

# Antitrust Implications of Home Seller Outcomes when using Flat-Fee Real Estate Agents<sup>\*</sup>

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## **Abstract**

In stark contrast to other agency-based consumer service industries, real estate agents have been remarkably effective at maintaining margins and market share. One possible explanation for the success of real estate agents is collusion, and consequently the industry is facing regulator scrutiny. In this paper we first consider the mechanisms through which collusion might be sustained. Although the industry's low concentration makes collusion harder to support, the involvement of both a seller's agent and a buyer's agent on a given home sale helps facilitate collusion. Selling agents need buyer's agents to deliver customers. Not only can full-commission agents collude against discount/flat-fee agents by steering their buyers away from such listings, they also can use the same punishment on other full-commission agents who cooperate with discount agents. Using data from three markets, we find that houses listed using flat-fee agents have longer expected times-to-sale than observably similar houses sold by full-commission agents, but ultimately sell for similar prices. These results are consistent with allegations that traditional agents steer clients away from flat-fee-listed homes, although we consider other possible explanations. We calculate that, even taking into account the longer expected time to sale and the increased effort of the homeowner, sellers who use flat-fee agents saved an average of over \$5,000 compared to hiring a full-commission agent. This casts doubt on the necessity of minimum-service laws that exist in several states and are being considered in others.

## **I. Introduction**

The last decade has not been kind to industries built on traditional models for providing agent-driven services to consumers. Between 1997 and 2006, employment in travel agencies fell by over 35 percent. As late as the mid-1990s, commissions to trade a 100-share block of equity stock ranged from \$75-150, but have now dropped below \$25 even at full-service brokerages and are lower still at online-only trade sites. The share of automobile insurance policies written directly to customers (thus bypassing insurance agents) rose by almost 70 percent between 1997 and 2005. These changes were not driven by secular declines in demand for the underlying services that the agents brokered. Domestic revenue-passenger enplanements rose 24 percent over the past decade. Equities trading volume is at near-record levels. The total dollar value of auto insurance policies written rose by almost 50 percent between 1997 and 2005.<sup>1</sup>

The diffusion of the internet and other associated information-technology-based commerce platforms has been cited as a likely explanation for these contractions. Whether by making it easier for consumers to find lower-cost agents, or allowing consumers to bypass agents altogether by creating cheaper distribution mechanisms (aka disintermediation), these technologies have been underlying drivers of difficulties for agents in these industries. In travel agency, the internet allowed airlines a low-cost means of distributing tickets via their own online sites or travel search engines, leading airlines to discontinue ticket commission payments. Commission revenue fell from approximately \$12 billion in 1997—60 percent of travel agency revenues—to essentially zero by the end of 2002 (Global Aviation Associates, 2002). In securities brokerage, e-commerce facilitated the entry of online trading centers like E\*Trade and the growth of discount brokerages with tech-heavy distribution platforms like Charles Schwab. In insurance, the internet lowered consumers' costs of obtaining multiple quotes and made the direct-policy-writing business model (employed by GEICO, for example) easier. Whatever the specific mechanism, agency industries saw their consumers become less reliant on them to facilitate matches to the final service—airline tickets, stock trades, or insurance policies in the examples above—presumably raising the utility of consumers of these services in the process.

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<sup>1</sup> Travel agency employment is from the Bureau of Labor Statistics and enplanements from the Bureau of Transportation Statistics. Stock trade commissions data are from Bakos et al. (2005). Direct insurance sales figures are from Flannagan and Yates (2001) and Flannagan and Aartrijk (2007).

Residential real estate agents are a notable exception to this trend. Membership in the National Association of Realtors (NAR) nearly doubled between 1997 and 2006. Bureau of Labor Statistics data on employment of real estate agents (more broadly defined than NAR membership) shows a similar increase. Annual new and existing home sales increased almost 50 percent from 1997 to 2006, and the median sales price rose 42 percent. Although commission rates appear to have declined slightly in the past five years in some surveys, the median commission fees (the rate multiplied by the sales price) rose 26 percent over 1997-2005 due to rising sales prices.<sup>2</sup>

Why has the real estate agent industry been so much more successful in preserving its position than many other agent-based consumer industries? One explanation is that the same electronic commerce innovations that other sectors saw were not present in real estate. Yet this is inconsistent with even casual observation. Consumers' access to residential real estate information has expanded greatly as those involved in the market have turned to the internet in multiple ways. A large fraction of homes for sale have internet listing sites, complete with detailed house specifications, virtual tours, and neighborhood profiles. Potential buyers can easily peruse dozens or even hundreds of listings, eliminating less appealing possibilities without ever taking the time to visit a house. Homeowners (selling, buying, or simply holding) are now able to review public records on house sales transactions, ownership histories, and taxation patterns, to name just a few. Indeed, a 2006 survey (National Association of Realtors, 2006) indicated that 80 percent of recent buyers had used the internet in their home-buying process (up from 2 percent in 1997), and 24 percent first found the home they eventually bought on the internet.

A second possibility is that even though substantial electronic commerce innovations have taken place in the industry, housing has attributes that keeps these innovations from having as much of an impact as in the travel services, stock brokerage, and insurance markets. Namely, housing is a big-ticket item and very heterogeneous; perhaps these features preserve an important role for tightly-knit agent-client relationships. Yet Emre, Hortaçsu, and Syverson (2007) have shown that e-commerce has impacted the structure of the new auto sales industry, and autos are similarly big-ticket (though of course not as big as housing), heterogeneous goods. Thus while

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<sup>2</sup> Home sales are from the NAR and the Census Bureau. Sales price data from the Department of Housing and Urban Development, and median commission from Federal Trade Commission and U.S. Department of Justice (2007).

we cannot definitively rule out that this product attribute distinction explains the differences between real estate brokerage and other agency industries, it is not an obvious explanation for them either.<sup>3</sup>

A third explanation for the relative strength of real estate agency is that, compared to other agency-based industries, real estate was initially more competitive. If a) commissions have always reflected marginal costs, b) those costs have been stable or rising, and c) agents continue to provide valuable services to customers, then there would be no reason for real estate agent commissions to fall. Certainly entry into the industry is easy, given the low licensing barriers and industry's ability to accommodate part time agents. This satisfies one condition of a competitive market. However, as Hsieh and Moretti (2003) document, the fact that commission rates exhibit so little variation across homes within or across markets implies that the marginal cost of selling a home must rise *proportionately* with the home's market value. This strikes many observers (see for example Federal Trade Commission and U.S. Department of Justice, 2007, and the citations therein) as implausible.<sup>4</sup>

A fourth possibility is collusion on the part of real estate agents. Such behavior has been alleged in the recent suit brought by the Department of Justice (DoJ) against the National Association of Realtors for their Virtual Office Website policy. It is also consistent with agents' efforts to institute and preserve state laws that either outlaw commission rebates (effectively making it illegal for agents to lower the price they charge for their services) or institute minimum-service requirements (forcing clients who would prefer low-cost, low-service real estate services to pay for more services than they wish). Finally, it is consistent with the alleged retaliatory conduct of traditional agents toward agents who operate a discount (e.g., flat-fee or rebate-based) agency model.

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<sup>3</sup> One piece of evidence against this explanation is the fact that in two of the three markets we examine in this paper (Cook County and Sacramento), the share of home listings done using flat-fee agents is *higher* in zip codes in which the housing stock is more heterogeneous. If heterogeneity increases the value of the agent, then the opposite pattern would be expected. In the third market (Santa Cruz) no clear relationship emerges.

<sup>4</sup> The Hsieh-Moretti point is actually more subtle. When commission rates are fixed (or nearly so) and there is free entry of agents into the market, the cost to a given agent of selling a home necessarily rises with overall house prices in the market, because more agents vie for each listing. However, this cost increase arises because agents have to work harder to obtain each listing, not because it becomes harder to sell a home once a listing contract is signed. It is this latter cost (what one might term the "technological cost" of selling a home) that seems unlikely to be proportional to the sales price, even though that is what would be implied by the competitive-market model.

If collusion does explain the difference between residential real estate and the harder-hit agency industries, this begs the question of which factors facilitate collusion in real estate that are not present in the other agent-based business. An obvious difference is that most real estate transactions require the cooperative efforts of two agents, not one as in travel agency, stock brokerage, and insurance sales. The fact that a competitor's cooperation is necessary to conduct business opens an opportunity for punishment regimes that support collusion.

To see how, consider a travel agent who cuts her fees with the hope of gaining extra business. If a larger potential clientele comes through the door as a result, she does not need her competitor to sign off on the new business for their transactions to go through. This makes her unilateral incentive to break from the collusive regime (tacit or explicit) all the more tempting. Any drop in costs, then, is likely to be passed through to consumers, at the expense of the higher-cost operations in the industry.

The necessity of cooperation in real estate makes things different in that industry. If an agent deviates from a collusive regime, other agents seeking to preserve collusion can punish that agent by withholding cooperation. This can make transacting as a deviator prohibitively costly. If a buyer's agent offers clients low-cost access to online home listings, for example, other agents can refuse to make their own listings available through such channels. Or, if a seller's agent cuts her commission rate, other agents may be able to steer their potential buyers away from her listed homes. These examples are more than theoretical possibilities; the former scenario is essentially the key anti-competitive activity alleged in the DoJ lawsuit, and allegations of the latter have also led to investigations, though evidence to this point has been insufficient to lead to a formal complaint (Federal Trade Commission and U.S. DoJ, 2007).

The ability of agents in this industry to engage in such immediate and targeted retaliations against discounting agents—and perhaps just as importantly, their ability to retaliate in turn against any *non-discount* agents who fail themselves to punish discounters when the opportunity arises—that can sustain a collusive equilibrium.

In this paper, we explore a range of issues related to allegations of anti-trust violations in residential real estate, with a particular eye toward the performance of discount agents (we will often refer to them as flat-fee agents), who have been the targets of the alleged illegal behavior. We begin in Section II by reviewing the specific antitrust concerns that have arisen in public policy debates. Section III considers what economic theory says about the successfulness of a

collusive strategy in an industry where cooperation of other industry operators is required to facilitate transactions (or at least greatly increases the probability of a transaction).

We then in Sections IV and V empirically evaluate the question of whether discount agents provide a product to customers that matches the value of traditional full-service agents. Using data from three real estate markets (Cook County, Santa Cruz County, and Sacramento), we find evidence that houses sold by flat-fee agents fetch the same prices as observably similar houses sold by full-commission agents. However, expected days-on-market are substantially higher for flat-fee homes relative to those listed by full-commission agents, both because of a lower probability of sale and a longer time-on-market conditional on a sale taking place. These results are consistent with allegations of traditional agents “steering” their own clients away from flat-fee-listed homes, though we consider other possible explanations. The results are also notably similar to those in Hendel, Nevo, and Ortalo-Magné (2007), who find that homeowners who use a for-sale-by-owner (FSBO) website—not unlike many discount-agent platforms—obtain prices that are similar to (in fact slightly higher than) those using full-commission agents, but that FSBO also involves a lower probability of selling and longer time-on-market. Using the market outcome differences we estimate, we calculate that homeowners in our data are able to sell their homes at a considerably lower cost using discount agents, even taking into account the longer expected times-to-sale and the selling costs that they must bear themselves (marketing, hosting showings, etc.) when using a flat-fee agent.

## **II. Antitrust Considerations in the Residential Real Estate Industry**

The DoJ lawsuit has brought antitrust concerns to the forefront of economic debate about the industry. Even so, the specific allegations in the complaint comprise only part of the potentially collusive activities that have concerned policymakers. We provide a brief overview of these concerns in this section.<sup>5</sup>

The central issue in the DoJ antitrust suit against the National Association of Realtors is the Association’s Virtual Office Website (VOW) policy. According to the NAR website, VOWs are “Internet sites operated by MLS participants through which they...work with clients and customers in cyberspace in ways similar to how real estate professionals interact with clients and

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<sup>5</sup> Much of what we cover here is discussed in greater detail in Federal Trade Commission and U.S. DoJ (2007).

customers in a ‘brick and mortar’ environment.”<sup>6</sup> Essentially, VOWs are designed to allow customers MLS access without having to come to the agent’s office. One discount brokerage model charges customers a flat fee for access to the VOW, allowing them to search MLS listings without the direct intercession of the agent. This saves the agent time and expense, allowing them to provide the service at a relatively low price, and offers more flexibility in the search process to those consumers willing to forgo extra help from an agent. Some internet-based agents also sell their VOW-searching clients as “leads” to sellers’ agents for a fee paid contingent on the client buying a selling agent’s listing.

The NAR adopted a policy that would let agents choose to withhold their listings from particular agents’ VOWs (a “selective opt-out”) or all VOWs (a “blanket opt-out”). The DoJ’s concern centers on the potential for traditional agents to withhold opportunities for trade from lower-cost VOW-based discount agency models. Agents could, especially if coordination is possible, withhold a large fraction of the houses listed for sale on the MLS from flat-fee agents’ VOWs. This would render their low-cost option essentially valueless to potential home buyers. While the selective opt-out might seem to be the most powerful tool for achieving this goal, since it would allow traditional agents to target discount agents specifically, the blanket opt-out essentially fills the same role. Because agents themselves have direct access to the full MLS (including those listings other agents have withheld from VOWs), traditional agents can still transmit these listings to their clients along their traditional, largely in-person transmission lines. Discount agents, on the other hand, suffer because their model is built on cost reductions gained through using the VOW to limit intensive in-office interactions with clients. This is not possible with a VOW that is only a faint shadow of the local MLS.<sup>7</sup>

Aside from those actions that led to the federal case, real estate industry groups have also been encouraging state-level policies that have plausibly anticompetitive effects. (State legislation is typically immune from federal antitrust enforcement.) Ten states have bans on agents offering rebates to their clients. These are essentially out-and-out bans on price cutting.

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<sup>6</sup> <http://www.realtor.org/mempolweb.nsf/pages/VOWQandA>

<sup>7</sup> On the day the DoJ filed the initial complaint, the NAR modified its VOW policy to remove the selective opt-out option, claiming that they had removed the provision of the policy that was at issue in the antitrust action. Some months later, the NAR filed a motion to dismiss the DoJ’s complaint. The DoJ, which had in the meantime responded with an amended complaint responding to the NAR’s modified policy, argued in both the amended complaint and the response to the motion that the blanket opt-out was anti-competitive in a similar manner to the selective opt-out. The NAR motion was denied in November 2006.



Furthermore, laws outlining minimum service requirements are currently in force in eight states and being considered in others. These statutes enumerate a set of services that all real estate agents must provide to clients. While their proponents argue these provisions protect consumers, the FTC, the DoJ, and consumer groups like the Consumer Federation of America have all opposed their passage. Minimum service requirements make low-cost agency models more difficult, or even impossible, to sustain. For example, the common discount agency model where the agent simply lists the client's home on the MLS for a flat fee and offers no further service could easily be interpreted as illegal under the new requirements. Outlawing low-cost, low-service models both reduces options available to consumers (the low end of the vertical product space distribution is essentially shut down) and reduces the competition traditional brokers face by raising the costs of their low-cost rivals.

In addition to these codified sources of antitrust concern, the industry has had a history of allegations of discount agents being targeted for reprisals from other agents, ranging from petty harassment or slander to “steering” buyers away from discount seller agents' listings. While such allegations have led to antitrust investigations—they were a major impetus for the 1983 FTC examination of the industry (FTC, 1983) as well as ones more recently—evidence of sufficient coordination has not yet been found (a single firm's refusal to work with another particular firm is typically not under the purview of competition regulation). Nonetheless, allegations of such activities are not uncommon (see, for example, Birger and Caplin, 2004), and these possibilities remain a concern for antitrust authorities.

One issue that has puzzled observers (e.g., Levitt and Syverson, forthcoming) is how a collusive equilibrium, if it exists, could be maintained in the industry. Legal barriers to competition can certainly facilitate collusion in areas where they are in force. Given the relative uniformity across markets of outcomes like commission rates, though, it seems that other collusion-supporting forces would also have to be at play. The puzzle arises because the industry has many firms, even within (most) metropolitan areas. Economic theory suggests that the difficulty of sustaining collusion grows with the number of actors (e.g., Tirole, 1987). While this is not a universal prediction (Brock and Sheinkman, 1985), it has been borne out in experimental studies (e.g., Isaac, Ramey, and Williams, 1984; and List, 2007).

Again, the answer here may lie in the fact that competitors' cooperation is needed in facilitating most transactions in the industry. In typical models of collusion, firms interact in the

market in the standard way—their choices affect the payouts and therefore the decisions of their competitors. Given a competitor’s decision, however, exchange takes place at the set terms without requiring the imprimatur of other firms in the industry. They can take retaliatory actions in the future, of course, but these too only affect the environment in which the deviating competitor operates and do not directly impact its transactions. In real estate, however, the fact that collusive firms may have to cooperate with any deviating firm for it to even engage in a transaction can be a powerful tool for preserving collusive behavior. As opposed to the traditional tradeoff of a collusive firm considering deviating—i.e., pricing low to enjoy a gain today at the expense of likely punishment in the future—a world where competitors must cooperate in transactions can keep a price cut from leading to *any* extra sales.

### **III. Collusion and Cooperating Competitors: Theoretical Framework**

In this section, we consider in more detail what economic theory suggests are the most important factors in supporting a collusive outcome in residential real estate agency.

Sustaining collusion is, by its nature, a dynamic process. In a static world, individual colluders typically have an incentive to deviate from collusive action, since they can generally raise short-term revenues and profits by charging a lower price than their competitors. To make collusion possible, dynamic incentives must counteract this short-term gain. These typically involve the threat of the loss of future rents from preserving collusion for firms that deviate to earn short-term gains. Future losses are caused either because colluding firms passively revert to a more competitive equilibrium, or because colluders actively retaliate against the deviator. Whether or not collusion can be sustained in equilibrium depends on the size of the short-term gain from deviating relative to the long-term loss from the breakdown in collusion.

An extra complication is involved when firms have different costs (Vives, 1999). In this case, firms will have different preferences over what the collusive price should be. Firms with lower costs will want a lower price. If cost asymmetries are large enough, low-cost firms may prefer to eschew collusion altogether, since in the competitive regime they may be able to drive out higher-cost firms from the market, or because the costs of administering collusive payouts among asymmetric firms outweigh any rents earned.

We assume in our analysis here that the cost differences between flat-fee and traditional agents are large enough that the discount agents would prefer the competitive-market outcome.

What we instead look at is the choice of a traditional agent to cooperate or not cooperate in transactions with a discount agent, since this decision strikes us key in preserving any collusion in the industry. Cooperation can take the form of allowing their listings to be posted on a discount agent's VOW, bringing clients to homes listed by discount agents with the same frequency they would if the same homes were listed by traditional agents, or not engaging in one of the other forms of retaliation that have been alleged. If collusion in the industry is to be successful, the incentives for traditional agents to *not* cooperate with flat-fee agents must outweigh any benefits from cooperating.

Let's consider these incentives more specifically. Suppose a traditional agent cooperates in a pending transaction with a discount agent. He will earn the commission from the sale, which we assume to be the standard rate prevalent in the market. By doing so, however, he realizes that by letting the discount agent operate successfully, his expected commission in the future will drop. This will happen for two reasons. One is competitive: when transactions are done through discounters, other consumers expectedly become increasingly aware of discount agency and any associated benefits (perhaps they witness these transactions themselves, or hear about them through friends, neighbors, or relatives). This will in turn increase the market share of flat-fee agents, raising the downward competitive pressures on traditional agents' commission rates. The second influence on the traditional agent's expected post-cooperation commission is the punishment response of other traditional agents. Because the agents participating in a home transaction are publicly observable, traditional agents can see who among them cooperates with a discount agent. This makes a cooperating traditional agent susceptible to targeting for reprisals by other traditional agents using the tactics discussed above. This retaliation lowers the probability that a cooperating agent can broker a successful transaction in the future. This is embodied in lower expected future commissions.

To formalize this intuition slightly, suppose the prevailing commission per agent in the market is equal to  $F$ . We assume for simplicity that all homes in the market are sold at a (normalized) value of 1, so the commission *level* per house is also  $F$ . To simplify our analysis, we do not endogenize the commission-setting process, instead treating it as a reduced-form outcome of a more complex market-level equilibrium. We also impose that the traditional agents in the market take this commission individually as given. This seems to be a reasonable

approximation to reality, especially given the evidence discussed above on the relative invariance of commission rates.

The traditional agent decides whether or not to cooperate with a discount agent in a transaction. He chooses the option that maximizes the present value of operating in the market given that the prevailing commission rate is  $F$ . That is, he maximizes the value function

$$W(F) = \max[V_C(F), V_{NC}(F)],$$

where  $V_C(F)$  is the present discounted value of cooperating in the transaction in the current period, and  $V_{NC}(F)$  is the value of not cooperating, given that the current size of the prevalent commission (the state variable) is  $F$ .

We can write the value function under cooperation in recursive form as follows:

$$V_C(F) = F + \beta EW(\gamma F).$$

If the agent cooperates with a flat-fee agent, the transaction occurs and he earns the commission  $F$  in the current period. However, the future payoff embodied in the discounted expected payoff found in the second term of the Bellman equation ( $\beta$  is the agent's discount factor), reflects the lower prevalent commission value expected in the next period. As described above, this reflects the lower expected payouts due to competitive and punishment effects. We parameterize the degree to which cooperation lowers commissions with the value  $0 < \gamma < 1$ .

If the agent refuses to cooperate, the transaction with the discount agent does not occur. However, we assume a transaction instead occurs with another traditional agent with some positive probability. Perhaps the non-cooperating agent finds a suitable house for their buying client that is listed by another traditional agent, or a buyer still finds one of their selling client's listings even though they withheld the listing from VOWs. Let this probability be  $0 < \delta < 1$ .

Thus the value function under not cooperating in the current period is

$$V_{NC}(F) = \delta F + \beta EW(F).$$

Note that by avoiding dealing with the flat-fee agent, the traditional agent has preserved the commission rate for the next period, either through stifling the competitive effect of flat-fee agents, or by avoiding retaliation from other traditional agents. In not cooperating, the traditional agent trades off a lower payout today, in the form of a lower probability of having a transaction go through, for a higher expected payoff in the next future (note that  $V'_C(F) > 0$ ,  $V'_{NC}(F) > 0$ , and  $W'(F) > 0$ ).

Three parameters embody the influences on the successfulness of a collusive outcome (which we define as traditional agents choosing to not cooperate):  $\beta$ ,  $\gamma$ , and  $\delta$ .<sup>8</sup> We discuss in turn the underlying economic forces that impact their values.

The discount factor  $\beta$  can be taken to represent time preferences, as is the standard practice. The more the agent discounts the future (i.e., the less patient he is), the more likely he is to cooperate. This is because cooperation with a discount agent involves trading off a lower future payment for a higher payment today, while not cooperating entails a lower payment today but higher expected payments in the future. The more the agent discounts the future, the less he cares about future payments relative to the current payout. This tilts his optimal decision in favor of cooperating.

The parameter  $\beta$  can also embody other influences. Suppose the agent will soon be leaving the market for one reason or another—perhaps he is near retirement or will be moving away. In this case, we would expect him to care much less about future outcomes. In the extreme, if the agent is working on what he knows to be his last transaction, there is a strong incentive to cooperate (although one might imagine there are ways that traditional agents could still impose costs on this agent even after he retires or moves out of the market). Therefore a low value for  $\beta$  could also embody such “short-timer” influences on the agent’s decision besides traditional time preference notions.

As we touched on above,  $\gamma$  embodies both the competitive and retaliatory effects of cooperating with a flat-fee agent. A smaller  $\gamma$ —i.e., a greater competitive or retaliatory effect—lowers the payoffs a cooperating agent can expect in the future, leading to less cooperation with discount agents. Several market fundamentals would be expected to impact the magnitude of  $\gamma$ . For example, the competitive effect should be greater (that is,  $\gamma$  should be lower) in smaller markets. A successful transaction by a discount agent in a city with hundreds or thousands of traditional agents is unlikely to have a notable impact on commissions, but one in a smaller town may. Controlling for market size, the competitive effect is likely to be inversely related to discount agents’ market penetration. The notion is that if flat-fee agents are already a dominant force, much of the competitive effect will have been already realized. The greatest *marginal*

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<sup>8</sup> We’re using “parameter” very loosely with regard to  $\gamma$  and  $\delta$ . These do not reflect fundamentals of either the market’s supply or demand side. They instead are reduced-form embodiments of (possibly very) complicated equilibrium outcomes that we do not attempt to model here. We simply find them a useful device for summarizing some of the economic influences on traditional agents’ cooperation choices.

competitive effect is therefore expected in markets where discount agents still account for a modest fraction of firms (though perhaps the maximal marginal impact is not exactly when there are no discount agents—there may be some “increasing returns” in the influence of discount agent success that cause it to grow for some fractions above zero).

The retaliatory effect embodied in  $\gamma$  will be larger where traditional agents can better coordinate their actions. To see why, recognize that the decision of other traditional agents to retaliate against those traditional agents who cooperate with discount agents is very similar to the structure laid out above. As with the initial decision to cooperate with the discount agent, such retaliation involves trading off a reduction in short term gain (retaliating agents lose the ability to have the cooperating agent as a partner in the current period’s transaction) for a gain in future payouts (high commissions are preserved). If only a small number of other traditional agents choose or are able to retaliate, the future loss for the cooperating agent will be minimal. This implies that those agents considering retaliating themselves are more likely to be better off forgoing such actions and cooperating with the traditional agent that deviated in the first place. However, if the retaliation has a coordination mechanism, this threat can be very powerful, both in its direct effect on the initial cooperation decision (through making  $\gamma$  smaller) as well as its indirect effect on “enforcing the enforcement”—keeping traditional agents willing to retaliate against deviators rather than hop on the deviation bandwagon themselves. This is also where the tie to the number of producers in the market discussed above comes into play. Presumably, with a large number of agents, deviations are less likely to be punished because the impact of any retaliation against those who fail to punish is small when agents are acting purely in their isolated self interest.

The barriers to collusion raised by having a large number of producers can be overcome via coordination mechanisms, however. These can take many forms. A large literature has pointed out that publicly observable transaction information can serve as a coordination device to support collusion (early work in this regard includes Stigler, 1964, and Green and Porter, 1984). Certainly this feature is present in the real estate market. The parties to the transactions are all observable (agents cannot secretly cheat on quantity), and the offered commission splits between buyers’ and sellers’ agents are listed in the MLS entry for a house (though we can’t rule out unobserved side payments). The owners of the brokerages for which the agents work can also serve as a coordination mechanism. They have leverage over the employment conditions of

agents, typically including how commissions are split between the broker and agent, and thus have leverage to enforce orders that they give. Furthermore, there are fewer (often *many* fewer) brokerages than agents in a market, which also tends to make coordination of retaliatory regimes easier. Finally, the local MLS systems themselves, which are supported by a consortium of local brokerages, can also serve as a coordination mechanism. Indeed, in addition to the nationwide VOW antitrust issues described above, individual MLSs have tried to ban listings of homes represented under certain types of listing agreements commonly used by flat-fee agents. Since there is usually only one MLS per market, any action that can be agreed upon by its members will be highly enforceable even if there are a large number of agents in the market (Hahn, Litan, and Gurman, 2006).

The third parameter,  $\delta$ , captures the diminution of the value of the current transaction when the traditional agent refuses to cooperate with the discount agent. This reflects the fact that even if the traditional agent does not engage in transactions with the discount agent, he still may see a transaction through in the period by matching up with a traditional agent. Higher values of  $\delta$  imply preserving collusion is easier because the loss from not cooperating with discounters is reduced.

This probability  $\delta$  will be higher the larger is the fraction of traditional agents in the market. When the market is thick with traditional agents, the loss from forgoing working with discount agents will be small. As discounters expand, however, it will be more costly to ignore their listings (when representing buyers) and VOW clients (when representing sellers). Interestingly, this implies that there may be network effects in discounting. When there are few flat-fee agents, it will be hard to get traditional agents to cooperate since they lose little by doing so. As the number of discounters grows so does the loss from not cooperating, making it increasingly easy for new discounters to enter the market. This positive feedback mechanism, if strong enough, could in theory lead to “tipping-point” situations where a market swiftly turns from being dominated by traditional agents to one with a large contingent of flat-fee agents.<sup>9</sup>

In sum, there are a number of agent- and market-specific features that can be tied to predictions about the successfulness of sustaining a collusive equilibrium in a local real estate market. These range from measures of traditional agents’ value of future transactions with their

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<sup>9</sup> We do not have a sense for the size of the feedback mechanism. We have not aware of any market that has yet experienced such a shift, so this suggests it is fairly modest.

cohort, to market size, to the presence of coordinating mechanisms, to the share of discount agents already in the market. All of these influences in the end will be reflected on the relative performance of discount agents. The stronger is any collusive regime, the poorer we should expect to see the outcomes of transactions they broker relative to their traditional agent competitors.

#### **IV. Data**

We use data drawn from Multiple Listing Service (MLS) records covering three areas of the United States: Cook County, Illinois,<sup>10</sup> a seven-county area including Sacramento, and Santa Cruz County, California. These data were provided to us by real estate agents in response to a March 2006 blog post soliciting the cooperation of agents for a research project to examine outcomes for home sellers using discount real estate brokers.<sup>11</sup>

In each of these three markets, we have all MLS listings for single-family homes covering the period January 2004 to March 2006. These data include not only homes that sell, but also listings that expire or are cancelled prior to a sale taking place. The data do not include housing transactions in which the seller does not enlist a real estate agent (i.e., for-sale-by-owner transactions).

MLS listings provide extensive detail about the homes that are for sale, the timing of events, listing and transaction prices, and the agents involved in the transactions. Home characteristics available in the data include basic facts such as number of bedrooms and bathrooms, the style of the home (e.g., colonial, ranch), whether there is air conditioning, and the house's square footage (except in Cook County where that field is frequently left blank). We know the ZIP code of the home.<sup>12</sup> We also have access to the marketing description provided in MLS for each house (e.g. "Well-maintained, spacious bungalow brimming with charm..."). Using text-extraction tools, we identify the presence of a wide array of keywords to control for less easily observable characteristics of home quality.

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<sup>10</sup> Our data on Cook county does not include the city of Chicago (which has a small share of single-family homes) and is limited to the thirty-three suburbs with the greatest number of sales of existing single-family homes.

<sup>11</sup> See <http://freakonomics.blogs.nytimes.com/2006/03/04/flat-fee-real-estate-agents-need-your-help/>. We received roughly fifty inquiries from curious real estate agents. When the agents realized the magnitude of the task that we were requesting and the technical sophistication required to fulfill our data request, most elected not to participate.

<sup>12</sup> In Santa Cruz County, the MLS-defined areas are generally smaller than ZIP codes, so we use these areas in place of ZIP codes.



Our analysis focuses on three primary outcomes: whether a sale is completed within the timeframe of our data, the number of days on the market for homes that sell, and the (logged) sale price of homes that sell. For the time-on-market and sale price variables we run specifications of the form

$$Outcome_{htz} = \beta FlatFee_h + X_h \Phi + \lambda_z + \delta_t + \varepsilon_{htz},$$

where  $h$ ,  $t$ , and  $z$  index respectively a particular home, the month and year in which a property is first listed in our data set, and the ZIP code in which the home is located. *Outcome* corresponds to either the number of days the house is on the market before a sale occurs or the logged sale price of the home. *FlatFee* is an indicator variable equal to one if the listing agency meets our criteria for providing flat-fee real estate agent services.<sup>13</sup> A vector of home characteristics is included in  $X_h$ : indicators for number of bedrooms, bathrooms, total rooms, size of garage, number of fireplaces, master bedroom bath, style of home, what the exterior is made of, square footage, age of the home, keywords from the written description in the listing, and where applicable other characteristics such as whether the property is on the coast. Also included as controls are fixed effects for the ZIP code in which the property is located and the year-month in which the property listing first appears in our data set. For the days-on-market and sale price outcome variables, we restrict the sample to homes in which a sale is observed. When we analyze whether a home ever sells, we include all homes listed, whether or not a sale takes place. Because a home ever selling is dichotomous, we estimate this relationship using a probit model with the same explanatory variables as the specification above. For this specification, we report in the tables the marginal effects evaluated at the sample means.

Our data set is affected by two-sided truncation. We only observe listings beginning in January 2004. The same home, however, can be listed numerous times before it sells. Within our sample we are able to identify multiple listings on the same home and combine these into a single observation. However, with the data we have we cannot reliably determine whether there were previous listings for that home before January 2004. Thus, when we report time on the market, it is only time on the market beginning in January 2004. Our sample ends in March 2006 when the data were collected. Thus, any home sale that occurs after this point in time will not be recorded in our data. To minimize the impact of this truncation at the end of the data, we

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<sup>13</sup> For precise definitions of how we define each of the variables used, see the data appendix.

restrict our sample to homes listed in either 2004 or the first three months of 2005, leaving a minimum of one full year for us to observe the outcome for any listing in our sample.

On the rare occasions in which a home sells twice within our sample, we include only the first sale. We exclude outliers in terms of sale prices (any home that sells for more than five times the sample median in the area as well as any home that sells for less than \$50,000). We drop listings from the sample that are missing data on key housing attributes such as the number of bedrooms. We also eliminate a small number of cases where the data entered are inconsistent (e.g., the home sells before the date it is listed).

Table 1 presents selected summary statistics for the remaining observations in each of the three areas used in our analysis.<sup>14</sup> In each case, we show data separately for full-service and discount agencies. Columns 1 and 2 correspond to Cook County; columns 3 and 4 are the Sacramento area, and columns 5 and 6 are Santa Cruz County. Standard deviations are shown in parentheses. We highlight in bold those pairs of entries for which we can reject at the five percent level equality of the means across full-service and flat-fee agents. Except where otherwise noted, the entries in the table include all home listings, regardless of whether a sale occurs within our sample.

The top row of Table 1 reports the number of listings in the data, highlighting the low penetration rates of flat-fee agents in all of these markets. The Cook County data includes 238 listings by discount agents, or 2.2 percent of all listings. The flat-fee shares in the other two markets are similarly low: 1.0 and 2.5 percent in Sacramento and Santa Cruz, respectively. One unfortunate implication of the uniformly low market share of flat-fee agents is that it greatly limits our ability to test some of the most interesting predictions of the theory above, such as the existence of network effects.

The next three rows of Table 1 show our primary outcome variables: whether the home sells within our sample time frame, days on the market (conditional on selling), and sale price. Sellers using discount agents are roughly 10 percentage points less likely to ever sell their homes in Cook County and Sacramento. These differences in means are statistically significant at the five percent level. Recall that our data only reflect home sales made through the MLS. To the extent that home sellers who use flat-fee agents are more likely to eventually withdraw their

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<sup>14</sup> Summary statistics for variables that take on many possible values like housing style, housing exterior, and ZIP code are not shown in the table, but full summary statistics are available from the authors.

homes from the MLS and instead pursue a for-sale-by-owner transaction, the differences between full-service and flat-fee agents may be exaggerated on this dimension. Even among homes that do sell through the MLS, time on the market is greater using flat-fee agents in Cook County and Sacramento (25 and 12 days longer, respectively). In Santa Cruz, flat-fee homes sell faster in the raw data, but not significantly so. In contrast to these divergent outcomes, there are no significant differences between the sale prices of homes sold by traditional and discount agents in any of the three markets.

The remaining rows in the table reflect home characteristics. In Cook County, homes sold using a flat-fee agent look similar on these dimensions to those represented by full-service agents. In Sacramento, the flat-fee homes have more square footage, bedrooms, and bathrooms. In Santa Cruz, the only statistically significant difference is that homes sold using flat-fee agents were built more recently.

## **V. Empirical Results**

Our empirical analysis of discount agency outcomes focuses on two questions. First, do homes sold by discount agents take longer to sell—not just time-to-sale conditional on a sale, but also accounting for any differences in the probability that a home sells in the first place? Second, do customers who use discount agents obtain lower prices for their homes? The answers to both can speak toward antitrust concerns in the industry. Both the times-on-market and the sales prices of homes transacted with discount agents relative to those represented by traditional full-commission agents can offer insight into the efficacy of discount agents as well as possible reasons for any observed differences. In addition, the prices obtained by home sellers using discount agents are relevant to the addressing the wisdom of the state-level minimum service laws we discussed earlier. If sellers using flat-fee agents appear to do worse on net after taking account of sale price, commissions paid, time on the market, and extra effort on the part of the home seller when using a flat-fee agent, this bolsters the case for minimum service standards. If they do better, then the minimum service argument is called into question.

Table 2 presents estimates of the relationship between having a flat-fee agent and whether, conditional on the home being listed in our sample, a sale is ever recorded. The values reported in the table are the marginal effect of moving from a full-service to a flat-fee agent, evaluated at the sample means. Each entry in the table is from a different probit estimation.

Although other covariates are included in the specifications, only the estimate on the discount variable is presented in the table. (Column 1 of Appendix Table 1 presents full results for the most saturated version of the model.) In addition to the estimated marginal effect, we also report robust standard errors and the pseudo- $R^2$  from the estimation. The number of covariates included in the specification increase moving from left to right in the table. In column 1 the only controls are fixed effects for the ZIP code and year-month of the listing. Column 2 adds basic features of the scale of the house: a quadratic in square footage, categorical indicators for the number of bedrooms, bathrooms, and other rooms, and the number of cars that the garage will hold. Column 3 adds additional controls capturing further aspects of the quality of the home: the presence of fireplaces, master bedroom baths, the presence of central air, as well as indicators corresponding to the age of the home, the style of the home, and the home's exterior. The final column adds in a wide range of keywords drawn from the written description of the home in the MLS listing. The top panel of the table shows results for Cook County, the middle panel corresponds to the Sacramento area, and the bottom panel is Santa Cruz County. In Cook County and Sacramento, homes represented by flat-fee agents are approximately 10 percentage points less likely to sell in our sample time frame than those using full-commission agents. These estimates are highly statistically significant. In Santa Cruz County, flat-fee agents are actually slightly more likely to have homes that sell, and these estimates are borderline statistically significant.

Table 3 reports results for time on the market for homes that are sold in our sample frame. The structure of Table 3 mirrors that of Table 2. The only differences between the two tables are that the dependent variable changes, this sample is restricted to homes that sell, and the model in this table is estimated with ordinary least squares rather than a probit. Flat-fee homes that sell in Cook County stay on the market more than a month longer than those represented by full-service agents. The results are not sensitive to the set of controls included. In the other two areas, flat-fee homes take 6-10 days longer to sell, although the differences are only statistically significant in Sacramento.

Table 4 presents results on the relationship between flat-fee agents and the (logged) price at which a home sells. Table 4 is identical to Table 3 except that the outcome variable differs. In contrast to the results for whether a home ever sells and time on the market, the price outcomes are much more mixed. In Cook County, discount-agency homes sell for more when only a

limited set of controls are included. As more covariates are included, however, any gap disappears. None of these differences are statistically significant. The same sort of pattern is present in Sacramento, with large price differences (7 percent) when no controls for housing characteristics are included, but a shrinking gap as more covariates are added. This pattern is consistent with the summary statistics in Table 1, which showed that flat-fee agents sold homes that were larger on average. In the fullest specification, homes sold by flat-fee agents sell for a statistically insignificant 1.7 percent premium. In Santa Cruz, once controls are included flat-fee homes also sell for a premium, although again this 2.3 percent difference is not statistically significant.

Although theory provides a number of further predictions (e.g. full-commission agents with a short time horizon will be more likely to cooperate with discount agents, full-commission agents who cooperate with discount agents should be punished, as the market share of discount agents rises collusion becomes more difficult to sustain, etc.), the small share of discount agent transactions impedes our ability to test these auxiliary predictions at the current time. As the share of discount agents rises, much richer tests of the theory will become possible.

#### *A. Interpreting the results on longer market times for homes using flat-fee agents*

Our results suggest that homes listed with flat-fee agents take longer to sell (both conditional on a sale having occurred as well as in expectation accounting for the chance of a delisting before a sale occurs), but eventually sell for prices similar to those listed with full-service agents.

One possible explanation for these findings is that full-service agents purposely steer buyers away from properties listed by flat-fee agents. This behavior would be aided by the fact that the MLS includes fields that make it easy for other agents to determine whether a listing is done on a flat-fee basis. Discount agents cannot easily disguise themselves; the MLS that contains Cook County has a system of fines in place for agents who incorrectly complete this

field.<sup>15</sup> Further, it is not clear why, absent collusive aims, the terms of the relationship between the seller and the seller's agent is relevant to a prospective buyer.<sup>16</sup>

There are, however, other possible explanations for why homes represented by flat-fee agents might remain on the market for a longer period of time. One is that, absent the guidance of a full-service agent, sellers using flat-fee agents initially price their properties too high. To test this hypothesis, we estimate regressions with the (logged) original listing price as the dependent variable and the full set of controls (excluding the flat-fee indicator) on the right-hand side of the equation. We include both homes that sell and those that do not in this estimation. Using this regression, we compute a predicted original list price for each property. (The coefficients in the prediction equations were allowed to vary by market.) In Sacramento and Santa Cruz County, flat-fee properties list for *less* than observably equivalent full-commission properties by 1 percent and 6 percent respectively. In Cook County, flat-fee agent homes list for roughly 1 percentage point more than would be expected. Thus, only in Cook County is it possible this story could explain the observed differences between flat-fee and full-commission time on the market. Further exploring Cook County, when we regress time on the market on our usual right hand side variables, but also adding the deviation of the actual original listing price from the predicted one, each 1 percentage higher original listing price predicts a (statistically significant) extra 0.7 days on the market. Since the listing price difference between flat-fee and full-commission listings in Cook County was about one percent, this channel can explain a 0.7-day time-on-market difference. This is only a small fraction of the observed 30+ day gap. Further, the flat-fee coefficient remains essentially unchanged when the original list price residual is added to the regression. To put into some perspective how large of an impact is implied by the flat-fee variable in Cook County, to increase time on the market by as much as using a flat-fee agent, one would have to increase the original list price by roughly 50 percent.<sup>17</sup>

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<sup>15</sup> The MLSNI rules committee voted in a tiered structure of fines for agents who engage in two types of deception: artificially manipulating time on the market and not properly completing the field that denotes flat-fee or discount seller relationships. See [http://chicagorealtor.com/DispArticle.cfm?ARTICLE\\_ID=2151&ISSUE\\_ID=232](http://chicagorealtor.com/DispArticle.cfm?ARTICLE_ID=2151&ISSUE_ID=232)

<sup>16</sup> Except, perhaps, to facilitate showing of the house—information already conveyed in other MLS fields.

<sup>17</sup> Another possible indicator of any poor pricing of discount agency houses would be if there was a systematically larger divergence between the actual and predicted original list prices for flat-fee homes. (This would imply that the market value of the homes as reflected in the sales price were farther from the list prices.) In fact, however, the mean squared deviations from the fitted original listing price are *smaller* for flat-fee agents in all three markets.

A second reason why homes represented by discount agents might sell more slowly is that these homeowners are unwilling to accept offers that other sellers would accept.<sup>18</sup> We have no direct way of testing for differences in discount rates across different groups of sellers, but one very crude piece of information available to us is the ratio of the sale price to the listing price at the time the deal is made. If homeowners using flat-fee agents are more patient than other sellers, one might expect that ratio to be closer to one for those using flat-fee agents. In none of the three markets do we find this to be the case: in two of the markets the coefficient on this variable is small and of the incorrect sign, and in the other market it is extremely close to zero.

A third explanation for longer times-to-sale with flat-fee agents is that the sellers who select these agents live in homes with characteristics that generally lead their homes to sell more slowly. Arguing against this claim is the fact that our estimates of the time on the market prove quite robust to increasing the number of controls moving from columns 1 to 4 of Table 3. The model's  $R^2$  increases substantially as additional controls are added (although not nearly as much as when the sale price is the dependent variable—we are much worse at predicting time on the market than sale price). In order for this explanation to have validity, however, the unobserved differences between flat-fee and full-service homes would have to differ systematically from the observed dissimilarities, which appear to be essentially uncorrelated with time on the market.

A fourth possible reason for the divergent time-on-market results is that home owners bear a greater responsibility for making the sale when using a flat-fee agent. Typically the home owner is responsible for staging and showing the home in flat-fee listings. The logic of specialization does indeed argue that real estate agents will have comparative (if not absolute) advantage at these tasks.<sup>19</sup> On the other hand, since the homeowner has much more at stake in the deal than an agent, the homeowner is unlikely to shirk on these responsibilities.

### *B. Welfare calculations for customers using flat-fee agents*

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<sup>18</sup> It is important to note that such a difference could arise endogenously from the full-service agent manipulating the seller to accept sub-optimal offers because the incentives of the agent and the seller diverge. See Rutherford, Springer, and Yavas (2005) and Levitt and Syverson (forthcoming).

<sup>19</sup> Many discount agents provide these services on a fee-per-hour basis (typically at a cost of \$50-\$100 per hour). However, our discussions with discount agents suggest that take-up rates on these services are low.

The Department of Justice, Federal Trade Commission, and consumer groups like the Consumer Federation of America have all opposed minimum service requirements for real estate agents, which have the effect of making it difficult or impossible for discount real estate agents to function. The National Association of Realtors, on the other hand, has been a strong proponent of these laws, arguing that they protect consumers.

With some additional assumptions, the data analysis above allows us to make rough comparisons of outcomes for home sellers using flat fee agents to those who use full-service agents. The comparisons should offer guidance as to whether consumers who hire discount agents save money at a level commensurate with their difference in service levels, or whether they instead suffer a disproportionately large quality loss without being fairly compensated for it through the commissions they save. There are four dimensions to consider in this calculation: real estate commissions paid, differences in the final price for which a home sells, costs associated with additional time on the market, and the extra costs borne by the home seller when using a flat-fee agent (showing the house, marketing expenditures, extra legal fees, etc.). We address these in turn.

With respect to real estate fees, a home owner using a full-service agent pays a share of the sale price of roughly 5 percent on average. (This number is probably slightly low, reducing our calculation of the possible savings from using a discount agent.) The average sale price across our three markets is roughly \$450,000, which translates into an average real estate commission of \$22,500. A seller hiring a flat-fee agent will pay roughly \$500 to her own agent, plus compensation to the buyer's agent equal to roughly 2.5 percent. Therefore the total real estate fees paid by a home seller with the average house under discount agency are \$11,750, or \$10,750 less than that paid for a full-service agent.

The second issue to consider is whether using a discount agent affects the final sale price. Our empirical evidence on this question suggests little impact of using a flat-fee agent. The point estimates are zero or positive in all three samples, but in two of the three cases as we better control for observable characteristics the price differential falls. To the extent that unobservable characteristics of these properties vary in a manner similar to the observables, our estimates of a positive impact of discount agents on sale prices are likely to exaggerate any benefits they



provide. We conclude that a reasonable interpretation of the data is that flat-fee agents have no clear impact on the price at which a home ultimately sells.<sup>20</sup>

The third consideration is the time-to-sale. Home owners using flat-fee agents can expect that their property will stay on the market longer than a house sold using a full-service agent. Our estimates of this parameter range from 8-33 days across the three markets, conditional on a sale. Since flat-fee homes are also less likely to sell, this gap represents a lower bound on the time difference. Accounting for the homes that never sell increases the expected difference in time on the market to approximately 12-40 days. A crude way of approximating the costs of longer time on the market is simply to calculate the carrying costs of holding the property for that additional time. This approach is likely to greatly overstate the true costs, though, since in most cases the home owner will be consuming the flow of housing services during this time (the house is generally not sitting empty). We are not including this benefit to the home owner in our calculations.<sup>21</sup> Assuming an interest rate of 8 percent per annum and an average home value of \$450,000, the carrying costs associated with holding the home for an additional 26 days (the midpoint of our estimate of 12-40 extra days) works out to be roughly \$2,500.

The final consideration is the additional home-selling costs borne by homeowners using flat-fee agents. Marketing costs are generally paid by full-service agents, but would be paid out of the homeowner's own pocket with a flat-fee agent. Based on discussions with real estate agents, we estimate these costs to be roughly \$100 per week on the market for a typical home. Incremental time spent selling the house (e.g., conducting showings and open houses) is another cost borne by home sellers. While there are no precise statistics on this time cost, a reasonable guess might be 5 hours per week. With an average time on the market of 10 weeks, this translates into an incremental labor effort by the homeowner of 50 hours. If we value their labor at \$30 per hour, the opportunity cost of that time is \$1,500, plus \$1,000 for out-of-pocket marketing expenses.

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<sup>20</sup> It is perhaps surprising that homes represented by flat-fee agents take longer to sell, but eventually sell for the same price. One might expect that both the time margin and the price margin would be affected. Certainly if a home owner wanted to trade off between those dimensions, there is the possibility. One partial answer to this puzzle is that the implied cost of the extra time in the market (as discussed below) is so small that it would not be worth it to a home owner to accept substantially lower offers to partially offset the longer waiting time.

<sup>21</sup> On the other hand, the variance in time on the market also increases as well with the use of a flat-fee agent. Increased uncertainty about the timing of a sale carries costs separate from the length of time on the market.

In total, we estimate the increased costs of using the flat-fee agent to total to roughly \$5,000, whereas the commission savings is \$10,750, for a net benefit to the home seller of \$5,750. Thus, at least for the set of home owners currently using flat-fee agents, the tradeoff appears to be a favorable one, and the justification for minimum service requirements is not well supported by the data.

An important caveat on these calculations, however, is that those sellers who stand to benefit the most from using flat-fee agents (well informed, internet savvy, etc.) are those we are actually most likely to observe using such agents in the data. This selection effect influences the calculations in two ways. First, if these unobservable factors influence outcomes like sales price and time on the market directly, the point estimates we obtained above will be biased. Potentially just as important is the possibility that there is heterogeneity in the impact of using discount agents across individual consumers, where those electing to use discount agents—i.e., those whose outcomes we observe in the current data—are the ones who benefit the most from the relationship. If this is the case, the average benefit of flat-fee agency across all consumers will be smaller than what we measure here.

## **VI. Conclusion**

Residential real estate agency has avoided the declines observed over the past decade in other agency-based consumer service industries like travel agency, stock brokerage, and auto insurance sales, even though the growth of the internet and associated e-commerce platforms, which made agents less relevant in those industries, was also present in real estate. In this paper, we explored the possibility that collusion could explain the real estate industry's relative fortune, and the mechanisms through which collusion might be sustained. A critical issue is whether traditional agents cooperate in transactions with agents working under new discount-agency business models.

We find that sellers who hire discount agents had a longer expected wait to sale. This reflects both a longer time on the market conditional on the house having sold (from one extra week to a month, depending on the market) as well as a lower probability of ever selling. However, we found no difference in the sales prices of observably similar homes, nor any indication that accounting for unobservable differences would change this fact.

One possible explanation for these results is that traditional agents steer their clients away from homes listed under flat-fee agency, lowering the probability of a sale in any given period. Other explanations are possible, though they have elements that do not square as well with the data.

Consumers who hired discount agents in our data avoided having to make large commission payments to their own agent at the cost of waiting longer to sell their home. Interestingly, these outcomes are similar to those for FSBO sellers documented by Hendel, Nevo, and Ortalo-Magné (2007). This is perhaps not surprising, because the FSBO marketing mechanism in Madison, WI (where their sample is drawn) is similar to many discount-agency models. Using our estimates of the relative market outcomes of the two agency models, we run some back-of-the-envelope calculations to see whether such consumers are benefiting on net from this arrangement. The results suggest that they do by a fair amount. This throws into doubt the necessity of minimum-service laws in force in several states and under consideration in others.

Our analysis does come with a caveat, however. We observe the impact of discount agency on those consumers who, by the very fact of flat-fee agents' still small market shares, are plausibly the most likely to benefit from discount agency. These benefits may not be as large for the average consumer, should we see flat-fee agents make considerable market share gains in the future.

All-in-all, the results suggest that discount agents do not garner their clients systematically worse outcomes in the market than do full-service, full-commission agents. However, at the present time, discount agency does entail a tradeoff between a longer expected time-to-sale and savings on commissions. This longer time-on-market is consistent with traditional agents being less likely to bring their own clients to flat-fee-listed homes in an attempt to preserve an uncompetitive market outcome. Discount agents are still a very small share of the markets for which we have data, however. As their share grows, collusion theory makes the strong prediction that the ability of full-commission agents to maintain collusion will shrink, leading the observed time-on-market gap to fall, providing an additional test of the theory.

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## Data Appendix

The three data sets used in this analysis were provided to us by real estate agents. In our data request we asked the agent to provide all listings of single-family homes posted between January 2004 and March 2006, regardless of whether or a sale occurred. To minimize the number of sample homes whose listings are truncated, we restrict the actual sample used to run from January 2004 to March 2005.

### *Exclusions*

So as to link multiple listings for the same property, we exclude from the sample any listing that does not have a parcel identification number, as well as cases in which different properties appear to be tagged with the same identification number (if two properties in different ZIP codes carry the same identification number, for example). We also drop a small number of outlier properties that sell for less than \$50,000, sell for more than five times the median in the ZIP code, or are missing identifiers for the listing agency's identifier.

### *Defining variables*

The variables included in the raw data differ across the three data sets depending on the information in each MLS and how its data fields are constructed. We use a core set of variables common to the three data sets, with supplementary control variables added when available in only one of the data sets (e.g., an indicator for homes in a coastal region in Santa Cruz).

The manner in which flat-fee agents are identified in the MLS data varies across region. In Cook County, we use two different indicators. The first is the "Special Compensation Information" (SCI) field included in the MLS which asks whether a listing is classified either as "limited service" or "exception." The second indicator is whether the buyer's agent is instructed to contact the home owner directly for arranging showings, instead of the usual arrangement in which the buyer's agent and listing agent communicate directly. Both measures are imperfect, but positively correlated ( $\rho = 0.4$ ). We define as a flat-fee agency any agency for which more than 40 percent of their listings qualify under either measure of flat-fee, limiting the sample to agencies that had at least ten listings over the 15-month period we examine. The distribution, as would be hoped, is bimodal, with most agencies having very few listings that qualify and a small number of agencies having virtually all listings qualify. In Sacramento, there is a field denoting whether a listing is "MLS only" or whether the listing is full service. In Santa Cruz County, the agent who provided the data also gave us a list of all flat-fee agencies operating in the area.

The Sacramento and Santa Cruz County data include the house's square footage, but in Cook County this field is nearly always empty. We exclude a small number of homes with fewer than 300 square feet listed or more than 8,500 square feet. We truncate the indicator variables for the number of bedrooms at six, the number of bathrooms at 4.5, and the garage size at 3 cars. We include indicator variables for house architectural style and exterior type; the set of included indicators varies according to the house types present in the different regions.

We include ZIP code fixed effects in the regressions, except in Santa Cruz County, where even more disaggregated MLS areas are available, and we include a fixed effect for each.

In all cases, keywords from the marketing text that accompanies a listing were identified via a text search for these phrases. In specifications that include the magnitude of the commission to a cooperating buyer's agent, these commissions were also ascertained through text searches, since the cooperating commission fields are free-form entry fields.

Table 1: Summary Statistics

	Cook County		Sacramento		Santa Cruz	
	(1) Flat-fee	(2) Full-service	(3) Flat-fee	(4) Full-service	(5) Flat-fee	(6) Full-service
House ever sells	<b>0.70</b>	<b>0.83</b>	<b>0.79</b>	<b>0.89</b>	0.77	0.78
Days on market, if ever sells	<b>102.90</b> <b>(90.77)</b>	<b>78.31</b> <b>(98.52)</b>	<b>44.89</b> <b>(45.06)</b>	<b>32.62</b> <b>(39.76)</b>	52.13 (50.44)	62.84 (85.80)
Sale price, if ever sells	439,744.95 (193,850.82)	421,649.92 (275,883.88)	315,751.25 (201,366.16)	311,698.89 (165,562.61)	654,477.00 (201,677.01)	728,931.12 (353,084.97)
Square footage	.	.	<b>1793.37</b> <b>(629.95)</b>	<b>1611.92</b> <b>(625.95)</b>	1656.41 (673.98)	1710.96 (911.68)
Year built	1949.55 (30.27)	1952.76 (25.72)	<b>1982.39</b> <b>(20.68)</b>	<b>1977.26</b> <b>(20.23)</b>	<b>1972.16</b> <b>(21.12)</b>	<b>1960.18</b> <b>(30.25)</b>
Number of bedrooms	3.45 (0.79)	3.42 (0.86)	<b>3.39</b> <b>(0.77)</b>	<b>3.19</b> <b>(0.79)</b>	2.91 (0.79)	2.98 (0.88)
Number of bathrooms	2.21 (0.77)	2.14 (0.81)	<b>2.23</b> <b>(0.62)</b>	<b>2.05</b> <b>(0.63)</b>	2.01 (0.65)	2.05 (0.77)
Fireplace	<b>0.80</b> <b>(0.73)</b>	<b>0.67</b> <b>(0.76)</b>	0.84 (0.37)	0.80 (0.40)	0.86 (0.35)	0.82 (0.38)
Central air	0.87	0.86	0.93	0.92	0.07	0.04
Master bedroom bath	0.44	0.40	<b>0.82</b>	<b>0.72</b>	.	.
Number of observations	238	10,746	270	26,100	83	3237

Notes: The data cover all MLS listings of single-family homes over the period January 2004 to March 2006. Data are from three separate areas: Cook County (excluding Chicago) in columns 1 and 2; the Sacramento area in columns 3 and 4, and Santa Cruz County in columns 5 and 6. The odd-numbered columns present summary statistics for listings done by flat-fee agents; the even columns correspond to full-commission agents. Pairs of entries for which the difference in means across flat-fee and full-commission agents differ at the .05 level are shown in bold. Standard deviations are shown in parentheses for variables that are not dichotomous. See the data appendix for further details about how the data set is constructed.

Table 2: The Impact of Flat-fee Agents on Whether a House Ever Sells

	(1)	(2)	(3)	(4)
Marginal effect of using a flat-fee agent:				
Cook County (N = 10,999)	-0.128**	-0.126**	-0.127**	-0.117**
	(0.027)	(0.027)	(0.028)	(0.027)
Pseudo R <sup>2</sup>	0.036	0.056	0.065	0.078
Sacramento (N = 26,368)	-0.104**	-0.100**	-0.104**	-0.097**
	(0.024)	(0.024)	(0.025)	(0.024)
Pseudo R <sup>2</sup>	0.018	0.033	0.040	0.048
Santa Cruz (N = 3,298)	0.060	0.051	0.052	0.044
	(0.025)	(0.027)	(0.025)	(0.024)
Pseudo R <sup>2</sup>	0.031	0.065	0.080	0.119
Covariates included:				
ZIP code fixed effects?	Yes	Yes	Yes	Yes
Month-year fixed effects?	Yes	Yes	Yes	Yes
Basic housing characteristics?	No	Yes	Yes	Yes
Measures of housing quality?	No	No	Yes	Yes
Keywords from descriptions?	No	No	No	Yes

Notes: The entries in the table are estimated marginal effects of having a flat-fee agent evaluated at the sample means using probit estimation. Robust standard errors are in parentheses. Pseudo R<sup>2</sup> are also reported. Each coefficient reported in the table is from a different specification. The number of covariates rises moving from left to right in the table. Only the coefficient on flat-fee agent is reported in the table. The full specifications corresponding to column (4) are reported in the Appendix tables. See the data appendix for a more complete description of the data set. \* denotes statistical significance at .05 level; \*\* denotes statistical significance at .01 level.



Table 3: The Impact of Flat-fee Agents on Total Days on the Market, Conditional on a Sale

	(1)	(2)	(3)	(4)
	Coefficient on flat-fee agent:			
Cook County (N = 9,103)	35.27**	34.20**	33.82**	33.30**
	(6.00)	(5.83)	(5.82)	(5.86)
Pseudo R <sup>2</sup>	0.136	0.187	0.199	0.213
Sacramento (N = 23,286)	10.38**	9.12**	9.56**	8.75**
	(2.38)	(2.32)	(2.32)	(2.31)
Pseudo R <sup>2</sup>	0.060	0.102	0.108	0.118
Santa Cruz (N = 2,564)	6.408	7.726	7.874	8.309
	(5.83)	(5.86)	(5.54)	(5.76)
Pseudo R <sup>2</sup>	0.051	0.121	0.151	0.213
Covariates included:				
ZIP code fixed effects?	Yes	Yes	Yes	Yes
Month-year fixed effects?	Yes	Yes	Yes	Yes
Basic housing characteristics?	No	Yes	Yes	Yes
Measures of housing quality?	No	No	Yes	Yes
Keywords from descriptions?	No	No	No	Yes

Notes: The dependent variable is days on the market. The sample is restricted to homes that sell in our sample window which ends March 2006. The entries in the table are the OLS coefficient on having a flat-fee agent. Robust standard errors are in parentheses. R-squareds are also reported. Each coefficient reported in the table is from a different specification. The number of covariates rises moving from left to right in the table. Only the coefficient on flat-fee agent is reported in the table. The full specifications corresponding to column (4) are reported in the Appendix tables. See the data appendix for a more complete description of the data set. \* denotes statistical significance at .05 level; \*\* denotes statistical significance at .01 level.

Table 4: The Impact of Flat-fee Agents on Logged Sale Price

	(1)	(2)	(3)	(4)
	Coefficient on flat-fee agent:			
Cook County (N = 9,103)	0.023	0.019	0.004	0.000
	(0.021)	(0.013)	(0.011)	(0.010)
Pseudo R <sup>2</sup>	0.596	0.851	0.886	0.895
Sacramento (N = 23,286)	0.071**	0.023*	0.019*	0.017
	(0.017)	(0.009)	(0.009)	(0.009)
Pseudo R <sup>2</sup>	0.410	0.827	0.837	0.844
Santa Cruz (N = 2,564)	-0.014	0.020	0.021	0.023
	(0.032)	(0.024)	(0.022)	(0.022)
Pseudo R <sup>2</sup>	0.329	0.679	0.709	0.729
Covariates included:				
ZIP code fixed effects?	Yes	Yes	Yes	Yes
Month-year fixed effects?	Yes	Yes	Yes	Yes
Basic housing characteristics?	No	Yes	Yes	Yes
Measures of housing quality?	No	No	Yes	Yes
Keywords from descriptions?	No	No	No	Yes

Notes: The dependent variable is  $\ln(\text{sale price})$ . The sample is restricted to homes that sell in our sample window which ends March 2006. The entries in the table are the OLS coefficient on having a flat-fee agent. Robust standard errors are in parentheses. R-squareds are also reported. Each coefficient reported in the table is from a different specification. The number of covariates rises moving from left to right in the table. Only the coefficient on flat-fee agent is reported in the table. The full specifications corresponding to column (4) are reported in the Appendix tables. See the data appendix for a more complete description of the data set. \* denotes statistical significance at .05 level; \*\* denotes statistical significance at .01 level.

Appendix Table 1: Full Regression Results, Cook County

Dependent variable:		(1)	(2)	(3)
		Ever sells	Days on Market	ln(sale price)
Flat-fee		-0.117 (0.027)	33.28** (5.68)	-0.0000280 (-0.00)
Age:				
	1 - 5 years	-0.120 (0.158)	23.26* (9.122)	0.0799** (0.019)
	6 - 10 years	-0.031 (-0.133)	0 .	0 .
	11 - 25 years	-0.047 (0.136)	-1.720 (8.480)	-0.0536** (0.018)
	26 - 50 years	-0.031 (0.120)	-3.212 (7.986)	-0.0811** (0.017)
	51 - 100 years	-0.038 (0.120)	-2.240 (8.183)	-0.0609** (0.018)
	100+ years	-0.057 (0.143)	-1.190 (10.601)	0.0114 (0.023)
	Age missing		30.38 (53.476)	-0.0874 (0.086)
Number of bedrooms:				
	2	0.127 (0.044)	-7.529 (27.513)	0.230** (0.049)
	3	0.179 (0.088)	-2.103 (27.473)	0.316** (0.049)
	4	0.134 (0.069)	7.284 (27.555)	0.390** (0.049)
	5	0.112 (0.049)	1.923 (27.760)	0.458** (0.050)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
6	0.074 (0.061)	19.62 (29.433)	0.551** (0.055)
Number of bathrooms:			
1	0.033 -0.025	0 .	0 .
1.5	0.041 (0.022)	4.384 (2.596)	0.0572** (0.006)
2	0.024 (0.023)	4.417 (2.477)	0.0721** (0.005)
2.5	0.030 (0.019)	8.934* (3.843)	0.148** (0.008)
3	0.002 (0.023)	9.360 (5.165)	0.145** (0.011)
3.5	0.018 (0.019)	17.72** (6.576)	0.261** (0.013)
4.5		24.85** (8.492)	0.378** (0.019)
Number of other rooms:			
3	-0.006 (0.019)	2.016 (3.282)	0.0236** (0.007)
4	-0.004 (0.019)	5.125 (3.369)	0.0571** (0.007)
5	-0.020 (0.021)	7.537* (3.725)	0.0947** (0.008)
6	-0.031 (0.024)	10.01* (4.464)	0.121** (0.009)
7	-0.045 (0.029)	21.93** (6.319)	0.151** (0.013)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
8	-0.013 (0.030)	25.28** (8.851)	0.205** (0.017)
Master bed bath	0.003 (0.011)	5.262* (2.589)	0.0441** (0.005)
Number of fireplaces:			
1	-0.002 (0.009)	-1.976 (1.918)	0.0762** (0.004)
2	-0.001 (0.015)	5.882 (3.872)	0.146** (0.008)
3	-0.002 (0.024)	11.88 (9.077)	0.304** (0.021)
Air conditioning:			
Central air	0.042 (0.019)	-2.235 (3.925)	0.0727** (0.010)
Other	0.057 (0.016)	4.139 (4.566)	0.0421** (0.011)
Number of cars in the garage:			
1	0.015 (0.027)	-9.607 (7.201)	0.0351* (0.016)
2	0.013 (0.028)	-12.93 (7.050)	0.0717** (0.015)
3	-0.046 (0.035)	-2.508 (8.416)	0.130** (0.018)
Style:			
American 4-sqr	-0.010 (0.032)	5.180 (0.62)	0.0613** (3.66)
Bi-level	0.019 (0.016)	-6.250 (-1.64)	-0.0134 (-1.69)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Bungalow	0.042 (0.015)	-10.47** (-2.58)	-0.0399** (-4.66)
Cape	0.063 (0.014)	-9.201* (-2.24)	-0.0495** (-5.62)
Contemporary	0.024 (0.021)	19.83* (2.15)	-0.0146 (-0.84)
Colonial	0.029 (0.014)	-1.889 (-0.46)	0.0644** (7.47)
Cottage	-0.023 (0.042)	-4.848 (-0.48)	-0.0259 (-1.25)
English	0.037 (0.024)	-7.452 (-0.96)	0.0750** (4.70)
Farmhouse	-0.006 (0.032)	-1.902 (-0.28)	-0.0148 (-0.78)
French provincial	0.072 (0.030)	10.52 (0.48)	0.114** (3.65)
Georgian	0.052 (0.018)	4.295 (0.77)	0.00269 (0.22)
Prairie	0.060 (0.029)	3.548 (0.26)	0.157** (6.06)
Quad-level	0.081 (0.024)	-11.44 (-1.27)	-0.0400* (-2.47)
Queen Anne	0.008 (0.042)	-7.877 (-0.74)	0.0179 (0.79)
Ranch	0.050 (0.013)	-6.641 (-1.94)	-0.0425** (-5.89)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Step	-0.006 (0.032)	-3.254 (-0.49)	-0.0421** (-2.83)
Traditional	0.051 (0.016)	11.43 (1.64)	0.0687** (5.31)
Tri-level	0.036 (0.016)	-3.266 (-0.76)	-0.0193* (-2.33)
Tudor	0.088 (0.022)	-3.706 (-0.44)	0.0879** (4.41)
Victorian	0.005 (0.031)	-8.897 (-1.01)	0.0529** (2.63)
Other	0.010 (0.031)	7.060 (0.74)	0.0429 (1.94)
Exterior:			
Brick	0.016 (0.022)	-10.94 (-1.62)	0.00144 (0.10)
ext_cd	0.018 (0.026)	-7.957 (-0.93)	0.00710 (0.40)
ext_avs	0.025 (0.022)	-9.920 (-1.47)	-0.0535** (-3.79)
ext_fr	0.018 (0.026)	-3.685 (-0.49)	-0.0225 (-1.35)
Stucco	0.045 (0.024)	-9.355 (-1.17)	0.0200 (1.13)
Agent-owned	-0.042 (0.017)	-0.421 (3.988)	0.0270** (0.008)
Constant		71.95* (30.495)	11.98** (0.057)

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N	10,999	9,103	9,103
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Notes: All estimates are for the Cook County data set. Column 1 reports the marginal effects from the probit estimation corresponding to Row 1, Column 4 of Table 2. Columns 2 and 3 are OLS estimates corresponding to Row 1, Column 4 of Tables 3 and 4 respectively. Included in all specifications, but not reported in the table, are ZIP code fixed effects, year-month interactions, and a large number of keyword descriptions. \* denotes statistical significance at .05 level; \*\* denotes statistical significance at .01 level.



Appendix Table 2: Full Regression Results, Sacramento

Dependent variable:		(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Flat fee		-0.097 (0.024)	8.739** (2.305)	0.0166 (0.009)
Age:				
	1 - 5 years	-0.119 (0.236)	8.704 (9.618)	0.0361 (0.050)
	6 - 10 years	-0.093 (0.236)	9.499 (9.630)	0.0414 (0.050)
	11 - 25 years	-0.098 (0.197)	12.41 (9.617)	-0.00115 (0.050)
	26 - 50 years	-0.108 (0.202)	14.64 (9.624)	-0.00644 (0.050)
	51 - 100 years	-0.137 (0.251)	15.88 (9.601)	0.0807 (0.050)
	100+ years	-0.249 (0.321)	17.89** (3.645)	-0.00194 (0.021)
	Age missing	-0.265 (0.396)	27.52 (20.574)	-0.0725 (0.058)
Square footage		0.000 (0.000)	0.0120** (0.003)	0.000453** (0.000)
	Square of square footage	0.000 (0.000)	0.00000100 (0.000)	-2.55e-08** (0.000)
Number of bedrooms:				
	2	0.030 (0.017)	-12.51** (3.269)	0.160** (0.015)
	3	0.042 (0.021)	-15.01** (3.354)	0.232** (0.016)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
4	0.026 (0.020)	-16.32** (3.444)	0.215** (0.016)
5	0.020 (0.020)	-17.02** (3.768)	0.168** (0.017)
6	-0.006 (0.033)	-19.46** (5.825)	0.151** (0.026)
Number of bathrooms:			
1	-0.980 (0.001)	-5.997* (2.784)	-0.0416** (0.012)
1.5	-0.931 (0.002)	-4.723 (2.979)	-0.0731** (0.013)
2	-0.880 (0.010)	-4.438 (2.855)	-0.0123 (0.012)
2.5	-0.976 (0.001)	-3.529 (2.943)	-0.0334** (0.013)
3	-0.971 (0.001)	-4.517 (3.013)	-0.0254 (0.013)
3.5	-0.910 (0.002)	-0.687 (4.235)	0.0107 (0.018)
4.5	-0.910 (0.002)	-2.577 (5.427)	0.0134 (0.022)
Master bedroom	0.017 (0.006)	-1.886** (0.631)	0.00157 (0.003)
Fireplace	0.012 (0.006)	-2.794** (0.647)	0.0377** (0.003)
Central air	-0.003 (0.007)	-2.505* (0.993)	0.0215** (0.005)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Number of cars in the garage:			
2	0.008 (0.013)	-1.476 (2.514)	-0.0232 (0.015)
3	0.028 (0.011)	-3.828 (2.196)	-0.0254 (0.014)
4	0.050 (0.014)	-6.181** (2.253)	0.0815** (0.014)
5	0.050 (0.010)	-10.76** (2.398)	0.0995** (0.015)
6	0.004 (0.078)	-5.693 (5.064)	0.178** (0.048)
Style:			
A.Frame	-0.022 (0.009)	3.129** (1.086)	-0.00108 (0.004)
Colonial	-0.013 (0.026)	1.571 (4.462)	0.00330 (0.018)
Contemporary	0.017 (0.005)	-0.653 (0.542)	0.00515* (0.002)
Cottage	0.025 (0.009)	-0.950 (1.340)	0.0501** (0.007)
Mediterranean	0.012 (0.010)	0.263 (1.342)	0.00808 (0.005)
Ranch	0.018 (0.005)	-1.117 (0.614)	0.0294** (0.003)
Spanish	0.010 (0.023)	-4.169 (2.748)	0.0111 (0.015)
Tudor	0.023 (0.019)	-7.283* (2.899)	0.108** (0.014)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Victorian	-0.004 (0.037)	-7.557 (6.457)	0.0124 (0.034)
Other	-0.006 (0.046)	12.10* (5.955)	0.0343 (0.036)
Exterior			
Brick	0.015 (0.015)	1.636 (1.729)	0.0303** (0.008)
Shingle		0 .	0 .
Siding	0.009 (0.015)	2.521 (1.690)	0.0189* (0.008)
Stone	-0.010 (0.020)	0.861 (2.022)	0.0264** (0.009)
Stucco	0.006 (0.015)	1.633 (1.619)	0.0122 (0.008)
Wood	-0.001 (0.015)	2.986 (1.671)	0.0122 (0.008)
Other	-0.030 (0.021)	4.377* (2.142)	0.0224* (0.010)
Agent owned	-0.003 (0.009)	-1.014 (1.018)	0.00803 (0.005)
Constant		63.48** (11.532)	11.60** (0.059)
N	26,368	23,286	23,286

Notes: All estimates are for the Sacramento data set. Column 1 reports the marginal effects from the probit estimation corresponding to Row 1, Column 4 of Table 2. Columns 2 and 3 are OLS estimates corresponding to Row 1, Column 4 of Tables 3 and 4 respectively. Included in all specifications, but not reported in the table, are ZIP code fixed effects, year-month interactions, and a large number of keyword descriptions. \* denotes statistical significance at .05 level, \*\* denotes statistical significance at .01 level.

Appendix Table 3: Full Regression Results, Santa Cruz

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Flat fee	0.043 (0.024)	8.535 (5.738)	0.0222 (0.022)
Age:			
1 - 5 years	0.00874 (0.032)	-35.27** (10.132)	-0.0662 (0.038)
6 - 10 years	0.007 -0.035	-31.26** (10.311)	-0.106** (0.040)
11 - 25 years	0.001 (0.030)	-31.99** (8.978)	-0.0814* (0.035)
26 - 50 years	0.022 (0.030)	-31.79** (9.103)	-0.0719* (0.035)
51 - 100 years	-0.006 (0.033)	-29.65** (9.286)	-0.0376 (0.037)
100+ years	-0.010 (0.035)	-27.54** (9.371)	-0.0678 (0.037)
Age missing	0.000 0.000	0 .	0 .
Square footage	0.000 (0.000)	0.0255** (0.007)	0.000354** (0.000)
Square footage missing	-0.031 (0.040)	19.51* (8.364)	0.450** (0.044)
Square of square footage	0.000 (0.000)	-2.40e-6 (0.000)	-2.25e-08** (0.000)
Number of bedrooms:			
2	0.001 (0.028)	-9.552 (5.277)	0.0445 (0.033)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
3	-0.006 (0.031)	-9.619 (5.670)	0.0467 (0.035)
4	-0.005 (0.035)	-15.57* (6.439)	0.0469 (0.040)
5	-0.041 (0.056)	-20.24 (10.909)	-0.0344 (0.054)
6	-0.022 (0.068)	18.21 (43.302)	-0.0570 (0.101)
Number of bathrooms:			
1	0.018 (0.021)	-9.640 (13.237)	-0.188** (0.063)
1.5		-15.70 (12.909)	-0.181** (0.064)
2	0.039 (0.019)	-13.81 (12.564)	-0.167** (0.062)
2.5	0.012 (0.023)	-16.92 (12.523)	-0.206** (0.061)
3	0.000 (0.026)	-13.25 (12.624)	-0.150* (0.061)
3.5	-0.006 (0.036)	-6.131 (14.582)	-0.100 (0.060)
4.5	-0.004 (0.041)	0	0 .
Fireplace	0.000 (0.014)	3.559 (2.447)	0.0381** (0.012)
Central air	-0.012 (0.025)	-6.310 (3.980)	0.0249 (0.019)

Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Number of cars in the garage:			
2	0.044 (0.024)	2.589 (8.072)	-0.0774** (0.029)
3	0.062 (0.021)	-3.526 (7.986)	-0.0348 (0.029)
4	0.082 (0.034)	-8.265 (7.903)	-0.0179 (0.029)
5	-0.059 (0.017)	-1.185 (10.288)	0.110** (0.041)
Style:			
Cabin	-0.023 (0.021)	10.59 (5.658)	-0.0505 (0.032)
Cape	-0.030 (0.026)	25.65* (10.207)	0.116* (0.049)
Country	-0.004 (0.031)	-0.440 (6.036)	0.0938** (0.036)
Colonial	0.097 (0.133)	-7.684 (18.925)	-0.0110 (0.068)
Cottage	-0.036 (0.014)	-1.887 (2.824)	0.0179 (0.016)
Mediterranean	0.012 (0.029)	8.119 (6.544)	0.0631* (0.031)
Ranch	-0.024 (0.015)	-2.371 (2.540)	0.000346 (0.013)
Spanish	-0.037 (0.026)	-1.252 (4.945)	-0.00462 (0.038)
Traditional	-0.018 (0.014)	0.340 (2.606)	-0.00404 (0.013)

Dependent variable:		(1)	(2)	(3)
		Ever sells	Days on Market	ln(sale price)
	Victorian	0.034 (0.038)	1.561 (7.850)	0.0691* (0.035)
	Other	-0.042 (0.027)	10.54 (14.295)	0.0476 (0.052)
	Missing	-0.001 (0.015)	3.540 (2.881)	-0.0193 (0.013)
Exterior	Brick	-0.028 (0.058)	-5.069 (9.137)	0.0590 (0.040)
	Shingle	-0.016 (0.057)	15.36 (10.915)	0.142** (0.046)
	Stucco	-0.044 (0.050)	0.268 (5.556)	0.0428 (0.028)
	Wood	-0.043 (0.064)	2.379 (5.477)	0.0483 (0.028)
	Other	-0.032 (0.084)	-33.78** (11.698)	0.0267 (0.077)
	Missing	-0.018 (0.056)	2.853 (5.655)	0.0512 (0.030)
Agent owned		-0.008 (0.017)	4.321 (3.393)	0.00910 (0.013)
Coast		0.027 (0.028)	9.642 (5.396)	0.238** (0.040)
Fixer-upper		-0.013 (0.018)	0.656 (4.794)	-0.123** (0.025)
exc1031		0.024 (0.025)	5.599 (4.679)	0.0373 (0.026)



Dependent variable:	(1) Ever sells	(2) Days on Market	(3) ln(sale price)
Constant		-9.517 (21.663)	12.10** (0.112)
N	3,298	2,564	2,564

Notes: All estimates are for the Sacramento data set. Column 1 reports the marginal effects from the probit estimation corresponding to Row 1, Column 4 of Table 2. Columns 2 and 3 are OLS estimates corresponding to Row 1, Column 4 of Tables 3 and 4 respectively. Included in all specifications, but not reported in the table, are ZIP code fixed effects, year-month interactions, and a large number of keyword descriptions. \* denotes statistical significance at .05 level, \*\* denotes statistical significance at .01 level.