scale

Number of bedrooms (categorical): 1, 2, 3, 4, 5, 6+
Number of bathrooms (categorical): 1, 1.5, 2, 2.5, 3, 3.5, 4+
Number of other rooms (categorical): 1, 2, 3, 4, 5, 6, 7+
Number of garage stalls (categorical): 1, 2, 3, 4+

Indicators of housing quality

Number of fireplaces (categorical): 1, 2, 3+
Presence of (dummy variable equaling one if attribute is present in house): master bath, central air conditioning, other air conditioning
Home age (categorical): unknown, 0-5 years old, 6-10 years old, 11-25 years old, 26-50 years old, 51-100 years old, 100+ years old
House exterior style (categorical): American four square, bi-level, bungalow, Cape Cod, contemporary, colonial, cottage, English, farmhouse, French provincial, Georgian, prairie, quad-level, Queen Anne, ranch, step-up ranch, traditional, tri-level, tudor, Victorian, other
House siding (categorical): aluminum or vinyl, brick, wood, stucco, other

Keywords used to describe home in listing (dummy variable equaling one if word/phrase or some shortened variant of it is used in the home description)

needs updating, estate sale, foreclosure, handyman, as-is, needs, TLC, rehabber's, bank-owned, priced for a quick/priced to sell, motivated, potential, youthful, close, !, new, spacious, elegance, beautiful, appealing, renovated/remodeled, vintage, state-of-the-art, maintained, wonderful, brand new, fantastic, charming, stunning, amazing, granite, immaculate, breathtaking, neighborhood, spectacular, landscaped, art glass, built-in, tasteful, must see, fabulous, leaded, delightful, move-in, gourmet, copper, Corian, custom, unique, maple, newer, hurry, pride, clean, quiet, dream, block, huge, deck, mint, stately