# The Relative Performance of Real Estate Marketing Platforms: MLS versus FSBOMadison.com

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*We compare house sales on a For-Sale-By-Owner (FSBO) platform to Multiple Listing Service (MLS) sales and find that FSBO precommission prices are no lower, but that FSBO is less effective in terms of time to sell and probability of a sale. We do not find direct evidence of the importance of network size as a reason for the lower effectiveness of FSBO. We do find evidence of endogenous platform differentiation: patient sellers use FSBO while patient buyers transact more often on the MLS (where they avoid patient sellers). We discuss the implications for platform competition, two-sided markets, and welfare. (JEL L85, M31, R31)*

A large proportion of real estate transactions are carried out with the help of real estate agents.[1] These agents provide expertise (on pricing, preparing a property for sale, and bargaining) and convenience (by showing the property, advertising and holding open houses, and taking care of paperwork). One advantage of working with an agent who is a realtor is access to the Multiple Listing Service (MLS), a database that compiles information on all properties listed by local realtors. Typically, realtors charge a commission of around 6 percent.

The advent of the Internet has affected many markets. The real estate market is one of them. Direct marketing has always been possible using newspapers, flyers, and other forms of advertising, but today the Internet offers a cheaper and potentially more effective platform to facilitate direct (by owner) marketing. Sellers can post detailed information and pictures along with virtual tours. For-sale-by-owner (FSBO) Web sites provide an alternative platform, or two-sided network, to compete with the MLS network.

We study the performance of these two competing platforms, the MLS, the established platform that offers the bundle of services available from realtors, versus FSBO, the newly established no-service platform. We compare sale price,[2] time on the market, and the probability of sale within different periods of time. We also study how sellers and buyers sort themselves into these two-sided markets to examine the importance of coordination and crowding out in determining network size.

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

[2] The National Association of Realtors Web site uses its 2005 Home Buyer & Seller Survey to support a claim 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."

We focus on the city of Madison, Wisconsin, where a single Web site (FSBOMadison.com) has become the dominant for-sale-by-owner platform. FSBOMadison.com offered us access to all FSBO listings since its inception. We combined the FSBO data with data from two other sources. First, the South-Central Wisconsin Realtors Association granted us access to all MLS listings in the city. Second, we matched every listing with data from the city of Madison. The city assessor's office maintains a database with the full history of transactions on every property, together with an exhaustive set of property characteristics. By merging these datasets we get a complete history of events that occurred for virtually every single-family home for sale between January 1998 and December 2005 (18,466 observations). A listing history includes: date and platform of initial listing, date of any moves across platforms, and outcome (sale date and price if sold, withdrawal date otherwise).

After controlling for house and seller heterogeneity, we find no support for the hypothesis that listing with a realtor and appearance on the MLS delivers a higher sale price (before subtracting commissions) than the FSBO transactions. The financial cost of selling through a realtor is the commission minus the price premium an MLS transaction might generate, plus the financial savings from a faster sale. Considering that realtors charge a 6 percent commission compared to the $150 fee for FSBOMadison.com, FSBO sellers come out ahead financially. The absence of an MLS premium does not mean realtors do not provide value to the seller, but rather that the price for convenience provided by a realtor seems to be the full realtor's commission.[3]

MLS transactions occur more quickly. The longer time to sell on FSBO is driven by two factors. First, over 20 percent of FSBO listings do not sell on FSBO; sellers then list on the MLS. Second, the probability of a quick sale is higher for houses initially listed on the MLS.

Quicker sales on the MLS might be explained by scale effects or by network composition. The FSBO platform size may not fully exploit economies of scale in network size. We find no direct evidence of the influence of network size on FSBO performance, but do find evidence of platform selection. Matching names in the city data allows us to see whether buyers and sellers are local. We consider that being local is a proxy for a better understanding of the market, more patience, and enhanced ability to search (over an out-of-town buyer who has to travel in order to search and buy).

Consistent with the idea that local buyers might be more patient, we find that local sellers sell at a premium, while local buyers pay less. We also find that patient sellers are more likely to use FSBO, while patient buyers are more likely to purchase on the MLS, where they face less patient sellers. These findings are in line with the literature on platform sorting (Thierry Foucault and Christine Parlour 2004; Ginger Jin and Andrew Kato 2007; Atila Ambrus and Rossella Argenziano 2009; Ettore Damiano and Hao Li 2008).

Platform comparisons require dealing with two econometric concerns. First, there could be unobserved characteristics of a property that affect both the decision to sell on FSBO and the outcomes. For example, easier-to-sell homes (those that most match the tastes of the population, as in Christopher House and Emre Ozdenoren 2008) 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 property heterogeneity, we examine properties that sold multiple times. The inclusion of a house fixed effect is essentially inconsequential. Unobserved house heterogeneity, which is fixed over time, does not seem to be a relevant issue.

The second measurement concern is self-selection of sellers into FSBO. Sellers may differ, for example, in their patience or bargaining ability. More patient sellers are likely to get a better

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[3] We would like to compare prices net of commissions as well, but without information on commissions we can compare only transaction prices. One reason for variation in commissions is whether a buyer is represented by an agent, in this case an FSBO transaction saves only half of the 6 percent commission.

price whatever platform they choose. At the same time, more patient sellers may be more prone to list on FSBO. In that case, we will get a positive correlation between FSBO and sale price.[4]

We deal with seller selection in several ways; they all suggest a nonsignificant FSBO premium. First, we compare the houses that listed and sold on FSBO to those that listed on FSBO, and then withdrew to list on the MLS.[5]

The second approach is related to Steven Levitt and Chad Syverson (2008b). They find—as we do in our data—a premium for realtors' own properties sold on the MLS. We compare the realtors' premium to the premium sellers get on FSBO; these are both by-owner transactions but on different platforms.

The third approach is to compare transactions by the same seller using different platforms, by matching seller names across transactions.

B. Douglas Bernheim and Jonathan Meer (2008) compare non-MLS listings with and without agents.[6] They look at sales of faculty and staff homes on the Stanford University campus with and without an agent. Like us, they find that brokers accelerate sales but do not deliver higher prices. They isolate the effect of information from other broker services; because the Stanford Housing Office maintains a free listing service for eligible buyers, Bernheim and Meer know the value of a broker does not reside in information diffusion (i.e., the platform). Instead, brokers' value "is likely confined to promotional services, negotiations, and the interpretation of market data."

Levitt and Syverson (2008a) use data from three different counties to compare the performance of flat-fee realtors to full service agents. They find no difference in selling prices but sales take slightly longer for those using a flat-fee agent.

Our findings are related to the literature on the determinants of network size. Two of the issues raised in this literature are the effect of multi-homing (Kenneth Corts and Mara Lederman 2009) and crowding out (Glenn Ellison and Drew Fudenberg 2003; Angelique Augereau, Shane Greenstein, and Marc Rysman 2006). We believe that FSBO development is determined by the proportion of informed buyers. Informed buyers can multi-home and therefore, unlike the typical model in the literature, coordination between buyers and sellers does not determine the size of the network. Instead, the fraction of informed buyers drives sellers' incentives to choose FSBO. We find that sellers who face a fixed number of buyers crowd each other out.

The rest of the paper is organized as follows. Section I presents the institutional background with special emphasis on Madison. Section II presents the data and basic descriptive analysis. Section III presents the results. It starts with raw platform comparisons followed by several approaches to deal with selection. Section IV presents some discussion on network diffusion, platform sorting, and welfare implications.

## I. Realtors and FSBOMadison.com

Historically, most real estate transactions have involved real estate agents. Homeowners wishing to sell their home sign a contract with an agent (the listing agent), typically offering the agent exclusivity for a limited period, usually six months, and agreeing to pay a commission, usually 6 percent of the sale price, if the house is sold during the contract period (Federal Trade Commission and US Department of Justice 2007). The commission is typically split between the

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

[5] Moving from FSBO to the MLS may depend on seller type. Nevertheless, the selection bias is likely to be attenuated, as the group of FSBO listers is likely to be more homogeneous than the population as a whole.

[6] See also G. Donald Jud and James Frew (1986) and Leonard Zumpano, Harold Elder, and Edward A. Baryla (1996).

listing agent and a selling agent (the agent who brings the buyer). When the same agent lists and sells the property, this agent gets the whole commission.[7]

Real estate agents are licensed by the state. In most states, licensing requires taking a short course and passing an exam. A real estate agent may become a realtor by joining the realtor association and subscribing to its code of ethics. Joining the association provides an 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 in setting the listing price, preparing the house, checking potential buyers' qualifications, showing the house, bargaining the terms of a deal, and handling the paperwork. Another advantage of working with a realtor is access to the MLS. In Madison this involves the ability to list on the South-Central Wisconsin MLS, which requires membership in the organization, and thus is available only to local realtors.

In 1998 an alternative to the MLS was launched in Madison: the Web site FSBOMadison.com. The FSBO founders recruited nine sellers who had advertised in the local newspaper, added the house of one of the founders, and launched their Web site with ten 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 (increasing to $150 for most of the period of our sample), homeowners can post their listing on the Web site (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 six months, and for a longer period if the fee is paid again. FSBOMadison.com has basically established itself as the only for-sale-by-owner platform in the area.

Properties are removed from the Web site upon direction of the homeowner. 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 listings that appear 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 a transaction agrees to pay a buying agent commission, typically 3 percent. In such a case, a FSBO transaction saves only half of the realtor commission.

Recently, a number of limited-service brokers have emerged. The dominant firm in Madison appears to be Madcity Homes (www.madcityhomes.com). Madcity Homes charges $399 to list a house on the MLS for six months and 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 a commission (roughly 3 percent) to any realtor who sells the house, whether the realtor is under a buyer agency agreement or not. No commission is paid if the sale does not involve a realtor. As of the end of 2005, when our sample ends, this firm was fairly small.[8]

## II. Data

Our data come 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

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[7] Some states, Wisconsin being one, also recognize the status of buyer agency. A buyer agent who is involved in a transaction deals with the listing agent to settle the terms of the transaction, and gets the selling agent commission.

[8] See also Paul Carrillo (2007). For a discussion of brokerage choice, see Stephen Salant (1991), Abdullah Yavas and Peter Colwell (1999), Henry Munneke and Yavas (2001), and Mark Nadel (2007).

the parcel numbers assigned by the City. We restrict our attention to single-family homes for two reasons: we lack address details for condominiums in the FSBO and MLS records, and the city and county databases are incompatible as regards condo records.

## A. *MLS Data*

The South-Central Wisconsin Realtors Association provided us with all listing activity on its MLS between January 1, 1998, and December 31, 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 includes the expiration date of the listing, the accepted offer date, the closing date, and the sale price as recorded by the realtors. We also know whether the listing realtor has an interest in the property.

## B. *FSBO Data*

The owners of the FSBOMadison.com Web site provided us with information on all the listings on the 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 1998–2005 for properties with addresses in the city of Madison.

## C. *City Data*

The city of Madison is in 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. The county also maintains a county-wide database with location information for each parcel. We use this database to obtain spatial coordinates for each property. Whenever there are inconsistencies between the county and the city database, we use Streetmap to locate the property.

Combining the three datasets gives us 22,455 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, perhaps including listing with several agents.

We exclude new construction from the sample (3,163 observations). New units are generally sold by developers, we exclude them because we are interested in platform performance for the average nonprofessional seller. We also exclude 149 houses that went though major renovation (we do not know their characteristics at the time they sold). We exclude 239 observations due to missing price or sales information. We include units between $50,000 and $1,000,000, which top-censors 11 high-priced units and bottom-censors 82 inexpensive units.

After merging these datasets and excluding the observations as described, we get 18,466 listings representing 14,057 unique properties between 1998 and 2005.

## D. *Descriptive Statistics*

Table 1 summarizes platform use over time. Rows describe where a property was initially listed. Columns represent the eventual outcome of a listing, namely, whether and on what platform a property sold.

The FSBO market share of listings for the entire sample period (top rows of Table 1) is roughly 21 percent. We define a nonsale 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 86 percent of the properties eventually sold. Of the properties sold, 94 percent sold through the initial listing platform. The

TABLE 1—PROPERTIES BY INITIAL LISTING PLATFORM AND OUTCOME, BY YEAR

| List/outcome | MLS | FSBO | Unsold | Total |
|---|---|---|---|---|
| *1998 to 2005* | | | | |
| MLS | 12,322 (84.6) | 40 (0.3) | 2,204 (15.3) | 14,566 (78.8) |
| FSBO | 887 (22.8) | 2,600 (66.7) | 413 (10.6) | 3,900 (21.1) |
| Total | 13,209 (71.5) | 2,640 (14.3) | 2,617 (14.2) | 18,466 |
| *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 |
| *2005* | | | | |
| MLS | 1,557 (72.9) | 7 (0.3) | 571 (26.7) | 2,135 (75.7) |
| FSBO | 137 (20.0) | 425 (62.0) | 123 (18.0) | 685 (24.3) |
| Total | 1,694 (60.1) | 432 (15.3) | 694 (24.6) | 2,820 |

*Notes:* The year is defined by initial listing date. An unsold property is defined as a property without a sale price in the city data. The numbers in parentheses are percents. Percentages add up to 100 along each row for the first three columns. In the last column, percentages add up to 100 by year.

remaining 6 percent are almost all switches from FSBO to MLS. Switches from MLS to FSBO are almost nonexistent, accounting for just 0.3 percent of the MLS listings.

The market share of FSBO in properties sold is 14 percent, which is lower than its listing share. Since FSBO started only in 1998, these numbers somewhat underestimate its current market share.

The rest of Table 1 presents the breakdown for every other year of the sample (1998, 2000, and so on). FSBO's share in listing and in outcomes increases over time. By 2005, the last year of the sample, the FSBO share in listing was over 24 percent, and its share of sold properties was over 20 percent.

In terms of diffusion, it is interesting to see how quickly FSBO has matured. While the first listings are in mid-1998, by 2000 FSBO's market share had essentially plateaued.

To judge the performance of each platform, we look at the proportion of properties that sell through their initial listing platform. Of the 3,900 initial FSBO listings, 2,600, or 66.7 percent, sold on FSBO. This compares to 84.6 percent of initial MLS listings (12,322 out of 14,566) that sold on the MLS. While there is a clear trend in FSBO listings, increasing from 6.0 percent in 1998 to 24.3 percent in 2005, the success rate is more stable. The success rate in 2005, 62.0 percent, is higher than the rate in 1998, 55.8 percent. However, there is no clear trend in the intervening years.

As the penetration of FSBO increases over time, it also differs across neighborhoods. In Table 2 we present the FSBO penetration rates across different assessment areas (as defined by the City of Madison for tax assessment purposes). We get similar variation if we look at elementary school areas. The FSBO listing share varies between 8.9 percent and 45.5 percent. The top FSBO-share

Table 2—FSBO Penetration Rates, by Area

|  | FSBO listing share (percent) | FSBO outcome share (percent) | Total number of properties sold |
|---|---|---|---|
| Area 70 | 45.5 | 31.4 | 121 |
| Area 28 | 44.3 | 27.1 | 70 |
| Area 17 | 39.3 | 28.6 | 262 |
| Area 89 | 37.0 | 29.0 | 176 |
| Area 19 | 29.8 | 19.1 | 178 |
| Area 1 | 25.9 | 17.6 | 255 |
| Area 21 | 25.6 | 17.8 | 180 |
| Area 2 | 19.7 | 12.6 | 239 |
| Area 88 | 19.4 | 11.3 | 417 |
| Area 76 | 17.4 | 12.1 | 363 |
| Area 39 | 13.2 | 9.0 | 212 |
| Area 73 | 11.3 | 8.9 | 452 |
| Area 86 | 8.9 | 2.6 | 192 |
| Overall | 21.1 | 14.3 | 18,466 |

*Notes:* Areas are as defined by the City of Madison for assessment purposes. The areas above represent a sample only.

neighborhoods tend to be close to the University of Wisconsin–Madison campus. Similar variation is present 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 percent to 100 percent (with one outlier at 9 percent). The mean success rate is 66 percent (standard deviation 13.2 percent).

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, a one-standard-deviation increase in the success rate translates into a 2 percentage point increase in the propensity to list on FSBO.

In Table 3 we compare the dependent variables in the subsequent analysis and several property characteristics. The columns present the mean and standard deviation for properties listed initially through FSBO and the 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. FSBO properties are older; they tend to be located on smaller lots and have smaller basements but have newer roofs and furnaces.

### III. Results

We now explore the differences in outcomes for properties sold through FSBO and the MLS.

A. *Outcomes by FSBO and MLS Platforms*

Tables 4–6 present the results of regressions of sale price, time on the market, and probability of a sale on an FSBO dummy variable and various controls.

In Table 4 we display the effect of platform on sale price (before netting any commission that sellers pay agents). In the top panel of the table the dependent variable is the logarithm of price; in the bottom panel we regress the price level on various controls. 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 assigned

TABLE 3—SAMPLE PROPERTY CHARACTERISTICS BY LISTING PLATFORM

| Characteristic | MLS | | FSBO | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | *t*-statistic |
| *Dependent variables* | | | | | | |
| Sale price | 180,858 | 86,720 | 199,423 | 77,507 | 18,565 | 11.42 |
| Time on market | 106.04 | 71.16 | 119.23 | 76.57 | 13.18 | 9.50 |
| Probability sold within 60 days | 0.54 | 0.50 | 0.46 | 0.50 | −0.07 | −9.23 |
| Probability sold within 90 days | 0.25 | 0.43 | 0.17 | 0.38 | −0.08 | −8.76 |
| Sold | 0.85 | 0.36 | 0.89 | 0.31 | 0.05 | 7.23 |
| | | | | | | |
| *Independent variables* | | | | | | |
| Age (as of 2007) | 45.84 | 24.68 | 47.96 | 26.82 | 2.12 | 4.39 |
| Number of bedrooms | 3.07 | 0.71 | 3.04 | 0.69 | −0.03 | −2.09 |
| Number of full bathrooms | 1.60 | 0.67 | 1.58 | 0.65 | −0.01 | −1.04 |
| Number of rooms | 3.65 | 1.19 | 3.66 | 1.14 | 0.01 | 0.49 |
| Total square footage | 1,734.53 | 694.29 | 1,705.74 | 576.75 | −28.79 | −2.24 |
| Lot size | 9,585.78 | 5,345.43 | 8,933.02 | 5,029.47 | −652.76 | −6.45 |
| Basement square footage | 997.66 | 382.77 | 955.41 | 330.68 | −42.25 | −5.92 |
| Inside condition | 3.72 | 0.55 | 3.66 | 0.59 | −0.06 | −5.97 |
| Outside condition | 3.77 | 0.49 | 3.75 | 0.51 | −0.02 | −1.66 |
| Roof age as of 2007 | 25.39 | 23.75 | 24.42 | 24.23 | −0.97 | −2.12 |
| Furnace age as of 2007 | 25.62 | 23.13 | 24.52 | 23.30 | −1.10 | −2.48 |
| Central air | 0.81 | 0.39 | 0.82 | 0.39 | 0.01 | 1.10 |
| Quality class | 4.79 | 1.15 | 4.82 | 1.06 | 0.03 | 1.60 |
| Street noise | 15.94 | 26.80 | 15.13 | 26.35 | −0.80 | −1.58 |
| Waterfront | 0.37 | 5.16 | 0.26 | 4.07 | −0.12 | −1.24 |
| Parcel view | 2.03 | 0.20 | 2.02 | 0.18 | −0.002 | −0.60 |

*Notes:* Characteristics are a sample of those available to us from the city data. Based on 15,849 observations, 13,209 in MLS, and 2,640 in FSBO.

TABLE 4—EFFECT OF PLATFORM ON PRICE

| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
|---|---|---|---|---|---|---|---|
| *Dependent variable: Logarithm of price* | | | | | | | |
| Sold on FSBO/100 | 9.48 | 3.45 | 4.01 | 3.14 | – | 0.75 | 0.45 |
| | (0.86) | (0.78) | (0.32) | (0.25) | | (0.41) | (0.42) |
| Initially listed on FSBO/100 | – | – | – | – | 2.98 | 2.48 | 2.68 |
| | | | | | (0.22) | (0.36) | (0.37) |
| MLS listing, sold on FSBO/100 | – | – | – | – | – | – | 4.98 |
| | | | | | | | (1.73) |
| $R^2$ | 0.012 | 0.221 | 0.871 | 0.925 | 0.926 | 0.926 | 0.926 |
| | | | | | | | |
| *Dependent variable: Price (in 1000s of dollars)* | | | | | | | |
| Sold on FSBO | 12.30 | 1.60 | 5.13 | 4.74 | – | −0.66 | −1.20 |
| | (1.94) | (1.82) | (0.82) | (0.68) | | (1.12) | (1.16) |
| Initially listed on FSBO | – | – | – | – | 5.00 | 5.44 | 5.89 |
| | | | | | (0.60) | (1.00) | (1.02) |
| MLS listing, sold on FSBO | | | | | | | 9.73 |
| | | | | | | | (4.73) |
| $R^2$ | 0.005 | 0.144 | 0.837 | 0.890 | 0.891 | 0.891 | 0.891 |
| | | | | | | | |
| 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 | 14,922 | 14,922 | 14,922 | 14,922 | 15,849 | 15,849 | 15,849 |

*Notes:* Dependent variable is transaction price (including commission). All columns report results of OLS regressions. In columns (i)–(iv), the sample includes only properties that sold on the platform where they originally listed. Columns (v)–(vii) also include properties that sold on a different platform from that where they originally listed. Time controls include year and month dummy variables and a linear time trend. Standard errors are in parentheses.

TABLE 5—EFFECT OF PLATFORM ON TIME TO SELL

| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
|---|---|---|---|---|---|---|---|
| *Dependent variable: Total time to sell* | | | | | | | |
| Sold on FSBO | −6.23 | −4.97 | −1.53 | −0.36 | – | −62.45 | −69.31 |
| | (1.57) | (1.52) | (1.49) | (1.50) | | (2.54) | (2.61) |
| Initially listed on FSBO | – | – | – | – | 19.47 | 63.67 | 69.00 |
| | | | | | (1.38) | (2.25) | (2.29) |
| MLS listing, sold on FSBO | | | | | | | 115.05 |
| | | | | | | | (10.65) |
| 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 | 14,922 | 14,922 | 14,922 | 14,922 | 15,849 | 15,849 | 15,849 |
| $R^2$ | 0.002 | 0.087 | 0.174 | 0.198 | 0.203 | 0.233 | 0.239 |

*Notes:* All columns report results of OLS regressions. 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 where originally listed. Column (v)–(vii) also include houses that sold on a different platform from that where they originally listed. Time controls include year and month dummy variables. Standard errors are in parentheses.

TABLE 6—EFFECT OF PLATFORM ON PROBABILITY OF SALE

| | | | Conditional on sale, sold within: | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Dependent variable: Dummy* | Sold | | 180 days | | 90 days | | 60 days | |
| *variable equal to one if:* | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) | (viii) |
| Initially listed on FSBO/100 | 2.04 | – | −7.11 | – | −11.81 | — | −9.69 | – |
| | (0.64) | | (0.66) | | (1.00) | | (0.87) | |
| FSBO listing stayed on FSBO/100 | – | 1.21 | – | 1.36 | – | −2.37 | – | −5.24 |
| | | (0.73) | | (0.74) | | (1.13) | | (0.99) |
| FSBO listing moved to MLS/100 | – | 4.02 | – | −28.27 | – | −35.28 | – | −20.89 |
| | | (1.21) | | (1.10) | | (1.68) | | (1.47) |
| MLS listing moved to FSBO/100 | – | −5.91 | – | −18.73 | – | −10.13 | – | −14.22 |
| | | (4.66) | | (4.97) | | (7.58) | | (6.61) |
| Mean of dependent variable(percent) | 85.8 | 85.8 | 87.0 | 87.0 | 51.9 | 51.9 | 22.2 | 22.2 |
| N | 18,466 | 18,466 | 15,849 | 15,849 | 15,849 | 15,849 | 15,849 | 15,849 |
| $R^2$ | 0.137 | 0.137 | 0.147 | 0.178 | 0.118 | 0.134 | 0.076 | 0.082 |

*Notes:* All columns report results of 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 restricted to properties for which a sale was eventually observed. All regressions include year and month dummy variables, a linear time trend, house, and neighborhood characteristics. Standard errors are in parentheses.

platform, this regression measures the causal effect of selling on FSBO. In the spirit of this ideal situation, the sample in columns (i) through (iv) includes only houses that sold on the platform where they were originally listed.

The results suggest that on average there is a large positive premium for selling on FSBO, roughly a 9.5 percent premium, or $12,300. As 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 risen, and so has the FSBO share of the market. Indeed, once we control for year and month time dummy variables and a linear time trend, column (ii), the effect drops to 3.45 percent, or $1,600 (still statistically significant).

To control for differences in properties, we construct a hedonic model of prices. Column (iii) reports the results of this model. In the controls we include the characteristics of the house described 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 suggest that while some characteristics are statistically different, the differences are slight.

In column (iv) we also control for neighborhood characteristics by including neighborhood fixed effects. The coefficients on these controls are of no direct interest, but we are able to explain 92.6 percent of the variation in the logarithm of price, and 89.1 percent of the variation in price. The impact of selling through FSBO drops to approximately 3.14 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 with respect to the results in column (iv). First, the sample now includes switchers: properties initially listed on one platform but that sold through the other. These properties are mostly houses that listed on FSBO that ended up being sold through the MLS. Second, the FSBO dummy is now defined as initially listed on FSBO, as opposed to being sold through FSBO.

This regression is of interest to potential sellers asking about 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. If we interpret the results as causal, they suggest that the premium for listing on FSBO, 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) a regression that includes both the initial listing platform and the sales channel. We see here a small additional premium of selling on FSBO of 0.75 percent. This premium is driven by the very small number of properties initially listed on the MLS that were eventually sold on FSBO.

In the last column we separate these properties. These houses command a high premium, about 5 percent over houses that listed and sold on the MLS. Once we isolate the 40 properties listed on the MLS that eventually sold on FSBO, we find that 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 over an MLS listing, in addition to saving the commission. Furthermore, sellers who initially list their houses on FSBO but then move to the MLS also command a significant premium over 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.

To explore the FSBO premium by year, we run the regression in column (v) separately for each year. The estimated coefficients (standard errors) from 1998 through 2005 are: 3.77 (0.99), 1.89 (0.71), 1.78 (0.61), 2.57 (0.52), 3.35 (0.53), 2.95 (0.49), 3.52 (0.50), and 3.79 (0.52). These numbers suggest a generally stable FSBO premium throughout the sample period.

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

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 controls are similar to those in 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 time to sell is six days shorter for selling on FSBO. Once we control for year and month dummies, and for house and neighborhood characteristics, the effect is not statistically significant, however. The additional controls change the $R^2$ modestly compared to the price regression where house and neighborhood characteristics explain a high proportion of the variation.[9]

Notice that the absence 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. It suggests that the MLS is more effective. While the average time to sell on the MLS reflects the entire population of houses listed on the MLS, as there are few switches to FSBO, the FSBO average represents the average conditional on selling and being in the 75 percent that sold on FSBO without moving to the MLS. Even absent unobserved heterogeneity, the FSBO average represents the luckiest draws, in terms of time to sell, while the MLS represents the whole population.

In the last three columns of Table 5, we again study the full sample of houses that sold, not just houses sold on the original listing platform. In column (v) we find that sellers who originally list on FSBO should expect to take 19.47 days more to sell. This is largely driven by sellers who originally listed on FSBO but then switched to the MLS.

The results in column (vii) allow us to separate the effects into four groups. The base group is properties listed and sold on the MLS. Compared to this group, the properties listed and sold on FSBO take 0.3 day less to sell, the same result we find in column (iv). For houses that were listed on FSBO but eventually sold on the MLS, the time to sell is almost 69 days longer. Finally, for the few houses that were listed on the 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, and 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. We call it a nonsale if we do not observe a sale price in the city data. Overall in the sample, 85.8 percent of the properties sold. The properties initially listed on FSBO are more likely to sell eventually, although some of them eventually sell through the MLS.

In column (ii) we separate 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 the MLS—properties that listed and sold on FSBO are roughly 2 percentage points more likely to sell, although the difference is not statistically significant. The properties that were listed on FSBO but eventually switched to the 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 were listed on the MLS and switched 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 eventual sale, within a fixed number of days. We look at 180, 90, and 60 days. We find a pattern similar to what

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[9] Time on market is defined by the timing of closing, which depends on considerations hard to predict, so a lower explanatory power is expected.

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 sell eventually, their initial success is lower than the MLS.

In columns (iv), (vi), and (viii) we separate the properties into four groups. The FSBO listings that sold on FSBO are less likely to sell within 60 or 90 days. The properties that started on either FSBO or the MLS, and then switched, take an even longer time to sell and thus are much less likely to sell within a fixed time period.

## B. *Selection*

A key issue in interpreting our results is selection. There are two separate concerns. First, are properties sold on FSBO comparable to those sold on the MLS? We control for a rich set of observed house characteristics, but it is still possible that there are unobserved differences (perhaps with respect to the liquidity of the property) that are correlated with the platform choice. Second, sellers' attributes might be correlated with platform choice.

*Unobserved House Characteristics.*—As we showed in Table 2, there are some differences in observed characteristics between the properties listed on FSBO and the MLS. 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, including a house fixed effect will control for the unobserved characteristic. Recall that we eliminated from our sample properties that experienced a major renovation during our period of study (this is one of the characteristics reported by the city assessor).

In our sample, there are 2,597 properties that sold more than once. The majority, 2,304, sold twice; 275 sold three times; and 18 sold four times. Together, this represents 5,737 sales. Out of these sales, 4,557 (or 80 percent) were listed and sold on the MLS; 867 (15 percent) were listed and sold on FSBO; 306 (5 percent) were listed on FSBO and sold on the MLS; and only 7 were listed on the MLS but sold on FSBO. Of the 2,597 properties that were sold multiple times, we have 847 that were sold using different platforms at different times.

Tables 7 and 8 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 control for differences across properties using the house and neighborhood characteristics.

We also display in Table 7 and 8 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 comparison is twofold. First, we want to highlight that the sample of houses that sell multiple times is representative, namely, that findings for those houses (without fixed effects) are similar to those for the whole sample (compare the coefficient on FSBO listing in column (ii) to the coefficient in Table 5 including the whole sample). Second, we want to show that controlling for house characteristics delivers similar findings as those rendered using fixed effects (see columns (i) and (ii)).

Together, these results suggest 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 are not large, and controlling for them did not make great difference. Because most unobserved house characteristics we can think of seem (roughly) fixed over time, we conclude that unobserved house characteristics are not a serious concern.

Table 7—House Fixed Effects Regressions–Price and Time to Sell

| Dependent variable: | Log of price | | | | Time to sell | | | |
|---|---|---|---|---|---|---|---|---|
| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) | (viii) |
| Initially listed on FSBO/100[a] | 2.13 (0.43) | 2.56 (0.36) | – | – | 23.20 (3.01) | 18.74 (2.12) | – | – |
| FSBO listing sold on FSBO/100[a] | – | – | 2.12 (0.49) | 2.64 (0.41) | – | – | 4.59 (3.36) | 0.77 (2.33) |
| FSBO listing moved to MLS/100[a] | – | – | 2.34 (0.72) | 2.42 (0.63) | – | – | 69.63 (4.96) | 67.81 (3.61) |
| MLS listing moved to FSBO/100[a] | – | – | 9.15 (3.36) | 3.10 (3.02) | – | – | 34.07 (29.78) | 38.27 (22.60) |
| House fixed effects | Yes | No | Yes | No | Yes | No | Yes | No |
| House + neighborhood characteristics | No | Yes | No | Yes | No | Yes | No | Yes |

*Notes:* All columns report results of OLS regressions. The sample includes properties for which multiple sales were observed. There are 2,597 such properties, involving 5,737 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 3,675 such properties, involving 8,084 listings. All regressions include year and month dummy variables and a linear time trend. Standard errors are in parentheses.

[a] In columns where the dependent variable is "time to sell," the independent variables are not divided by 100.

Table 8—House Fixed Effects Regressions–Probability of Sale

| Dependent variable: Dummy variable equal to one if: | Sold | | Conditional on sale, sold within: | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 90 days | | | 60 days | | |
| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) | (viii) |
| Initially listed on FSBO/100 | 0.23 (0.26) | 0.42 (0.19) | −12.30 (2.37) | – | – | −7.63 (2.11) | – | – |
| FSBO listing sold on FSBO/100 | – | – | – | −1.59 (2.67) | 0.01 (1.88) | – | −1.68 (2.40) | −1.20 (1.69) |
| FSBO listing moved to MLS/100 | – | – | – | −38.50 (3.93) | −38.02 (2.90) | – | −22.34 (3.54) | −21.88 (2.61) |
| MLS listing moved to FSBO/100 | – | – | – | 11.97 (18.30) | 10.10 (14.01) | – | −1.00 (16.46) | −10.94 (12.57) |
| House fixed effects | Yes | No | Yes | Yes | No | Yes | Yes | No |
| House + neighborhood characteristics | No | Yes | No | No | Yes | No | No | Yes |

*Notes:* All columns report results of OLS regressions. The sample includes properties for which multiple sales were observed. There are 2,710 such properties, involving 5,737 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 3,675 such properties, involving 8,084 listings. All regressions include year and month dummy variables and a linear time trend. Standard errors are in parentheses.

*Seller Selection.*—If some unobserved seller type affects both the outcome variable and platform choice, our estimates will be biased. Some sellers might be better, or more patient, at bargaining and thus able to get a higher price whatever of the platform they use. Being more patient, 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 to the analysis of seller selection is to compare the differences in outcomes for the sellers who listed initially on FSBO and sold on FSBO to the sellers who listed initially on FSBO but ended up switching to the 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 the MLS, after listing on FSBO, are driven by purely random forces, then the estimates suggest that the two platforms deliver the same prices.

Even if moving to the MLS depends on seller type, the selection bias should be reduced, as the group of FSBO listers is likely to be more homogeneous 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 the MLS? A patient seller may stay longer on FSBO. On the other hand, moving to the MLS entails a longer wait to sell (given our findings so far), so it might, instead, be that the more patient sellers are those who decide to move to MLS. In other words, there might be selection, but its relation to sales price is less clear.[10]

**By-Owner Sales on MLS.**—Our second approach to quantify the role of unobservable seller characteristics is to compare FSBO sales to realtor sales of properties they own themselves. These transactions provide us with a "sale by owner" using the MLS.

Levitt and Syverson (2008b) report that realtors obtain better prices when they sell properties in which they have an ownership stake. We assume that realtors are no worse at selling their own properties than nonagents. Thus, the effect of realtors selling their own properties represents an upper bound on the impact of seller selection.

The results are presented in Table 9. The variable "Sold by Owner" is a dummy variable that equals one for all sales by either realtors selling their own homes on MLS or a sale on FSBO. The variable "Sold on FSBO" equals one for sales on FSBO, so its coefficient is a direct measure of the difference between the performance of FSBO sales and sales by owners/agents on the 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.

Like Levitt and Syverson, we find agents obtain a premium when they sell properties in which they have an ownership stake. For price, time to sell, and probability of sale within 180 days, however, there is no statistically significant difference between agent/owner and sales on FSBO (see in particular columns (i) and (ii)). FSBO sales, on the other hand, are less likely to happen within 60 or 90 days.

**Seller Fixed Effects.**—Our final approach compares multiple sales by the same seller. We use the observed multiple sales to control for unobserved seller heterogeneity. Matching names across transactions, we identify 287 sellers who listed properties using different platforms; these involved 809 sales.[11]

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[10] For the sample of movers (from FSBO to the MLS) we regress price, time on the market on the MLS, and probability of selling within the first 60 days after moving on the time the property spent on FSBO before a platform change. We find that the time spent on FSBO has no explanatory power for any of those performance variables on the MLS. The absence of a correlation between staying with FSBO and the MLS performance seems to suggest that the length of time sellers stay on FSBO does not seem to reflect systematic selection.

[11] There are two possible sources of error in matching names. We might miss sellers who register transactions with somewhat different names (e.g., with or without initials, or with spouse versus without). We might also misclassify as a match different sellers with identical names.

TABLE 9—FSBO VERSUS SALES BY AGENT/OWNER ON THE MLS

| Dependent variable: | Log of price | | Time to sell | | Sold in 60 days | Sold in 90 days | Sold in 180 days |
|---|---|---|---|---|---|---|---|
| | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| Sold by owner/100 | 2.13 | 1.86 | −0.42 | −3.07 | 2.44 | 6.33 | 1.38 |
| | (0.65) | (0.63) | (3.82) | (3.98) | (2.49) | (2.88) | (1.90) |
| Sold on FSBO/100 | 1.06 | 1.14 | 0.05 | −2.12 | −6.08 | -5.81 | 1.96 |
| | (0.68) | (0.66) | (4.02) | (4.20) | (2.63) | (3.03) | (2.00) |
| N | 14,922 | 15,849 | 14,922 | 15,849 | 15,849 | 15,849 | 15,849 |

*Notes:* All columns report results of OLS regressions. In columns (i) and (iii),the sample includes only houses that sold on the platform where they originally listed. The sample in columns (ii) and (iv)–(vii) also includes houses that sold on a different platform from that where they originally listed. All regressions include year and month dummy variables, a linear time trend, and house and neighborhood characteristics. Standard errors are in parentheses.

TABLE 10—CONTROLLING FOR UNOBSERVED SELLER HETEROGENEITY

| | (i) | (ii) | (iii) | (iv) |
|---|---|---|---|---|
| *Dependent variable: Logarithm of price* | | | | |
| Initially listed on FSBO/100 | | | 1.58 | |
| | | | (0.81) | |
| FSBO listing sold on FSBO/100 | | | | 1.35 |
| | | | | (0.94) |
| FSBO seller/100 | 2.67 | 1.21 | | |
| | (0.20) | (0.44) | | |
| $R^2$ | 0.926 | 0.928 | 0.961 | 0.965 |
| *Dependent variable: Time to sell* | | | | |
| Initially listed on FSBO | | | 19.92 | |
| | | | (5.64) | |
| FSBO listing sold on FSBO | | | | −3.18 |
| | | | | (6.71) |
| FSBO seller | 16.45 | 2.68 | | |
| | (1.28) | (2.67) | | |
| $R^2$ | 0.201 | 0.196 | 0.497 | 0.541 |
| | | | Sellers with multiple: | |
| Sample | All sales | MLS listings | Listings | Sales |
| Fixed effects | No | No | Yes | Yes |
| N | 15,849 | 12,362 | 964 | 809 |

*Notes:* All columns report results of OLS regressions. In column (ii) the sample includes only properties that were listed on the MLS. In columns (iii) and (iv) the samples include properties sold by sellers with multiple sales between 1998 and 2005. There are 341 sellers that sold properties listed using different platforms, involving 964 sales; 287 sellers sold properties using different platforms, involving 809 sales. The regressions in columns (iii) and (iv) include seller fixed effects. All regressions include year and month dummy variables, a linear time trend, and house and neighborhood characteristics. Standard errors are in parentheses.

The results are presented in Table 10. 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 at any time during the sample period, not necessarily at that observation. The sample includes all sales, and the regression includes the usual time, house and neighborhood controls. We see that most of the effect of FSBO we saw in Table 4 can be explained by this dummy variable.

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

The results suggest that FSBO listers are indeed likely to get higher prices even when they sell through the MLS, on average 1.21 percent higher. Note that these listers take slightly longer to sell, although the effect is not statistically significant. All this points out that seller selection is indeed present: selection creates a positive correlation between price and the propensity to list on FSBO. Even controlling for selection, though, MLS listing 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 on different platforms. 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 also include fixed effects for the sellers.

The results suggest that when listing on FSBO these sellers get a 1.58 percent higher price (not statistically significant). On average it takes 20 days longer to sell a property listed on FSBO.

In column (iv) we repeat the analysis using 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 price premium associated with either platform.

We also examine instrumental variables regressions to control for the potential correlation between listing on FSBO and unobserved characteristics. In all these cases, the impact of listing on FSBO is not statistically different from zero. Depending on the exact functional form, however, the standard errors are very high, which is consistent with instrumental variables that are 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.

Our exploration of various ways to control for seller selection in the decision to use FSBO suggests that selection is indeed present. When we control for selection, we find that the FSBO price premium disappears. There is no evidence that MLS provides any price premium over FSBO. Considering the realtor commission versus the FSBO fee, FSBO sellers come out ahead financially.

## C. Costs and Benefits of Using FSBO

So far we have focused on the transaction or sale price, not netting any commission paid. We do not observe the commissions or, in the case of FSBO, whether a commission was paid to the buyer's agent, but we can use a back-of-the-envelope calculation to examine the platforms' relative costs. This is only a rough computation that ignores many other considerations.

Let's consider the listing of an average house on FSBO. Our results suggest that a seller should expect the same sale price, whatever the platform. Selling on FSBO involves an additional marketing effort quantified in Levitt and Syverson (2008a) as $1,000 of out-of-pocket expenses and 50 hours at $30 an hour, for a total of $2,500. If the buyer has an agent, the seller would pay roughly 2.75 percent, which on a $200,000 home amounts to $5,500, for a total of $8,000 for selling on FSBO.

A seller who does not sell on FSBO and switches to MLS should expect an additional 64 days to sell the property, which at an annual 8 percent interest rate amounts to $2,700. This is in addition to the full MLS commission. Assuming a 5.5 percent commission, the total cost in this case would amount to $16,200.

To compute the expected cost, we need the probabilities for the different events. The observed probability of switching to MLS is 25 percent. If the probability of having to pay a buyer's agent, conditional on selling on FSBO, is 20 percent, then the expected cost is $6,750 for FSBO compared to roughly $11,000 (5.5 percent of $200,000) for MLS. Alternatively, if the probability of paying a buyer's agent is 100 percent, the expected cost is $10,050. Depending on the probability of selling to a buyer without an agent, the seller could either come out slightly ahead, basically hiring herself for $30 an hour, or make $5,925.

## IV. Implications for Platform Competition and Welfare

The performance of two-sided networks depends on the size of the network and on product differentiation (Mark Armstrong 2006; Jean-Charles Rochet and Jean Tirole 2006; Ambrus and Argenziano 2009). We discuss both issues. First we consider the diffusion of FSBO, and the apparent determinants of the size of the network. Next we examine buyer and seller heterogeneity, as well as sorting as a source of—endogenous—platform differentiation. Finally, we evaluate the different welfare determinants.

### A. *Diffusion and Network Size*

Table 1 shows FSBO came quickly to maturity. Its market share basically plateaued by 2000, just two years after it started. Although FSBO's share of listings has grown over time, from 6.0 percent in 1998 to 19.7 percent in 2000 and then 24.3 percent in 2005, its success rate, as measured by the probability of selling conditional on listing, has been relatively steady. After an initial success rate of 55.8 percent at inception in 1998, the rate remained in the 60 and 70 percent range through 2005. Other measures of success, like FSBO premium by year and time on the market, have remained stable as well. This cursory look at diffusion suggests that performance did not change with the network's size.

A potential explanation of why FSBO performance has remained unchanged is that the marginal FSBO adopter has to be indifferent between platforms, while in this period the MLS performance was presumably constant. In other words, optimal adoption may be holding FSBO performance close to MLS performance (which as the dominant platform probably remained unaffected throughout the period).

Furthermore, notice that in this market only the sellers have to choose between platforms. Buyers can multi-home; the only cost involved is the time spent browsing. The main limiting factor on the buyer side is awareness. Not all buyers, especially buyers from out of town, are familiar with FSBOMadison.com. Thus, network size (at least in the short run) is driven by buyers' information, which in turn affects sellers' incentives to join FSBO.[12]

In such a setup, short-run variation in the number of FSBO listers does not affect buyers' behavior. That is, more listings in a specific month do not translate into more buyers shopping on FSBO. Thus, we expect sellers to crowd each other out. In other words, more listings competing for the same number of buyers hamper rather than enhance seller performance.

To test this argument, we regressed time on the market of FSBO listings as well as the probability of succeeding on FSBO on: the level of market activity (number of listings that month), the ratio of FSBO listings out of total listings, and controls. As expected, more active periods are associated with a shorter time on the market and a higher success rate. The opposite is true for

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[12] Naturally, in the long run, sellers' success may affect the spread of information about FSBO. However, the situation is quite different from the typical paradigm in the literature, which considers an instantaneous coordination game between buyers and sellers. FSBO diffusion does not seem determined by a short-run coordination problem.

the proportion of the listings on FSBO. When more listings go on FSBO, it takes longer to sell on FSBO (given the total number of listings), and the probability of success is lower.

Basically, we do not find that FSBO performance changes with network size.[13] A potential explanation lies in a model with an exogenous increase in demand due to information diffusion among buyers and endogenous platform choice by sellers. The increased benefits of listing on FSBO as demand grows are competed away by the additional sellers. Indeed, we find correlations that are consistent with crowding out among sellers who compete for a fixed number of FSBO buyers.

## B. *Heterogeneity and Sorting*

We have seen that controlling for seller selection affects the estimate of the FSBO price premium. We now search for more direct evidence of heterogeneity and selection. We also examine selection by the buyers.

We know very little about buyers and sellers—nothing more than their names as recorded by the city in completed transactions. By matching names across transactions in the city data, we can check whether buyers and sellers are local. For each transaction we define a buyer as local if he sold a property in the city no later than 90 days after closing, and a seller as local if she bought another property in the city 90 days prior to closing or later.

Local buyers probably know the market better and perhaps are more patient. Nonlocal buyers are more likely to search during visits to town. A seller who does not remain in town, i.e., a nonlocal seller, is more likely to be in a rush to close a deal before he or she moves. We classify 20.2 percent of sellers, and 14.4 percent of buyers as local.

While the name-matching procedure is potentially fairly noisy, despite the noise involved in defining local transactors, the proxy correlates with several relevant variables. The main findings are the following.

First, when we include local seller/local buyer fixed effects in the hedonic regressions, like those in Table 4, we find that local sellers get a 1.4 percent premium (with a standard error of 0.2 percent) when selling their properties. Local buyers pay 1.2 percent less (with a standard error of 0.3 percent) when buying (Val Lambson, Grant McQueen, and Barrett Slade (2004) report that out-of-town buyers pay a premium). We interpret these results as evidence of heterogeneity, suggesting that local transactors get a better deal, which is consistent with the idea that they are more patient.

Second, local sellers are more likely to use FSBO. The probability that nonlocal sellers will list on FSBO is 21.0 percent (0.4 percent standard error), while local sellers are 4.7 percent (0.8 percent) more likely to list on FSBO.

On the other hand, local buyers are less likely to be involved in a FSBO transaction. Nonlocal buyers have a 22.4 percent chance of buying a property listed on FSBO, while local buyers are 3.2 percent (1.0 percent) less likely to do so. These findings are consistent with better or more patient bargainers listing on FSBO, but patient buyers who can avoid FSBO prices end up trading more often on the MLS.

A final word on sorting. The fact that FSBO listings sell at a premium does not mean that no buyer would trade on FSBO. Buyers search everywhere for the best deal. When faced with tougher sellers (on any platform), they get a lower share of the surplus. Thus, given that FSBO sellers are tougher bargainers on average, we should expect patient buyers to complete transactions on the MLS more often than nonlocal buyers (more surplus is needed to keep buyers equally happy to trade on FSBO). Indeed, we find that local buyers trade less often on FSBO.

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[13] Table 2 does report differences across neighborhoods possibly linking success to network size. We cannot tell whether neighborhood characteristics determine both diffusion and success or whether success is related to adoption.

Interestingly, local buyers are also less likely to trade with local sellers, regardless of the platform (more surplus is needed for them to trade among themselves).

We thus find evidence that local sellers sell at a premium and local buyers pay less. More important, we find that being local correlates with platform selection. Thus, agent sorting endogenously differentiates the platforms.

### C. *Welfare Implications*

Let us consider the welfare impact of the presence of FSBO. FSBO differs from the MLS in several ways. It involves no commissions; it possibly delivers a different matching technology and it involves no agent services. We argue that the former represents a welfare-neutral transfer, while the latter two differences may affect total welfare.

We assume that, in the relevant range, commissions have a negligible impact on the overall number of transactions. Thus, commission avoidance represents simply a transfer 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.

There is an additional potential efficiency gain associated with eliminating commissions. As Chang-Tai Hsieh and Enrico Moretti (2003) note, the fixed agent commission leads to excess realtor entry (especially in expensive areas) and to rent dissipation through nonprice competition among agents (Federal Trade Commission and US Department of Justice 2007). As the share of FSBO rises, the rents to realtors go down, potentially mitigating the excessive realtor entry.

We now turn to the second distinction. FSBO represents a different matching technology. The slower FSBO performance may reflect the mix of buyers and sellers present on the platform (namely, selection) or platform size, in which case FSBO could be regarded as inefficient.

Regarding network size, we have noted that the performance of FSBO is not directly related to the number of current listings. In Table 1, however, we see very clear platform migration patterns; while over 22.8 percent of FSBO listers eventually move to the MLS, only 0.3 percent of MLS listers move to FSBO.[14] These patterns are consistent with the MLS being a larger and more effective platform.

We can interpret this finding through a stock-flow model (Melvyn Coles and Abhinay Muthoo 1998). MLS offers a wider stock of buyers. Probably all buyers (due to multi-homing) shop on the MLS, while only a subset of buyers shop on FSBO. A seller who fails to find a match among the stock of FSBO buyers has to migrate to the MLS to expose her property to the stock of MLS buyers who do not shop on FSBO. A potential interpretation of the finding that only a few listings migrate from the MLS to FSBO is that FSBO buyers are a subset of MLS buyers.

The final distinction between platforms is the services that real estate agents on the MLS offer (showing, pricing, conditioning the house). FSBO provides a product for sellers who are not willing to pay for such services.

Could FSBO be welfare reducing? In theory, if the network is not large enough, it could be. Those who could lose because of the presence of FSBO are noninformed buyers who will not be exposed to FSBO listings (and miss potential matches they would have seen if there were

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[14] Lack of movements from the MLS to FSBO cannot be fully explained by the six-month lock-in to an agent because we observe almost 700 properties relisting on the MLS. These are properties that reenter the MLS with a different agent. The median relisting happens after 120 days, and 75 percent of them occur before six months. In other words, a good proportion of sellers manage to get out of their contracts with an agent.

a single platform). Informed buyers who can multi-home, FSBO listers (opted for FSBO), and uninformed sellers (because buyers multi-home) are all made (weakly) better off by the presence of FSBO.

On the other hand, FSBO offers platform differentiation, which might be welfare-enhancing (Armstrong 2006). FSBO is differentiated on two dimensions. It offers a no-frill service and, due to sorting, a different kind of matching. The sorting of sellers by platforms may ease targeted search. Buyers can concentrate on the platform where they are most likely to find a counterpart. For instance, an aggressive buyer knows she is less likely to agree with a tough seller, so she may look mostly on the MLS to avoid unfruitful searches.

## V. Concluding Remarks

We have compared the performance of MLS and FSBO platforms for the sale of single-family residential properties. After controlling for differences in house and seller characteristics, we find that the MLS delivers no price premium (even before netting commissions). MLS transactions do involve a shorter time to sell. The longer time to sell on FSBO is driven by FSBO listings that fail to sell and have to move to the MLS, and by the higher probability of a quicker sale on the MLS.

The findings suggest platform selection. FSBO attracts a particular type of seller. The higher prices these sellers are able to command suggest that these sellers are the better bargainers, and the longer time to sell on FSBO suggests the sellers are also more patient.

We find an asymmetric flow of sellers across platforms. If only some buyers are familiar with FSBO, then after listing on FSBO a seller has an incentive to move to the MLS to expose the property to additional buyers. If most buyers are familiar with the MLS, however, there is no incentive to move to FSBO.

A stock-flow model like that in Coles and Muthoo (1998) can explain these migration patterns, and might be a useful way to study the two-sided markets like the residential real estate market. The theoretical literature on two-sided markets has not used the stock-flow framework, while the stock-flow literature has neglected platform size, assuming an exogenous flow of participants. Blending the two models might be an interesting direction for future research.

What do our results imply for market structure in the brokerage industry, particularly in Madison? If one believes that sellers are aware of the FSBO option, and know that there is no price premium associated with listing on the MLS, our results suggest that a large fraction of the population is willing to pay a significant amount for the services that realtors provide. Thus, despite a 6 percent commission rate, realtors are going to continue to maintain a high market share.

An alternative view is that FSBOMadison.com is still in a growth stage. As more people become aware of FSBO, and realize that there might not be a price penalty associated with it, its share of the market should increase.

The dataset we use in this paper comes from one market. We chose it because the data were available, and FSBOMadison.com and the local realtors' association were willing to cooperate. Without further data and analysis, we do not know if our results might hold more broadly. The sample we analyze includes the years 1998–2005. This was a good period for the housing market, but in 2005 the market began to cool down. During down market years the numbers might be different, although our primary results are similar in different years of our sample. Furthermore, the price increases in Madison during the boom years were relatively modest, with an average yearly real price increase of 4.9 percent. The findings also hold for 2005, when housing prices increased only 2.4 percent in real terms.

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