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THE RELATIVE PERFORMANCE OF REAL ESTATE MARKETING PLATFORMS:
MLS VERSUS FSBOMADISON.COM

Igal Hendel
Aviv Nevo
François Ortalo-Magné

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ABSTRACT

We compare outcomes obtained by sellers who listed their home on a newly developed For-Sale-By-Owner (FSBO) web site versus those who used an agent and the Multiple Listing Service (MLS). We do not find support for the hypothesis that listing on the MLS helps sellers obtain a significantly higher sale price. Listing on the MLS shortens the time it takes to sell a house. The diffusion of the new FSBO platform was quick, with the market share stabilizing after 2 years, suggesting it managed to gain a critical mass necessary to compete with the MLS. However, the lower effectiveness of FSBO (in terms of time to sell and probability of a sale) suggests that the increasing returns to network size are not fully exploited at its current size. We discuss the welfare implications of our findings.

Igal Hendel
Department of Economics
Northwestern University
2001 Sheridan Road
Evanston, IL 60208
and NBER
igal@northwestern.edu

François Ortalo-Magné
School of Business
University of Wisconsin, Madison
5259 Grainger Hall
975 University Avenue
Madison, WI 53706-1323
fom@bus.wisc.edu

Aviv Nevo
Department of Economics
Northwestern University
2001 Sheridan Road
Evanston, IL 60208-2600
and NBER
nevo@northwestern.edu

1 Introduction

A large proportion of housing transactions are carried out with the help of realtors.¹ Realtors provide expertise (on pricing, conditioning the house for sale and bargaining) and convenience (by showing the house, advertising and holding open houses and helping with the paperwork). Another advantage of working with a realtor is access to the Multiple Listing Service (MLS), a database that compiles information on all the properties listed by local realtors. For their services, sold almost exclusively as a bundle, realtors charge a commission at, or around, 6%. The commission rate has been stable over time and across regions and has been the subject of the scrutiny of antitrust authorities (see DOJ, 2007).

The advent of the internet has affected many markets. The real estate market is one of them. Direct marketing was always possible using newspapers, flyers and other forms of advertising. However, the internet offers a cheaper and potentially more effective platform that facilitates direct (by owner) marketing. Sellers can post detailed information, photos as well as virtual tours. For-Sale-By-Owner (FSBO) websites provide an alternative platform, or two-sided network, that competes directly with the MLS network.

In this paper we study the performance of these two competing platforms: MLS and FSBO. The established platform offering the bundle of services available from realtors, versus the newly established no-service platform. The actual cost of MLS transactions is the commission minus the price premium an MLS transaction might generate and the financial savings from a faster sale. The price premium may largely offset, or even more than make up for, the commission.² We quantify the actual monetary cost of using an agent by comparing the performance of listings by owner to transactions with realtors. We also assess the platforms' effectiveness, comparing measures like time on the market and the probability of sale within a time window.

We focus on the city of Madison, Wisconsin, where a single website (FSBOMadison.com) has become the dominant for-sale-by-owner platform. With the cooperation of FSBOMadi-

¹Real estate agents are licensed by the state. A realtor is a real estate agent who is a member of the Realtor Association.

²The National Association of Realtors website claims, based on the 2005 Home Buyer & Seller Survey that "the median home price for sellers who use an agent is 16.0 percent higher than a home sold directly by an owner; \$230,000 vs. \$198,200; there were no significant differences between the types of homes sold."

son.com we gained access to all FSBO listings since the start of the platform. We combined the FSBO data with data from two other sources. First, from the South-Central Wisconsin Realtors Association we got access to all MLS listings in the city. Second, we matched every listing with data from the city of Madison. The city of Madison assessor office maintains a database with the full history of transactions on every property together with an exhaustive set of property characteristics. By merging these data sets we get a complete history of events that occurred for virtually every single family home for sale, over 15,000 observations, between January 1998 and December 2004. A history of a listing includes: date and platform of initial listing, moves across platforms, and outcome (sale date and price if sold, withdrawal date otherwise).

After controlling for houses and seller heterogeneity, we find no support for the hypothesis that the MLS delivers a higher sale price than FSBO. Considering that realtors charge a 6% commission versus \$150 for FSBO, FSBO sellers come ahead financially. The lack of a MLS premium does not mean realtors do not provide value to the seller. It means instead that the cost of the convenience provided by realtors seems to be the full commission.

MLS does, however, lead to faster transactions. The longer time to sell on FSBO is driven by two factors. First, over 20% of FSBO listings do not sell on FSBO and have to list afresh on the MLS. Second, the probability of a quick sale is larger for houses initially listed on the MLS.

Next, we consider the welfare implications of the results. From the quicker time to sell we conclude that the MLS is a more effective matching platform. This suggests that FSBO's current size does not fully exploit economies of scale in network size. In the context of homogenous platforms welfare would increase if all transactions were consolidated into a single network. The countervailing force, which calls for multiple platforms, is product differentiation (Armstrong, 2006, and Rochet and Tirole, forthcoming). In this case, the platforms are differentiated by the service level. Full service by agents and no frills by FSBO. Therefore, it might be efficient for both platforms to coexist. The bundling of agents' services with the MLS, the source of differentiation, is the current practice, but is not technologically dictated. It might be beneficial to unbundle the platform from the additional services offered

by agents.³

The raw price comparison shows that the average sale price of homes that sell on FSBO is higher than the average price of homes that sell with a realtor. The characteristics, reported in the city assessor's database, of houses sold on the different platforms are somewhat different. However, after controlling for these observed characteristics a significant price gap persists. Naturally, platform selection is the main suspect behind the persistent premium. We take several approaches to deal with selection. All the approaches support the same conclusion: MLS does not deliver a price premium.

There are two concerns due to platform selection. First, there might be unobserved house characteristics that affect both the decision to sell on FSBO and outcomes. For example, easier to sell homes (i.e., conform better to the taste of the population) may be more likely to be listed and sold through FSBO. At the same time these popular homes may sell at a premium. To deal with unobserved house heterogeneity we examine properties that sold multiple times. The inclusion of a house fixed effect is essentially inconsequential. We therefore conclude that unobserved house heterogeneity, which is fixed over time, does not seem to be a problem.

The second concern is the selection of sellers into FSBO. Sellers may differ, for example, in their patience or bargaining ability.⁴ More patient sellers are likely to get a better price, regardless of the platform they choose. At the same time they may be more prone to list on FSBO. In that case we will get a positive correlation between FSBO and sale price.

We deal with the potential seller selection issue in several ways. First, we compare the houses that listed and sold on FSBO, to those that listed on FSBO, failed, and eventually sold on the MLS. These two groups of houses sell on different platforms but belong to the initial population that selected FSBO. If we think that the reason some sold while others did not is luck of the draw, then the difference in price will give us the causal effect of FSBO. Even if moving from FSBO to MLS depends on seller type the selection bias should be attenuated, as the group of FSBO listers is more homogenous than the population as a

³Although there is a tendency –or attempts– in the direction of unbundling services, realtors are quite reluctant to do so (see Nadel (2007)).

⁴For a descriptive study of bargaining patters using English data see Merlo and Ortalo-Magné (2004), and Merlo, Ortalo-Magné and Rust (2006) for a structural model of bargaining using the same data.

whole.

The second approach to deal with seller heterogeneity is related to Levitt and Syverson (2006). They find –as we do in our data– a premium for realtors’ own properties sold on the MLS. They attribute this price gap to an incentive problem. We compare the realtors’ premium to the premium sellers get on FSBO. Both are by owner transactions; thus, do not suffer from the agency problem identified by Levitt and Syverson. They amount to by-owner transactions in different platforms. Since realtors are professionals this comparison should bound the impact of selection. Even if the homeowners who use FSBO are better bargainers than the typical homeowner, it is reasonable to assume they are no better at bargaining than professional realtors. We find that the FSBO premium is similar to the premium realtors obtain when selling their own homes.

The third approach we take is to compare transactions of the same seller using different platforms. After matching seller names across transactions we find no price premium across platforms. Namely, the initial FSBO premium vanishes once we add a seller fixed effect.⁵

One important caveat is that our data comes from a single city. We do not know how representative the results are of other markets. Similar FSBO websites exist in many other markets, mostly in medium size cities (see www.fsbo-publishers.org). Madison is reasonably representative in measurable demographics, although it is unique in other dimensions (college town, state capital), it is unclear how this would impact our main findings. It would be useful to repeat the analysis for other markets.

As far as we know this is the first paper that compares the performance of MLS to an internet based FSBO platform. A related study that complements our findings, by Bernheim and Meer (2007) compares non-MLS listings with and without agent. They look at sales of faculty and staff homes on the Stanford University campus with and without an agent. They find, consistent with our findings, that brokers accelerate sales but do not deliver higher prices. They isolate the effect of information from other broker services, since the Stanford Housing Office maintains a free listing service for eligible buyers they know the value of a

⁵We examined various factors that impact the sellers decision to sell on FSBO as instrumental variables. For example, we used the fraction of previous sales on FSBO in the seller’s neighborhood. The point estimates we find are consistent with a FSBO premium. However, the instruments are very weak and the standard errors are very large.

broker does not reside in information diffusion (i.e., the platform). Instead, brokers' value "is likely confined to pro-motional services, negotiations, and the interpretation of market data."

The rest of the paper is organized as follows. Section 2 presents the institutional background with special emphasis on Madison. Section 3 briefly describes a theoretical framework, borrowed from the labor literature, to think about platform selection. Section 4 presents the data and basic descriptive analysis. Section 5 presents the results. It starts with raw platform comparisons followed by several approaches to deal with selection. Finally, we present some welfare implications and concluding remarks.

2 Realtors and FSBOMadison.com

Historically, most real estate transactions have been performed using real estate agents. Homeowners wishing to sell their homes contract with a real estate agent (the listing agent) offering the agent exclusivity for a limited period, usually 6 months, and agreeing to pay a commission, of usually 6% of the sale price, if the house is sold during the contract period.⁶ The commission is typically split between the listing agent and the selling agent, who is the agent that brings the buyer.⁷ When the same agent lists and sells the property, this agent gets the whole commission.

Real estate agents are licensed by the state. In most states licensing requires a short course and passing an exam. A real estate agent becomes a realtor when s/he joins the realtor association and subscribes to its code of ethics. Joining the association provides the agent with several advantages; one of them is access to the MLS.

Working with an agent, and agreeing to pay the commission, gives the homeowner access to a number of services. The National Association of Realtors (NAR) argues that Realtors provide valuable help with setting the listing price, preparing the house, checking potential buyers' qualifications, showing the house, bargaining the terms of the deal, and handling

⁶For a discussion of the commissions charged by agents see DOJ (2007).

⁷Some states, for example, Wisconsin, also recognize the status of buyer agency. If a buyer agent is involved in the transaction, s/he deals with the listing agent to settle the terms of the transactions, and gets the selling agent commission.

the paperwork. Another advantage of working with a realtor is access to the MLS. In the market we examine this involves the ability to list on the South Central Wisconsin MLS, which costs a minimal fee, \$10 as of 2007, but requires membership in the organization, and thus is available only to local realtors.

In 1998 an alternative to the MLS was launched in Madison, Wisconsin: the website FSBOMadison.com. Christie Miller and Mary Clare Murphy recruited 9 listings from ads in the local newspaper, added Mrs. Murphy's house and launched their website with 10 listings. From the get-go, the strategy of FSBOMadison.com was to provide a cheap no-frills service. In exchange for a fee of \$75 initially, \$150 for most of the period of our sample, homeowners can post their listing on the website (property characteristics, contact details and a few pictures). FSBO provides sellers with a yard sign similar to those provided by realtors but with the distinctive logo and color of FSBOMadison.com. Listings are kept active for 6 months, more if the fee is paid again. FSBOMadison.com has established itself as basically the only website for for-sale-by-owner properties in the city.

Properties are removed from the site upon instruction of the homeowners. Typical events that trigger removal include sale of the property, withdrawal of the property from the market, or transfer of the property to the MLS platform. The staff of FSBOMadison.com monitors listings on the MLS and extinguishes any listing from their website that ends up on the MLS. This is done primarily to avoid disputes with the MLS.

Real estate agents are occasionally involved in FSBO sales when they represent the buyer and one of the parties to the transaction accepts to pay a buying agent commission, typically 3%. In such a case, a FSBO transaction only saves half the realtor commission.

Recently, a number of limited-service brokers have emerged. In Madison, the dominant firm appears to be Madcity Homes (www.madcityhomes.com). Madcity Homes charges \$399 to list a house on the MLS for 6 months and also provides the seller with a yard sign. The homeowner gets no other service. Additional services are available for an extra fee upon request. The homeowner is responsible for paying the 3% commission to any realtor that sells the house, whether the realtor is under buyer agency agreement or not. No commission must be paid if the sale does not involve a realtor. By the end of 2004, when our sample ends, this firm had too few listings for us to analyze the extent to which limited-service brokerage

yields different outcomes than full-service MLS listings or FSBOMadison.com listings.

3 Theoretical Framework

In this section we briefly describe a theoretical framework, borrowed from the labor literature that will help us think about platform selection and guide the empirical exercise. Coles and Muthoo (1998) present a stock-and-flow model of matching between unemployed workers and job vacancies.⁸ We adopt their stock-and-flow model, to platform choice. There are several relevant issues like: incomplete information, learning about market conditions or own property, which we abstract from.

The basic idea of their model is as follows. There is a flow of new buyers and sellers into the market (which in their case is a single platform) in every period. The flow of entrants is immediately –and costlessly– put in touch with the stock of agents on the other side of the market. There is a probability λ that there are gains from trade between each buyer and seller (namely, that a house for sale meets the needs of each specific buyer). The parties that find a single match to trade with split their gains from trade. If instead a newcomer meets multiple counterparts, she receives simultaneous offers generating a Bertrand-type game. Agents that trade leave the market. Incoming buyers (sellers) that do not find a match, or fail to trade, join the stock of buyers (sellers). They remain on the market waiting for newcomers (flow) to trade with.

Coles and Muthoo show that in equilibrium matched players always trade (due to complete information). In equilibrium there is no trade among the stocks; if two members of the stock had gains from trading they would have traded already (upon arrival, namely, when one was part of the (in-)flow). Thus, in equilibrium the incoming flow trades with the stock.

We consider two variations: (i) the coexistence of two competing platforms, F and M , where agents can meet and, (ii) house and seller heterogeneity. The framework will help us think about platform selection as well as moves across platforms.⁹

⁸See also Coles and Smith (1998), and Taylor (1995), and for a discussion of brokerage choice Salant (1991), Yavas and Colwell (1999) and Munneke and Yavas (2001).

⁹We do not solve the full model. Solving the model with heterogeneity would be very hard, beyond the scope of this paper. We only intend to intuitively discuss plausible extensions of a more basic framework easier to solve.

Notice that in a stationary environment it would be hard to explain why sellers move across platforms. Coles and Muthoo’s framework, once we allow for multiple platforms, captures the idea of exploring a stock and then moving on to the other network’s unexplored stock. As we argue next, within the relevant environment of our application it provides a sharp prediction regarding platform moves, namely, one way moves across platforms.

Heterogeneity We think of houses differing in their degree of liquidity, λ . Owners of more liquid houses, may systematically opt for one of the platforms, and at the same time sell at a premium (as they generate more offers). Sellers may also be heterogeneous, for example, in their patience or bargaining ability. Patience in this model will affect both platform choice as well as transaction price given a platform.

Platform Choice We make the following assumptions in order to capture the main practical differences across platforms. First, we assume that only a proportion of agents know the existence of platform F .¹⁰ Only informed agents have a choice, uninformed ones trade on M .¹¹ Second, we assume there is an asymmetry between buyers and sellers. While informed buyers can shop on both platforms, sellers choose a single platform. This exclusivity is required by the MLS. Third, listing on M , in addition to the exclusivity, involves a commitment to pay a transaction cost (or commission) C should the house sell within τ periods of listing. These assumptions make F a cheaper alternative, it involves no fees. At the same time F involves less exposure, thus a lower matching rate.

Implications Only informed sellers face a choice, they have to chose an exclusive platform. Others parties (uninformed buyers and uniformed sellers) are either uniformed of F , or shop on both (informed buyers are not constrained by exclusivity). The trade off faced by informed sellers is between an expensive and more effective platform, M , and the non-fee F platform that offers exposure to fewer buyers (only those informed of F). An immediate implication is that for any specific property, the extra exposure leads to higher success rate.

¹⁰Heterogeneity in the disutility of trading without a realtor can also drive platform choice. Some sellers are aware of the option of selling by owner but may find it too costly or unpleasant.

¹¹Although not necessary, it is reasonable to assume that the set of buyers aware of F is a subset of those aware of M . For example, out of town buyers are less likely to be familiar with FSBOmadison.com.

Claim 1 *For given seller and house characteristics, on M we should observe shorter time to sell and higher success rate, holding time on the market fixed.*

The benefit of listing on F is common to all sellers, however, the more patient the seller or liquid the property the less costly it is to try F first. Thus, the appeal of F depends on seller patience and liquidity of the property, λ (see House and Ozdenoren (2007)).

Two implications are immediate. First, impatient sellers and non-liquid properties list on M . Second, sellers that fail to match on M have no incentive to move to F . The reason is that buyers on F are a subset of those that shop on M , thus after listing on M will not find in the stock of F any buyers who have not seen the property. Having explored all the stock of buyers (all buyers are present on M), the seller has to wait for the flow of new buyers. Since the flow is larger on M , impatient sellers stay. In sum, we should not expect any flow from M to F .

In contrast, patient sellers and owners of liquid properties prefer to initially list on F . If they fail to match on F , they move to M to match with the rest of the stock of buyers (those that shop only on M). Once they explored M , the whole stock of buyers has been exhausted, thus, they have no incentive to move back to F . The incentives just described can be summarized in the following claims.

Claim 2 *More patient sellers and owners of liquid houses list on F first.*

Claim 3 *Sellers that fail to match on F move to M and stay (to match the flow on M). There are no moves from M to F*

Given similar terms, buyers are indifferent between the platforms. Thus, as buyers become more patient they would not pay a platform premium.

Claim 4 *As frictions vanish (i.e., more buyers become patient and informed about F) prices across platforms tend to coincide*

In sum, the model suggests that patient sellers are likely to list on FSBO to expose their property to a subset of the stock of buyers. Should they fail to match, they move on to the MLS to expose their property to the rest of the stock, and the subsequent flow of buyers. In contrast, no moves from MLS to FSBO are expected.

4 Data

We obtained data from FSBOMadison.com, the South-Central Wisconsin Realtors Association, the City of Madison and Dane County. We merged the data into a single database, organized by parcel numbers as designated by the City. We restrict our attention to single family homes because of lack of address details for condos in the FSBO and MLS records and incompatibility between the city and county database for condos records.

MLS data The South-Central Wisconsin Realtors Association provided us with all listing activity on their Multiple Listing Service between 1/1/1998 and 5/23/2005. For each listing, we know the address of the property, its parcel number, the listing date, and the status of the listing. In addition, whenever relevant, each record contains the expiration date of the listing, the accepted offer date, the closing date and the sale price as recorder by realtors. We also know whether the listing realtor has an interest in the property.

FSBO data The owners of the FSBOMadison.com website provided us with information on all the listings with their service since it started in 1998. For each listing, we know the address of the property, the last name of the seller, the date the property is put on the web and sometimes information about the outcome of the listing. We use data for the years 1998-2004, with an address in the city of Madison.

City Data The city of Madison is located within Dane County. The city assessor database provides information on sale prices and a large set of property characteristics, about both the parcel and the buildings. In addition, the county maintains a county-wide database with location information for each parcel. We use this database to obtain spatial coordinates for each property. The county and the city do not use the same parcel numbers for condominium. Whenever there are such incompatibilities, we use Streetmap to locate the properties.

Matching the three data sets we get 19,142 observations. An observation is a marketing history from initial listing, on one of the platforms, until sale or withdrawal from the market. Actual histories can be complicated, like listing with several agents. We exclude new

construction from the sample, 3007 observations. New units are generally sold by developers. The reason we exclude them is that we are interested in platform performance for the average non-professional seller. We exclude 149 houses that went through major renovations (we do not know their characteristics at the time they sold). We exclude 253 observations due to missing price or sales information. We include units between \$50,000 and \$1,000,000, which top censors 4 units and bottom censors 72 inexpensive units. After merging these data sets and excluding observations as described we get 15,606 listings, which represent 12,373 unique properties, in the period 1998 to 2004.

4.1 Descriptive Statistics

Table 1 summarizes platform usage over time. A row represents where the property was initially listed. The columns represent the eventual outcome of the listing, namely, whether it sold and how.

The market share of FSBO in listings during the entire sample period is roughly 20%. We define a non-sale as any listing that showed up on either MLS or FSBO but was not recorded later in the city data with a sale price. Approximately 87% of the properties eventually sell. Out of the properties that sell, 95% sell through the initial listing platform. The remaining 5% are almost completely switches from FSBO to MLS. Switches from MLS to FSBO are almost nonexistent, accounting for just 0.2% of the MLS listings.

This is consistent with the predictions of the model (i.e., Claim 3) by which some sellers may try the cheaper platform first but they have no incentive to return. Moreover, should they prefer to list on M they would not move to F , as they have no additional stock to match on F once M was already explored.

The market share of FSBO in properties sold is 14%, slightly below its listing share. Since FSBO was only introduced in 1998, these numbers somewhat underestimate the current FSBO market share. Therefore, in the rest of Table 1 we present the breakdown for every other year of the sample. FSBO's share in listing and in outcome increases over time. By 2004, the last year of the sample, FSBO share in listing is almost 26%, and the share in sales is almost 19%.

In terms of diffusion, it is interesting to point out how quickly FSBO came to maturity. While the first listings are in mid 1998, by 2000 FSBO's market share basically plateaued.

To judge the performance of each platform we look at the proportion of properties that sell through their initial listing platform. Of the 3,138 initial FSBO listings 2,153 or 68.6% sell on FSBO while 86.0% of initial MLS listings (10,725 out of 12,468) sell on MLS. While there is a clear trend in FSBO listing, increasing from 6% in 1998 to 25.6% in 2004, the success rate is more stable. The success rate in 2004, 72.6%, is higher than the rate in 1998, 55.8%. However, there is no clear trend in the intermediate years.

Just as the penetration of FSBO increases over time it also differs across neighborhoods. In Table 2 we present the FSBO penetration rate across different assessment areas. These areas are defined by the City of Madison for assessment purposes. We get similar variation if we look at elementary schools areas. The FSBO listing share varies between 7.9% and 43.6% The top FSBO share neighborhoods tend to be close to campus. Similar variation is present also in the FSBO share of sales.

The success rate of FSBO listings also varies by neighborhood. For a neighborhood with at least ten FSBO listings the success rate ranges from 31% to 100% (with one outlier at 9%). The mean success rate is 66% and the standard deviation is 13.2%. There is a positive relation between the propensity to list on FSBO and the success rate, which can be seen through a linear regression. Using the estimated slope, one standard deviation increase in the success rate translates into 2 percentage points increase in the propensity to list on FSBO.

In the analysis below we compare the performance of properties sold through FSBO and through MLS. A key question is whether these properties are comparable. In Table 3 we compare several property characteristics. The columns present the mean and standard deviation for properties listed initially through FSBO and MLS. The last two columns present the difference between these means and the t-statistic of the difference. The differences in the means for most characteristics are small. However, because of the reasonably large sample size the differences are significant in some cases. For example, FSBO properties are somewhat older, tend to be on smaller lots and have smaller basements, but have somewhat newer roofs and furnaces.

5 Results

5.1 Outcomes by FSBO and MLS platforms

We now explore the differences in outcomes for properties sold through FSBO and MLS. Tables 4-6 present the results from regressing sale price, time on the market and the probability of a sale, on a FSBO dummy variable and various controls.

In Table 4 we display the effect of platform on price. In the top panel of the table the dependent variable is the logarithm of price, while in the bottom panel we regress the price level on various controls. The sample in columns (i) through (iv) includes only properties that sold on the platform they were originally listed. In the first column we regress price on a dummy variable that equals one if the house was sold on FSBO (divided by 100). If listing platform is determined at random, and the seller cannot switch from the platform they were assigned then this regression measures the causal effect of selling on FSBO. In the spirit of this ideal situation the sample includes only houses that sold on the platform they originally list.

The results suggest that on average there is a large positive premium for selling on FSBO, roughly an 11 percent premium or 14,800 dollars. Since the dependent variable is the sale price, and not the sale price net of commission, this premium is on top of the saved commission. The magnitude of the premium is driven by the time trends that we saw in Table 1. Over time prices have gone up and so has the share of FSBO sales. Indeed, once we control for year and month time dummy variables and a linear time trend, in column (ii), the effect goes down to roughly 4 percent, or 3,000 dollars, but is still statistically significant.

The numbers in Table 3 suggest that there is some difference in the observed characteristics of houses sold through FSBO and MLS. If the houses sold on FSBO have more attractive characteristics, then the FSBO dummy variable will also capture the impact of these features, rather than the effect of selling through FSBO. Furthermore, Table 2 suggests that FSBO has a higher share in some areas. If these areas are more attractive this will bias our estimates.

In order to control for the differences in houses we construct a hedonic model of prices. Column (iii) reports the results from this model. In the controls we include the characteristics

of the house, displayed in Table 3. The effect of selling on FSBO is mostly unchanged and stays at roughly 4 percent. This is consistent with the numbers in Table 3 that suggested that while some characteristics were statistically different, the differences are small. In column (iv) we also control for neighborhood characteristics by including neighborhood fixed effects. The coefficients on these controls are of no direct interest. However, the key is that we are able to explain 92.4 percent of the variation in the logarithm of price, and 89.3 percent of the variation in price. The impact of selling through FSBO goes down to approximately 3.2 percent.

The regressions in columns (i) through (iv) focus on the impact of the platform through which the house was sold. In column (v) we explore the impact of the initial listing channel. There are two differences relative to the results in column (iv). First, the sample now includes switchers: houses that initially listed on one platform but that sold through the other. These are mostly houses that listed on FSBO but ended up being sold through MLS. Second, now the FSBO dummy is defined as being initially listed on FSBO, as apposed to being sold through FSBO.

This regression is of interest for a potential seller asking what is the expected impact on price if they list on FSBO, and then behave like the sellers in the sample (depending on how lucky they were with the FSBO stock of buyers), regardless of where they end up selling. The results suggest that the premium for listing on FSBO, which is estimated at 3.1 percent, is almost identical to the premium for selling through FSBO.

To further explore the distinction between listing and selling on FSBO we also examine, in column (vi), the regression that includes both the initial listing platform and the sales channel. We see that there is a small additional premium of selling on FSBO of 0.7 percent. This premium is driven by the very small number of houses that initially listed on MLS, but were eventually sold on FSBO. In the last column we separate these houses. These houses command a large premium, over 6 percent relative to houses that listed and sold on MLS. Once we isolate the thirty properties that list on MLS but eventually sell on FSBO, we find that now the additional premium of selling on FSBO disappears.

Overall the results in Table 4 deliver a surprising result. Sellers on FSBO are able to sell their houses at a premium relative to MLS. In addition, sellers that initially list their

houses on FSBO but then move to MLS also command a significant premium relative to initial MLS listings. The causal interpretation of the results relies on random assignment to platform, or random success, conditional on time, house and neighborhood characteristics. Random assignment is a strong assumption in this context. We deal with selection in the next section.

We also explored the FSBO premium by year. We ran the regression in column (v) by year. The estimated coefficients (standard errors) from 1998 to 2004 are: 4.05 (1.01), 3.39 (0.82), 2.13 (0.72), 3.40 (0.58), 3.02 (0.59), 3.14 (0.52), and 2.69 (0.52). These numbers suggest that the FSBO premium was roughly stable through out the sample period.

Finally, we used a quantile regression to estimate the effect of listing on FSBO, the effects were constant across quantiles and thus essentially identical to the effects in the mean regression in Table 4.

We now examine other outcomes. In Table 5 we focus on the total time to sell, defined as the time between the initial listing and the sale date as recorded in the city data. The dependent variable in all regressions is the total time to sell, and the controls follow a similar structure to Table 4. In columns (i) through (iv) we focus on the sample of houses that sold on the platform where they were initially listed.

Without any additional controls, the results in column (i) suggest that total time to sell is 4 days shorter when selling on FSBO. Once we control for year and month dummies, and for house and neighborhood characteristics, the effect of selling on FSBO is not statistically significant. The additional controls change the R-squared very little, compared to the price regression where the house and neighborhood characteristics explained a large fraction of the variation.¹²

Notice that the lack of a statistical difference in the time on the market does not imply that FSBO is as effective a platform as the MLS. Quite the contrary, this suggests that the MLS is likely more effective. While the average time to sell on the MLS reflects the whole population of houses listed on MLS, since there are few switches to FSBO, the FSBO average represents the average conditional on the house belonging to the 75% that sold on FSBO

¹²Time on market is defined by the timing of closing which depends on considerations hard to predict, thus a lower explanatory power is expected.

before moving to MLS. Even absent unobserved heterogeneity the FSBO average represent the luckiest draws, in terms of time to sell, while MLS the whole population.

In the last three columns we once again study the full sample of houses that sold, not just houses that sold on the platform originally listed. In column (v) we find that sellers who originally list on FSBO should expect to take 20 days longer to sell. This is largely driven by houses that originally listed on FSBO but then switch to MLS. The results in column (vii) allow us to separate the effects in four groups. The base group is properties listed and sold on MLS. Relative to this group the properties listed and sold on FSBO take 1 day longer, the same result we found in column (iv). For houses that listed on FSBO but eventually sold on MLS the time to sell is almost 69 days longer. Finally, for houses that listed on MLS but that were sold through FSBO the expected time to sell is 115 days longer.

To further characterize the differences of outcomes between the two platforms we report, in Table 6, the effect of platform on the probability of sale. In all cases we regress a dummy variable, which varies by column, on platform dummy variables, year and month dummy variables, a linear time trend, house and neighborhood characteristics.

We start by examining in columns (i) and (ii) the probability of a sale. The dependent variable is equal to one if the property sold. A non-sale is defined if we do not observe a sale price in the city data. Overall in the sample 87 percent of the properties sold. The properties initially listed on FSBO tend to have a higher probability of eventually being sold, although some of them are eventually sold through MLS. In column (ii) we separate the properties into four groups depending on initial listing and final channel. If the property sold the final platform is the platform where it sold, otherwise it is the last platform used for listing. We find that relative to the base group – properties that listed and sold on MLS – properties that listed and sold on FSBO are roughly 1 percentage points more likely to sell, although the difference is not statistically significant. The properties that listed on FSBO but eventually switched to MLS are even more likely to sell. Relative to the base group they are roughly 4 percentage points more likely to sell. The properties that list MLS and switch to FSBO are less likely to sell, but this is an extremely small group and the effect is not estimated precisely.

In columns (iii)-(viii) we examine the probability of a sale, conditional on eventually being

sold, within a fixed number of days. We look at 180, 90 and 60 days. We find a pattern similar to what we saw in Table 5: the properties listed on FSBO tend to take longer to sell. Thus, within a fixed interval of time a FSBO property is less likely to sell. Although FSBO listings are somewhat more likely to eventually sell, their initial success is lower than MLS. This is mainly driven by the properties that start on FSBO and switch to MLS. In columns (iv), (vi) and (viii) we separate the properties into four groups. The FSBO listing that sold on FSBO are less likely to sell within 60 or 90 days. This is consistent with MLS exposing sellers to a bigger stock of buyers (as in Claim 1). The properties that start on either FSBO or MLS, and then switch, take an even longer time to sell and thus are much less likely to sell within a fixed time period.

5.2 Selection

In the previous section we documented the difference in outcomes for properties listed on FSBO and MLS. A key issue in interpreting the results is selection. As suggested by Claim 2 there are two separate concerns. First, are properties sold on FSBO comparable to those sold on MLS? We control for a rich set of observed house characteristics, but it is still possible that there are unobserved differences that are correlated with the platform choice. Second, even if the house unobserved characteristics are not correlated with the channel, the sellers attributes might be. We now discuss both of these issues in detail.

5.2.1 Unobserved House Characteristics

As we show in Table 2 there are some differences in observed characteristics between the properties listed on FSBO and MLS. These differences are not large but in some cases they are statistically significant. Indeed, once we control for house and neighborhood characteristics, in the regressions we display in Tables 4-6, the results change somewhat. The differences in the observed characteristics might suggest differences in unobserved characteristics as well. To examine this issue we exploit properties that were sold multiple times in our sample using different platforms. As long as the unobserved characteristics are constant over time looking at properties that sold multiple times, then including a house fixed effect will control for the

unobserved characteristic. Recall that we eliminated from our sample property that undergo a major renovation during our period of study (this is one of the characteristics reported by the city assessor).

In our sample, there are 2,023 properties that sold more than once. The majority, 1,872, sold twice, with 146 and 5 selling three and four times. Together this yields 4,202 sales. Out of these sales 3,376 (or 80%) were listed and sold on MLS, 629 (15%) listed and sold on FSBO, 194(5%) listed on FSBO and sold on MLS, and only 3 listed on MLS but sold on FSBO. Out of the 2,023 properties that were sold multiple times we have 645 that were sold using different platforms at different times.

In Table 7 we present results using this sample. Different columns focus on different outcome variables. In all regressions we include year and month dummy variables and a linear time trend. In almost all cases the results are similar to those we found in Tables 4-6, where we controlled for differences across properties using the house and neighborhood characteristics.

We also display in Table 7 regressions using the same sample, but dropping the fixed effects and controlling for differences using the house and neighborhood characteristics instead. The results are essentially identical. The motivation behind this regression is twofold. First, to highlight that the sample of houses that sell multiple times –used in this section– is representative, namely, that findings for those houses (without fixed effects) are similar to those for the whole sample. Second, to show that controlling for house characteristics delivers similar findings as those rendered using fixed effects.

Together these results suggest that there is no bias in the estimates due to an unobserved house effect that is fixed over time. This should not be surprising. The differences in the observed characteristics were not large and controlling for them did not make a large difference. Since most unobserved house characteristics, we can think of, seem (roughly) fixed over time we conclude that we should not be concerned over the impact of unobserved household characteristics on our estimates.

5.2.2 Seller Selection

If an unobserved seller type affects both the outcome variable and platform choice our estimates will be biased. For example, some sellers might be better, or more patient, at bargaining and therefore able to get a higher price regardless of the platform they use. Being more patient, according to the model, they are also more likely to list on FSBO. Absent appropriate controls for seller type we will overestimate the effect of selling on FSBO. We explore several ways to deal with this problem.

Conditioning on Initial Listing The first approach is to compare the differences in outcomes between those sellers who listed on FSBO and sold on FSBO and those who initially listed on FSBO but ended up switching to MLS. The results in Table 4 suggest that conditional on listing on FSBO there is a small, and not statistically significant, increase in price from also selling on FSBO. If we believe that moves to MLS, after listing on FSBO, are purely driven by random forces then the estimates suggest that the two platforms deliver the same prices. There is no gain in the sale price from selling on MLS relative to FSBO.

Even if moving to MLS depends on seller type the selection bias should be reduced, as the group of FSBO listers is more homogenous than the population as a whole. Namely, in the range of sellers, these observations belong to the set that self-selected into FSBO. Furthermore, it is not clear that the selection indeed dictates a bias. Consider selection on patience. Is it the more or the less patient seller who moves to MLS? A patient seller may stay longer on FSBO. On the other hand, moving to MLS entails a long wait (given the findings in the previous section), thus it might be that the more patient sellers are those that decide to move on to the MLS. In other words, there might be selection, but its relation to sales price is less clear.¹³

¹³For the sample of movers (from FSBO to MLS) we regressed price, time on the market on the MLS, and probability of selling within the first 60 days after moving on the time the house spent on FSBO before changing platforms. We found that the time spent on FSBO has no explanatory power on any of those performance variables on the MLS. The lack of correlation between stay in FSBO and MLS performance seems to suggest as the decision to stay more or less on FSBO does not seem to reflect any systematic selection.

By-Owner Sales on MLS Our second approach to quantify the role of unobservable seller characteristics is to compare FSBO sales to realtors' transactions of their own properties. These transactions provide us with a "sale by owner" using the MLS. Levitt and Syverson (2006) report that realtors are able to obtain better prices when they sell properties in which they have an ownership stake relative to properties, sold by the same realtors, where they are not owners. We assume that realtors are no worse at selling their own properties than non-agents. In other words, the effect of realtors selling their own homes is an upper bound on the impact of seller selection.

The results are presented in Table 8. The variable "Sold by Owner" is a dummy variable that equals one for all sales by either a realtor selling their own home on the MLS, or a sale on FSBO. The variable "Sold on FSBO" equals one for sales on FSBO, and therefore its coefficient measures directly the difference between the performance of FSBO sales and sales by owner/agents on MLS. The regressions in columns (i) and (iii) include only properties that sold on the platform where they were initially listed. The results in the other columns include all properties that sold.

As in Levitt and Syverson we find that owners obtain a premium when selling properties in which they have an ownership share. However, for price, time to sell and probability of sale within 180 days there is no statistically significant difference between agent/owner and sales on FSBO. FSBO sales on the other hand are less likely to happen within 60 or 90 days.

Seller Fixed Effects Our final approach is based on using multiple sales by the same seller. We use the observed multiple sales to control for unobserved seller heterogeneity. Matching names across transactions we identified 265 sellers who listed properties using different platforms, these involved 744 sales.¹⁴ The results are presented in Table 9.

In the first column we regress the logarithm of price on a dummy variable that equals one if the seller listed a property on FSBO any time during the sample, not necessarily at that observation. The sample includes all the sales in the sample and the regression includes the usual time, house and neighborhood controls. We see that most of the effect of FSBO

¹⁴There are two possible mistakes in matching names. Sellers that register transactions with somehow different names (e.g., with or without initials, or with spouse vs without) may be overlooked. We may miss those valid matches. On the other hand, we may misclassify as a match two sellers with identical names.

we saw in Table 4 can be explained by this dummy variable.

This might not be too surprising since this coefficient is a weighted average of the sellers that sold only once using FSBO and those that sold more than once and used FSBO at least once. Since the first group is larger they might explain most of the effect. For that reason in column (ii) we run the same regression but for MLS transaction only. Since the sample includes exclusively MLS transactions the coefficient on FSBO lister reflects the selection effect and not a platform effect.

The results suggest that FSBO sellers are indeed likely to get a higher price even when selling through MLS. On average they get 0.9% more. Note, that they take slightly longer to sell, although the effect is not statistically significant, suggesting that they are more patient. All this points out to seller selection is indeed present. Consistent with Claim 2 selection is creating a positive correlation between price and propensity to list on FSBO. However, selection is not enough to fully reverse the result that MLS does not command a premium.

In the last two columns in the table we restrict the sample to the properties sold by sellers who had multiple sales/listings. There are 216 different sellers that sold multiple properties using different platforms involving 608 sales. In column (iii) we report the result of regressing the log of price, and time to sell, of the properties sold by these sellers on a dummy variable that equals one if the property was listed on FSBO, and the usual controls. We include also fixed effects for the sellers. The results suggest that when listing on FSBO these sellers get 1.65% higher price, but the effect is not statistically significant. On average it takes 16 days longer to sell the house when listing on FSBO. In column (iv) we repeat the analysis with a dummy variable that equals one if the property is listed and sold using FSBO. As in column (iii) we include seller fixed effects. The results suggest that there is no statistical difference in the price or the time to sell.

We also examined instrumental variables regressions to control for the potential correlation between FSBO and the unobserved characteristics. In all these cases the impact of FSBO was not statistically different than zero. However, depending on the exact functional form, the standard errors were very large, which is consistent with the instrumental variables being only weakly correlated with the decision to use FSBO. Indeed the "first stage" verifies this. The instruments we tried include the neighbors' propensity to list, or their success, on

FSBO.

In summary, we explored various ways to control for seller selection in the decision to use FSBO. The results suggest that indeed selection is present. After controlling for selection we find that the FSBO premium disappears. We find no evidence that MLS provides any premium relative to FSBO.

6 Welfare Implications

We now discuss the welfare implications of the entry of a FSBO platform implied by our results. FSBO listings differ from MLS listings in two distinct ways: FSBO involves no commissions and the FSBO platform potentially delivers a different matching propensity (due to network size). Consider both elements. We argue the former represents a welfare neutral transfer, while the latter impacts total welfare (through slower matching, longer spells on the market, and perhaps poorer matches).

Commissions, as any price, may impact total welfare through a change in the quantity of houses transacted. We assume that, in the relevant range of commissions, their impact on the number of transactions is negligible. Thus, commission avoidance represents redistribution from realtors to FSBO users. Sellers on FSBO enjoy a substantial reduction in the cost of transacting in the real estate market. While they have to put in more effort, revealed preferences tell us FSBO users must be better off, at the expense of realtors who lose part of their rents. The lesson from the Madison case is that this welfare transfer can be achieved with a relatively small initial investment. The key to the success of the platform resides in coordination needed to generate a critical mass. Competition from independent alternative networks may preclude generating a critical mass.

The second welfare consideration is that FSBO, or any competing platform, may preclude fully exploiting scale economies in network size. In the presence of network effects, depending on the environment, only one platform can survive (Cantillon and Yin, 2006). However, the countervailing force, which calls for multiple platforms, is product differentiation (Armstrong, 2006, and Rochet and Tirole, forthcoming). We evaluate the implications of our findings regarding these two determinants of the optimal market structure: differentiation

and network effects. We ask what our findings say about the welfare consequences of FSBO.

The overall picture coming out of the findings presented in the previous sections is that although FSBO does not entail a price penalty, it is a less effective platform. The larger network, the MLS, does better in terms of both expected time to sell and probability of a transaction within a time period. The effectiveness of the larger platform suggests scale economies appear not to be fully achieved by FSBO. The finding from our analysis that MLS is more effective is a key for welfare. Absent differentiation across platforms we could conclude that a single platform would lead to higher aggregate welfare. However, platform differentiation may justify the coexistence of several platforms.

What can we say about platform differentiation? There are two dimensions in which the platforms differ. One is the matching effectiveness of the platforms, which is affected by the size of the network. The second difference across platforms is the service provided by the agent (showing, pricing, conditioning the house). There is a sense in which both these dimensions are vertical (i.e., at equal prices all consumers prefer a more effective platform and one that offers a higher level of service). Sellers differ in their willingness to pay for these services. The key distinction between the two dimensions of differentiation involves network effects. Platform effectiveness, involves network economies while the other services do not. Other things equal a larger platform benefits all traders. On the other hand, the other services involve no externality; no platform is required for their efficient provision.

If FSBO was differentiated from MLS only in its effectiveness, then its entry would decrease total welfare. However, FSBO is also differentiated in the level of service. Therefore, it might be socially efficient to have multiple platforms, offering different service levels, catering to different types of sellers.

Realtors have historically bundled their services with the MLS.¹⁵ But there is no technological reason for this bundling. In case of unbundling the additional services, and offering different service levels, welfare gains can be accrued by having a single network. The single platform would exploit network economies, delivering higher welfare relative to the current allocation which involves a substantial fraction of the population listing in a less effective

¹⁵There are many reasons why realtors historically bundled their services. Regardless of the reason, they are quite reluctant to unbundle them (e.g., see foreclosure cases mentioned above). Unbundled services although becoming more common are still rarely offered (see Nadel 2007).

platform. In addition, the add-on services can be separately marketed to those willing to pay for them, allowing to exploit network scale economies without imposing an inefficient provision of services (too high for some).

There is an additional dimension of efficiency gains rendered by unbundling. As pointed out by Hsie and Moretti (2003) the fixed commission leads to: excess realtor entry (especially in expensive areas) and to rent dissipation through non-price competition among agents (see DOJ, 2007). Unbundling the services from the MLS could resolve both. Agent prices will be tied to the type and quality of the services they offer. Moreover, entry will not be tied to the rents generated by the access to the MLS.

7 Concluding Remarks

In this paper we examine the relative performance of two competing networks: MLS and FSBO. After controlling for differences in house and seller characteristics we find that MLS delivers no price premium. MLS does, however, lead to faster transactions. The longer time to sell on FSBO is driven by two factors. First, a proportion of FSBO listings fails and have to move to the MLS. Second, the probability of a quick sell is larger for houses initially listed on the MLS. The lack of a MLS premium means that the cost of the commission charged by realtors is not compensated by a higher sale price, on average.

The empirical findings are consistent with the stock and flow matching framework discussed in Section 3. Consistent with Claim 1, matching is more effective in the platform with the largest inventory, MLS. The type of selection we found in 5.2.2 is consistent with Claim 2, by which FSBO listing is associated with higher house prices (e.g., better bargainers or more patient sellers). Table 1 shows support for the prediction that FSBO listers move to MLS (and stay) in order to explore the bigger stock of MLS buyers, but MLS listers won't move to FSBO (Claim 3). While over 22% of FSBO listers eventually move to the MLS only 0.2% of MLS listers move to FSBO. Finally, the lack of price differences across platforms can be interpreted, in light of Claim 4, as lack of frictions. In a frictionless environment, with patient enough buyers shopping on both platforms, we should not expect a platform premium. In other words, it is the sellers for whom platform choice matters (due to service

and convenience) that will carry the burden of the commission.

What do our results imply for market structure in the brokerage industry in Madison? If one believes that sellers are aware of the FSBO option, and know that there is no premium associated with MLS, then our results suggest that a large fraction of the population is willing to pay a significant amount for the services provided by realtors. Thus, despite the 6% commission rate, realtors are going to continue to maintain a high market share. An alternative view is that FSBOMadison.com is still diffusing. As more people become aware of it, and realize that there might not be a price penalty associated with FSBO, its share of the market will increase.

The data set we use in this paper comes from one market. We selected this market because of the availability of data and the willingness of FSBOMadison.com and the local realtors association to cooperate with us and share their data. At this point we cannot generalize beyond this market. Without further data and analysis we do not know if our results hold more broadly. As we show the penetration rates of FSBOMadison.com vary widely across neighborhoods. It is our impression, based on casual observation, that the penetration rates of FSBO vary across markets. Understanding what drives this variation and the forces behind the diffusion of FSBO is key to understanding the broader implications of our findings.

The data we analyzed so far end at 2004. It would be interesting to study a market during a more difficult time, during a cooler housing market. We could see if the cost or, returns to, using a realtor vary with the cyclicity of the market.

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Table 1: Properties by Initial Listing Platform and Outcome, By Year

List\Outcome	MLS	FSBO	Unsold	Total
1998 to 2004				
MLS	10,725 (86.0%)	30 (0.2%)	1,713 (13.7%)	12,468 (79.9%)
FSBO	697 (22.2%)	2,153 (68.6%)	288 (9.2%)	3,138 (20.1%)
Total	11,422 (73.2%)	2,183 (14.0%)	2,001 (12.8%)	15,606
1998				
MLS	1,806 (84.2%)	3 (0.1%)	336 (15.7%)	2,145 (94.0%)
FSBO	43 (31.2%)	77 (55.8%)	18 (13.0%)	138 (6.0%)
Total	1,849 (81.0%)	80 (3.5%)	354 (15.5%)	2,283
2000				
MLS	1,285 (87.0%)	4 (0.3%)	187 (12.7%)	1,476 (80.3%)
FSBO	106 (29.3%)	226 (62.4%)	30 (8.3%)	362 (19.7%)
Total	1,391 (75.6%)	230 (12.5%)	217 (11.8)	1,838
2002				
MLS	1,458 (86.9%)	3 (0.2%)	216 (12.9%)	1,677 (76.6%)
FSBO	101 (19.7%)	381 (74.4%)	30 (5.9%)	512 (23.4%)
Total	1,559 (71.2%)	384 (17.5%)	246 (11.2%)	2,189
2004				
MLS	1,564 (81.3%)	9 (0.5%)	352 (18.3%)	1,925 (74.4%)
FSBO	102 (15.4%)	480 (72.6%)	79 (12.0%)	661 (25.6%)
Total	1,666 (64.4%)	489 (18.9%)	431 (16.7)	2,586

The year is defined by initial listing date. An unsold property is defined as not having a sales price in the city data.

Table 2: FSBO Penetration Rates, By Area

	FSBO Listing Share (%)	FSBO Outcome Share(%)	Properties Sold
Area 70	43.6	33.7	101
Area 28	39.3	25.0	56
Area 17	37.7	28.1	231
Area 89	33.8	27.0	148
Area 19	27.3	18.2	154
Area 1	26.5	18.7	219
Area 21	24.5	16.1	143
Area 2	20.9	14.1	206
Area 88	19.4	12.6	326
Area 76	17.8	12.9	309
Area 39	12.2	7.7	181
Area 73	9.4	7.3	382
Area 86	7.9	2.4	165
Overall	20.1	14.0	15,606

An area is defined by the City of Madison for assessment purposes. The above areas are a sample out of areas defined by the city.

Table 3: Sample Property Characteristics by Listing Channel

Characteristic	MLS		FSBO		Difference	t-stat
	Mean	Std. Dev.	Mean	Std. Dev.		
age (as of 2007)	46.32	24.37	48.27	26.46	1.95	3.73
# of bedrooms	3.07	0.72	3.05	0.68	-0.02	-1.47
# of full bath rooms	1.59	0.67	1.58	0.65	-0.01	-0.60
# of rooms	3.66	1.20	3.68	1.15	0.02	0.95
total sq footage	1,736.10	697.85	1,717.09	582.36	-19.00	-1.34
lot size	9,606.95	5,391.42	9,017.61	5,260.97	-586.50	-5.19
basement sq footage	998.46	381.79	959.40	329.74	-39.06	-4.99
inside condition	3.71	0.55	3.64	0.60	-0.07	-5.53
outside condition	3.75	0.49	3.75	0.51	-0.01	-0.92
roof age (as of 2007)	26.12	23.94	24.89	24.26	-1.23	-2.43
furnace age (as of 2007)	26.23	23.34	24.90	23.40	-1.33	-2.71
central air	0.81	0.39	0.82	0.38	0.01	1.61
quality class	4.79	1.16	4.84	1.07	0.05	1.88
street noise	16.12	26.90	15.35	26.47	-0.77	-1.37
water front	0.39	5.31	0.26	3.96	-0.13	-1.25
parcel view	2.03	0.20	2.02	0.18	-0.004	-0.96

The above characteristics are a sample of those available to us from the city data.

Table 4: The Effect of platform on Price

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Dependent variable: logarithm of price							
Sold on FSBO/100	10.75 (0.92)	4.02 (0.85)	3.96 (0.35)	3.19 (0.28)	–	0.67 (0.45)	0.31 (0.47)
Initially Listed on FSBO/100	–	–	–	–	3.07 (0.24)	2.59 (0.40)	2.87 (0.41)
MLS Listing, Sold on FSBO/100	–	–	–	–	–	–	6.41 (1.98)
$R^2 =$	0.015	0.190	0.870	0.924	0.925	0.925	0.925
Dependent variable: price (in 1000's of dollars)							
Sold on FSBO	14.81 (2.02)	2.93 (1.93)	5.21 (0.85)	5.09 (0.71)	–	0.23 (1.18)	-0.64 (1.08)
Initially Listed on FSBO	–	–	–	–	5.09 (0.62)	4.92 (1.05)	5.60 (1.08)
MLS Listing, Sold on FSBO	–	–	–	–	–	–	15.55 (5.15)
$R^2 =$	0.007	0.124	0.842	0.893	0.894	0.894	0.894
Time Controls	no	yes	yes	yes	yes	yes	yes
House Characteristics	no	no	yes	yes	yes	yes	yes
Neighborhood Effects	no	no	no	yes	yes	yes	yes
$N =$	12,878	12,878	12,878	12,878	13,605	13,605	13,605

All columns report results from OLS regressions. In columns (i)-(iv), the sample includes only properties that sold on the platform they originally listed. The sample in column (v)-(vii) also includes properties that sold on a different platform than originally listed. Time controls include year and month dummy variables and a linear time trend.

Table 5: The Effect of platform on Time to Sell

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Sold on FSBO	-3.83 (1.68)	-3.76 (1.67)	-0.16 (1.63)	1.42 (1.65)	–	-61.08 (2.83)	-67.52 (2.57)
Initially Listed on FSBO	–	–	–	–	20.07 (1.51)	63.92 (2.52)	68.95 (2.90)
MLS Listing, Sold on FSBO							115.13 (12.28)
Time Controls	no	yes	yes	yes	yes	yes	yes
House Characteristics	no	no	yes	yes	yes	yes	yes
Neighborhood Effects	no	no	no	yes	yes	yes	yes
N =	12,877	12,877	12,877	12,877	13,604	13,604	13,604
R ² =	0.001	0.018	0.148	0.174	0.181	0.209	0.214

All columns report results from OLS regressions. The dependent variable is total time to sell, measured in days, from the date of the initial listing until the sale date, recorded in the city data. In columns (i)-(iv), the sample includes only houses that sold on the platform they originally listed. The sample in column (v)-(vii) also includes houses that sold on a different platform than originally listed. Time controls include year and month dummy variables.

Table 6: The Effect of platform on Probability of Sale

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Dependent variable: dummy variable equal to 1 if:	Conditional on sale, sold within:							
	Sold		180 days		90 days		60 days	
Initially Listed on FSBO/100	1.90 (0.69)	–	-7.43 (0.73)	–	-11.74 (1.10)	–	-10.07 (0.96)	–
FSBO listing stayed on FSBO/100	–	1.03 (0.78)	–	0.56 (0.81)	–	-2.51 (1.25)	–	-5.93 (1.09)
FSBO listing moved to MLS/100	–	4.19 (1.21)	–	-28.34 (1.23)	–	-35.70 (1.90)	–	-20.91 (1.65)
MLS listing moved to FSBO/100	–	-4.31 (5.29)	–	-18.21 (5.75)	–	-5.72 (8.80)	–	-9.60 (7.68)
Mean of dependent variable(%)	87.1		87.5		53.0		23.5	
N =	15,605				13,605			
R ² =	0.132	0.134	0.132	0.160	0.118	0.134	0.083	0.088

All columns report results from OLS regressions. The dependent variable is a dummy variable, which varies by column. In columns (i) and (ii), the sample includes properties that were not sold, while in columns (iii)-(viii) the sample is only properties that a sale was eventually observed. All regressions include year and month dummy variables, a linear time trend, house and neighborhood characteristics.

Table 7: House Fixed Effects Regressions

Dependent variable:	log of price				time to sell			
Initially Listed	2.48	2.65	-	-	25.33	19.73	-	-
on FSBO/100*	(0.49)	(0.41)			(3.47)	(2.48)		
FSBO listing	-	-	2.38	2.73	-	-	9.50	3.65
sold on FSBO/100*			(0.55)	(0.46)			(3.88)	(2.70)
FSBO listing	-	-	2.83	2.43	-	-	67.75	69.80
moved to MLS/100*			(0.86)	(0.76)			(5.99)	(4.41)
MLS listing	-	-	9.15	3.49	-	-	24.31	51.81
moved to FSBO/100*			(4.24)	(3.88)			(45.00)	(34.01)
House Fixed Effects	yes	no	yes	no	yes	no	yes	no
House+Neighborhood Char	no	yes	no	yes	no	yes	no	yes

Dependent variable: dummy	Conditional on sale, sold within:			
variable equal to 1 if:	Sold		90 days	60 days
Initially Listed	0.30	0.45	-14.45	-
on FSBO/100	(0.34)	(0.24)	(2.79)	-7.35
FSBO listing	-	-	-	-2.46
sold on FSBO/100				(2.84)
FSBO listing	-	-	-	-20.30
moved to MLS/100				(4.38)
MLS listing	-	-	-	6.64
moved to FSBO/100				(21.75)
House Fixed Effects	yes	no	yes	yes
House+Neighborhood Char	no	yes	no	no

*In columns where the dependent variable is "time to sell" the independent variables are not divided by 100.

All columns report results from OLS regressions. The sample includes properties where multiple sales were observed, there are 2023 such properties involving 4202 sales. In columns where "sold" is the dependent variable the sample also includes properties that were listed more than once, at different times even if they did not sell, there are 2728 such properties involving 4921 listings. All regressions include year and month dummy variables and a linear time trend.

Table 8: FSBO versus Sales by Agent/Owner on MLS

	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Dependent variable:	log of price		time to sell		sold in 60	sold in 90	sold in 180
Sold by Owner/100	2.12	1.84	-0.95	-3.47	2.41	7.27	1.95
	(0.70)	(0.68)	(4.19)	(4.35)	(2.74)	(3.17)	(2.19)
Sold on FSBO/100	1.12	1.22	2.35	0.28	-6.75	-6.93	0.51
	(0.74)	(0.72)	(4.41)	(4.60)	(2.89)	(3.34)	(2.19)
N=	12,878	13,605	12,877	13,604	13,605	13,605	13,605

All columns report results from OLS regressions. In columns (i) and (iii), the sample includes only houses that sold on the platform they originally listed. The sample in columns (ii) and (iv)-(vii) also includes houses that sold on a different platform than originally listed. All regressions include year and month dummy variables, a linear time trend, house and neighborhood characteristics.

Table 9: Controlling for Unobserved Seller Heterogeneity

	(i)	(ii)	(iii)	(iv)
Dependent variable: logarithm of price				
Initially Listed on FSBO/100			1.65 (1.86)	
FSBO listing sold on FSBO/100				1.96 (2.59)
FSBO Seller/100	2.58 (0.25)	0.92 (0.54)		
Dependent variable: time to sell				
Initially Listed on FSBO			16.47 (10.87)	
FSBO listing sold on FSBO				-16.66 (15.38)
FSBO Seller	-2.65 (1.57)	4.33 (3.32)		
Sample	all sales	MLS listings	sellers w/ multiple listings/sales	
Fixed Effects	no	no	yes	yes
	N= 13,605	10,755	742	608

All columns report results from OLS regressions. In column (ii) the sample includes only properties there were listed on MLS. In columns (iii) and (iv) the samples include properties sold by sellers with multiple sales between 1998 and 2004, there are 265 sellers that sold properties listed using different platforms, involving 744 sales, 216 seller sold properties using different platforms, involving 608 sales. The regressions in columns (iii) and (iv) include seller fixed effects. All regressions include year and month dummy variables, a linear time trend, house and neighborhood characteristics.