2009

THREE ESSAYS ON RESIDENTIAL REAL ESTATE BROKERAGE

Jason S. Beck
University of Kentucky, Jason.Beck@armstrong.edu

ABSTRACT OF DISSERTATION

Jason S. Beck

The Graduate School

University of Kentucky

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THREE ESSAYS ON RESIDENTIAL REAL ESTATE BROKERAGE

ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Business and Economics
at the University of Kentucky

By
Jason S. Beck

Lexington, Kentucky

Co-Directors: Dr. Frank Scott, Professor of Economics
and Dr. Aaron Yelowitz, Associate Professor of Economics

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ABSTRACT OF DISSERTATION

Three Essays on Residential Real Estate Brokerage

The first essay investigates how individual characteristics influence sales outcomes for houses they help transact. It develops hedonic housing models to assess the impacts of agent characteristics such as the level of recent and concurrent agent activity on sales outcomes (price and time on market). This is done in a Multiple Listing Service (MLS) setting using seven years of data obtained from a large Midwestern city. I find evidence that more active listing agents sell homes more quickly, though they do so to the detriment of final sales price. I also find that more listings concurrently held by agents have a statistically significant, negative effect on price. Selling agents appear to be quite neutral in the process and have little effect on either sales price or time on market.

The second essay defines market concentrations of residential real estate brokerage services across one hundred diverse U.S. markets. Since real estate is immobile, each geographical location constitutes a local market and thus national measures of market concentration, of the type espoused by the National Association of Realtors (NAR), are of little value. The only way to get a meaningful picture of the market in general is to collectively examine observations at the city/town level. Once indices of concentration are obtained, it may be possible to get a sense of minimum and maximum scale efficiencies as well as what market specific characteristics give rise to high or low concentrations.

The third essay examines the "just-below" pricing strategy in the context of home sales. Many retailers price their goods/services directly below some round amount (i.e. pricing at $2.99 instead of $3.00) and a number of studies document the effectiveness of this strategy on the demand for relatively inexpensive items (clothing, groceries, small appliances, etc). A lesser developed strand of literature examines the prevalence and effectiveness of just-below pricing in the context of larger purchases, namely real estate. This essay affirms the prevalence of just-below pricing in home transactions and finds

evidence that just-below pricing can yield a higher final transaction price compared to homes initially priced on an even price point.

KEYWORDS: Real estate, broker characteristics, agent characteristics, market structure, pricing strategies

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Jason S. Beck

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By

Jason S. Beck

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Co-director of Dissertation

_____
Co-director of Dissertation

_____
Director of Graduate Studies

_____
Date

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ACKNOWLEDGEMENTS

Though the dissertation is an individual work, I benefited greatly from the direction and support from several individuals. Foremost, I would like to thank my dissertation co-chairs, Professors Frank Scott and Aaron Yelowitz for their guidance and willingness to share their skills as economists. I would also like to thank my committee members, William Hoyt, and Paul Childs, who provided many helpful suggestions.

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CHAPTER 1. INTRODUCTION

In 2008, nearly five million existing homes were transacted, the large majority of them with the assistance of a real estate agent. Real estate brokerage has thus become a large industry which annually generates sixty to seventy billion dollars from home transactions. Furthermore, seventy percent of Americans own the home they live in and it often represents the largest component of net wealth. As such, understanding the residential real estate brokerage process and market takes on special significance, especially in the context of the recent home value adjustments beginning in late 2007.

The first essay explores the effects of agent characteristics on residential home sales outcomes, specifically final sales price and time on market. Since selling one's home usually represents one of the largest transactions in a person's life, and since few people go through the process more than a few times, it is unsurprising that a market for specialized transaction assistance would develop. Real estate agents fulfill this role, acting as middlemen who use their experience, marketing skills, and institutional knowhow to match potential buyers with sellers as well as assist in price negotiation. While many papers have compared unassisted transaction outcomes ("for sale by owner" homes) to those brokered by a professional, relatively few have looked into the impact of specific agent characteristics in the context of agent assisted transactions. This first essay examines the impact on sales outcomes produced by agents that are more active in transacting properties (measured, for example, by the number of transactions the agent has been involved in over the past thirty days), as well as the effect of more concurrent listings held by the listing agent. More active listing agents may have a better knowledge of current market conditions which could translate into better outcomes for the seller. On the other hand, due to a principle-agent problem between the seller and the listing agent, high levels of agent activity may signify eagerness on the part of the agent to "get the deal done" and to do so quickly even if it means a reduction in the final sales price, since, on the margin, a reduction in sale price represents only a small reduction in agent income. Seven years of Multiple Listing Service data from a large Midwestern city are used to construct housing hedonics which include these measures of agent activity. Controlling for observable house characteristics, results indicate that agents listing and selling more houses are able to complete transactions quicker, but the final sales price tends to be low-

er. Concurrently held listings have a statistically noticeable, but very small, negative impact on the sales price.

The second essay looks at the real estate industry at the firm level. With relatively low barriers to entry and the Multiple Listing Service, which grants all participants equal listing exposure regardless of size, one may expect this market to be highly competitive. The Department of Justice, however, reports anecdotal evidence of high market concentrations in some areas and the seemingly rigid six percent commission structures further raises questions about the competitiveness of the industry. While inter-firm collusion over commission rates is illegal, brokerage firm owners can and do impose floors on commissions their agents can charge. Inter-firm competition is then important to understanding the competitiveness of the industry. Since each city/town is an individual and autonomous market, national measures of concentration are of little value and only a few studies have measured concentration in specific, individual markets. Even collectively, these studies of individual markets provide a very incomplete picture of the overall structure. This essay uses a Multiple Listings Service aggregator website owned by the National Association of Realtors (www.realtor.com) to collect information on listings over one hundred individual local markets of varying size and geographical location. The website hosts a profile for each active Multiple Listing Service listing in the geographic area specified. These profiles include basic housing characteristics (number of bedrooms, bathrooms, etc), the listing price of the home, and, most importantly, the associated listing brokerage firm. Measures of market concentration, such as the Herfindahl-Hirschman index and concentration ratios, are then constructed. While a few instances of relatively high concentration do exist, overall, concentration levels appear not to be alarming, with an average Herfindahl-Hirschman index of around 1,000. Further analysis explores what city/town level factors influence market concentration and finds market size does have some effect as small markets tend to be more concentrated. Since particularly small markets tend to be the most concentrated, this may suggest a non-zero minimum efficient scale, but the large number of very small firms operating across all sized markets suggests this assertion must be made with caution.

The third essay addresses the prevalence and effectiveness of a “just-below” pricing strategy in residential real estate. Many retailers choose to strategically price their

goods/services just below some round price focal point (i.e. pricing at $2.99 rather than $3.00). Many studies have been done on just- below pricing in the context of inexpensive household goods and they often find it can have a noticeable, sometimes startling, effect on demand. Much less work has been done on the effectiveness of just-below pricing on very large purchases, such as houses. This is interesting because many of the alleged psychological mechanisms by which just-below pricing is thought to work, such as consumer's misperception of pricing information, may have a much weaker effect for large, important purchases which are undoubtedly considered with more scrutiny. Two existing studies that have looked into just-below pricing in housing have reached opposing conclusions as to its effect. Drawing again from the data used in the first essay, the high frequency with which home sellers (and their real estate agents) use just-below pricing seems to suggest that they expect it to have some beneficial effect. Indicator variables are created for homes which employ just-below pricing and are included in a housing hedonic to show that pricing just below a $10,000 pricing increment is indeed associated with a higher final sales price, especially when compared to homes priced right on the increment. Direct comparisons of homes just below and right on an even focal price point also suggest a premium for a just-below price.

CHAPTER 2. THE EFFECT OF AGENTS ON RESIDENTIAL REAL ESTATE SALES OUTCOMES

2.1 Introduction

Real estate agents are middlemen who use their knowledge and ability to facilitate exchanges between buyers and sellers of homes. The frequency with which sellers and buyers choose to involve agents suggests that market participants value their services.[1] Since homes typically represent a large portion of an individual's wealth, understanding the transaction process is important. Recently, it has become clear that the U.S. housing market has entered a period of adjustment. Nationally, home prices have fallen over eleven percent in the one year period ending in September, 2008 while the number of homes sold has decreased by a third in the same period.[2] Some specific areas have been affected even more severely.[3] In light of these recent developments, understanding the role of real estate agents in the transaction process takes on extra significance, particularly to those hoping to buy or sell a home.

Several studies have examined the effects of agents by comparing sales outcomes between professionally brokered homes versus non-brokered "for sale by owner" (FSBO) homes with mixed conclusions. Relatively little work has focused on the effects of individual agents on sales outcomes among brokered homes. This paper will expand the existing literature by exploring the effects of agent characteristics on outcomes in a Multiple Listing Service setting. Specifically, level of recent agent activity, agent familiarity with a particular market segment, and number of concurrent listings held by the listing agent will be examined. The results indicate that more active agents sell homes faster, but do so at the detriment of sales price. There is also evidence that listing agents holding a greater number of concurrent listings obtain a lower sales price, though the marginal effect is very small.

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[1] The National Association of Realtors (NAR) reports that 84% of residential real estate transactions are made with the assistance of an agent (www.Realtor.org).

[2] U.S. Census Bureau (http://www.census.gov/hhes/www/housing.html)

[3] For instance, some previously robust markets, such as Phoenix and Las Vegas, have seem home prices fall over 30% in one year.
(http://www2.standardandpoors.com/portal/site/sp/en/us/page.topic/indices_csmahp/0,0,0,0,0,0,0,0,0,0,1,1,0,0,0,0,0.html).

2.1.1 What Do Agents Do?

The selling of one's home is likely to be one of the largest transactions most individuals engage in. As such, even small errors in pricing or marketing could cost thousands of dollars in lost sales price or cause the home to remain on the market for an extended period of time. Furthermore, most people go through the process only a few times in their lifetime and thus the development of a market for brokers with specialized knowledge and ability is reasonable. For home sellers, real estate agents provide knowledge of local market conditions, home presentation, and marketing knowhow. They also help to discern an appropriate asking price, and to locate potential buyers. Traditional full service real estate agents provide these services.[4] Real estate agents/brokers are usually compensated for their services through a commission rate calculated on the final sales price of the house (Section 2.2 contains a more detailed description of the compensation structure of agents/brokers).

The distinction between a real estate "agent" and a real estate "broker" should be clarified. A broker refers to an individual with a state issued license to transact real property. Every real estate office must thus have at least one broker. An agent is an individual typically specializing in dealing with customers but who must work with a broker to conduct the transaction on behalf of the client. Agents must also possess a license from the state. An agent license is a prerequisite to a broker licenses and is easier to obtain. Real estate professionals with a broker's license often work as agents and thus basically are autonomous firms. It is also common for a single brokerage firm to have several (sometime even hundreds) of agents under a single broker. Since there is probably more heterogeneity in agents' ability to match buyers with sellers, market a house, obtain choice listings, etc. than in brokerage,[5] agents will be the primary focus of this paper.

For a given transaction, there are typically two types of agents: listing agents and selling agents. Listing agents are those contacted by the seller to assist in the selling

[4] Nadel (2006) has classified the services of full service real estate agents into the following eight categories that have been cited in the literature: 1) MLS listing, 2) Closing, 3)Setting an optimal asking price and time to sell, 4) Advertizing beyond the MLS, 5) Staging, 6) Arranging visits by potential buyers, 7)Negotiations, and 8) Other services, such as advice on which home improvements would affect resale value or leasing possibilities for the property.

[5] Although the actual brokerage may be fairly homogenous, brokers may influence managerial style or acquisition of individual agents which could have an overall impact. As such, firm level controls should be built into any empirical model developed.

process. Selling agents, in spite of the perhaps misleading name, are involved on the buy-side of the transaction. They are typically contacted by an interested buyer seeking assistance in finding a house to purchase. Note that while specialization can and does occur, nearly all agents involve themselves with both listing and selling at some point. Using their skills and knowledge along with tools of the profession (the MLS, for instance), listing and selling agents assist in bringing the two parties together. Traditionally, the homeowner pays the listing agent a commission which the listing agent then shares in some proportion with the selling agent (and the associated buy-side broker) and thus the homeowner is indirectly paying for the selling agent's services as well. It is because of this that selling agents are said to owe fiduciary responsibilities to the homeowner, despite the frequent perception that the selling agent represents the buyer[6]. Some states allow for the possibility of so-called "dual agency", whereby a single agent (and thereby a single broker) handles both sides of the transaction. Evidence is mixed as to the effect of dual agency compared to the traditional model (see Evans (2005) and Gardiner (2007)).

2.1.2 Over What Dimensions Might Agents Differ?

An obvious dimension of differentiation would be specialization among agents into listing versus selling. This has been explored by Zumpano et al. (1993). Since the skills required in listing and selling may differ, it is reasonable to think some specialization could occur. Zumpano et al. find that specialization in listing has a statistically significant (and positive) impact on agent income.

The abilities, effort levels, and performances of agents are likely heterogeneous, so several studies take a human capital approach to earnings. They tend to find fairly unsurprising effects (i.e. more experience is associated with higher earnings) but the effect on sales outcomes remains understudied (Section 2.2 contains a brief review of this literature).

[6] The rise of so-called "buyers agents" is well documented (see Elder et al. (2000), Munneke and Yavas (1999)). These agents alter the traditional model by substituting an agent paid by the buyer with fiduciary responsibilities to the buyer in place of a selling agent. These types of transactions represent a fairly small part of the brokerage market and have surprisingly shown little effect in sales prices (see Section 2.2 for a more detailed review of the literature).

For a listing agent, knowledge of the market and how to present a home to maximize its appeal are important abilities, but agents may also differ on dimensions that are not directly related to selling homes. For instance, given the fairly fixed rate commission structure, if effort to sell a house is homogenous across homes (or perhaps fairly close), higher value homes lead to higher commission fees and thus are more desirable. It is possible that two agents may have identical sales abilities but one is better able to locate and get listing contracts from higher priced homes. One might assume that in equilibrium, competition for high value homes would be fiercer than for low value ones and agents better able to locate high value homes would be able to earn higher incomes. Naturally this depends on agents having different ability in locating high value homes. If agents are all the same one would expect incomes to equalize, with some agents having a few high value homes and some agents having a larger number of low value homes.

Another possibility is that agents differ in their ability to locate and/or win contracts for homes that are appealing in some unobservable way. Even a very rich set of hedonic controls will not account for everything. One example that comes to mind is "curb appeal". If agents vary in their ability to recognize and/or list homes with differing amount of curb appeal, there could be better sales outcomes associated with certain agents that do not come from selling ability.

The chapter will proceed as follows. Section 2.2 outlines the pertinent literature. Section 2.3 discusses the data used in the empirical analysis. Section 2.4 discusses the results and Section 2.5 concludes.

2.2 Literature Review

2.2.1 Agents as an Input in the Matching Process

Brokerage is often modeled as listing agents expending effort to first secure listings and then match with selling agents associated with prospective home buyers. In an early and influential paper, Yinger (1981) discusses the nature of the brokered transaction and develops a formal search model where offers come through random draws from the population of potential buyers. Search activities of agents are inputs to their output (matching buyers with sellers) and are the main choice variable for agents in the model.

Intuitively, search activities increase as search costs decrease or as commission rates increase. Other search modeling can be seen in Williams (1998), Johnson et al. (1988) and Salant (1991).

2.2.2 Agent Compensation

Several papers focus on a human capital approach to agent income. Glower and Hendershott (1988) use survey data of 481 Ohio Realtors in 1986 to examine the relationship between income and traditional human capital controls. Consistent with theory, hours worked, education, and experience seem to affect earnings with the experience effect diminishing and leveling off at around seventeen years. Follian et al. (1987) follow a similar methodology using an Illinois survey with similar results. Finally, Crellin et al. (1988) utilize a nationwide 1984 NAR survey with 1,600 observations and largely confirm the Glower and Hendershott and Follian et al. findings. In all three studies, higher incomes were linked to hours worked, possessing a broker's license, education, and experience. Gender and race seem to have a fairly minor impact on agents' earnings but a larger one on brokers'.

Under a fixed commission rate structure, all else equal, higher home values in an area would mechanically translate into higher agent incomes. However, low barriers to entry imply that any excess returns will be eroded by entry. Hsieh and Moretti (2003) theorize that under fixed commissions, areas with higher average home values will have more agents competing for these lucrative listings, resulting in an average agent obtaining and selling a fewer number of homes. They compare two cities, Boston and Minneapolis, which are similar over most dimensions except for housing prices, which were roughly twice as high in Boston. Selling a house in Boston then would yield a commission fee that is roughly twice as large compared to a similar transaction in Minneapolis. Interestingly, they find that the average agent in Minneapolis is twice as productive, selling 6.6 houses per year versus 3.3 for the average agent in Boston. The implication is that free entry is socially wasteful in this case because agents will engage in wasteful prospecting actives.

Johnson et al. (2007) examine agent income with respect to agent specialization. Broadly speaking, agents can choose to specialize in finding sellers and listing homes, or

in matching prospective buyers to homes for sale in the market. The 2001 NAR Membership Survey was used with a fairly straightforward human capital earnings equation with controls for degree of specialization in either listing or selling. The results indicate that a balanced portfolio is associated with lower earnings, but only specialization in listing is associated with statistically significant higher earnings.

2.2.3 Firm Structure

The NAR reports that in 2004 there were 236,000 active real estate brokerage offices in the United States. These offices range greatly in size from a single broker (who also serves as the office's lone agent) to very large firms serving an entire metropolitan area with hundreds of agents. This large disparity in firm size is sometimes attributed to the MLS (NAR, 2005) which make listings available through a computerized database inviting selling agents to cooperate in a transaction. In such a platform, smaller firms advertize listings on even footing with larger ones and exposure is obtained to the widest possible audience. However, Frew (1987) has shown that sharing information can be inconsistent with income maximization. It is theorized that since cooperating with another firm to sell a listing involves sharing the commission (a fifty percent/fifty percent split is typical but not exclusive) there may be incentives to "hold back" listings and try to sell them "in house" thereby keeping the entire commission within the firm. Clearly this is more likely to happen with large firms as they will have access to a larger number of in house potential buyers, and there is some evidence to support this. In a follow up paper, Frew et al. (1993) examine the offered commission rates (the so-called "co-broke" rates) in the Lexington, Kentucky MLS and find that the commission offered to the cooperating broker is negatively related to the size of the listing firm.

There is some evidence of economies of scale and scope in brokerage. Zumpano et al. (1993) employ a translog cost function and NAR survey data of brokerage firms to examine the performance of the market. Their findings suggest that there are modest scale economies in brokerage, yet most firms are too small to fully take advantage of them. Zumpano and Elder (1994) look at the two primary dimensions of specialization, listing and selling, and find that the compositions of output can affect costs and that a balanced composition of sales and listings is least costly.

A few papers look into franchise affiliation and its effect on firm performance. Franchise affiliation generally offers a well-known brand and may signal quality. This may be particularly pronounced in real estate brokerage since a subset of home buyers are new to a city and would likely have little specialized knowledge of local firms. This may lead to increased reliance on firms affiliated with a franchise. Most work seems to either support or at least not contradict a positive association between franchise affiliation and earnings (see Frew and Jud (1986), Lewis and Anderson (1999), and Jud et al. (1994)). Benjamin et al. use a 2001 national NAR survey of brokerage firms and find that franchise affiliation is associated with higher revenues, but not profits, indicating that franchisors are able to extract rents from franchisees.

2.2.4 Effects of Agents on Sales Outcomes

i.) Performance of agents versus self-marketed homes (FSBO's)

Several studies have compared sales outcomes of homes sold through agents versus those sold through a seller's own efforts (known as For-Sale-By-Owner, or FSBO transactions). Intuitively, one would expect an agent to have some beneficial impact on price (if not necessarily the price net of the commission fee) and/or time on market but a few studies have called this into question and it is probably fair to say that no clear consensus has emerged in the literature. One noteworthy paper by Hendel et al. (2007) has made use of data from a well developed FSBO website (FSBOMadison.com) in the Madison, Wisconsin area and was able to compare those transactions with those sold through the area's conventional MLS. Results indicate that homes listed with agents are generally not associated with a higher sales price though time on market is generally shorter. The authors point out that even if there is a not an associated increase in sales price, agents do provide benefit to the seller in the form of assistance through the process which likely has value. As such, it is not necessarily possible to conclude that agents are not worth the commission. Other studies that find FSBO outcomes comparable or superior to those listed on the MLS include papers by Yavas and Colwell (1995) and Johnson et al. (2005). Dorian et al. (1985), Jud and Frew (1986), and Colwell et al. (1992) find that agents do obtain a higher sales price compared to FSBO's.

ii.) Relative performance of agents in agent assisted transactions

Since the main focus of this essay will be examining the heterogeneous effects of individual agents, the studies reviewed in this section are most pertinent. Specifically, the papers by Jud and Winkler (1994) and Turnbull and Dombrow (2007) call for particular attention.

In their 1994 paper "What Do Real Estate Brokers Do: An Examination of Excess Returns in the Housing Market", Jud and Winkler explore brokerage firm and agent characteristics on the prices received by home sellers. They use around 4000 MLS transactions (1991-1993) from Greensboro, North Carolina to first construct a traditional hedonic pricing model (without agent or firm effects). The predicted sale price is compared to the actual sales price, allowing for a computation of a percentage measure of excess returns above (below) the predicted market price. Using this measure of excess returns as a dependent variable, they use OLS to test the effects of agent experience (measured in number of previous transactions), office fixed effects (for both listing and selling office), as well as other controls. Agent experience is the key variable in the regression and is statistically insignificant. Thus, they claim to find no evidence suggesting that agent characteristics influence excess returns which is consistent with the idea that the market is efficient and no agent is able to extract excess returns, through knowledge or abilities. Likewise, they find that individual brokerage offices (controlled for by fixed effects) have no statistically significant influence on generating excess returns.

The principal-agent relationship between sellers and listing agents is well recognized in the literature, and is perhaps best illustrated by Levitt and Syverson (2005). They point out that since agents receive only a fraction of the marginal increase in the price a higher offer would involve, there may be incentives for agents to persuade sellers to accept a low offer.[7] Comparing transactions in which the agent is selling his or her own homes versus ones in which agents are acting on behalf of clients reveals that agents

[7] For instance, if one assumes a 6% commission, this is split (usually 3%/3%) with the selling agent leaving only 3% on the listing side of the transaction. The listing agent must further split the 3% with his/her broker. While this split can vary dramatically, a 50% split seems typical. As such, an agent nets perhaps 1.5% on any marginal increase on the sale price. It is plausible, or perhaps even likely, that an extra $150 to the agent is hardly worth the extra effort to generate an offer $10,000 higher than an existing one, not to mention the exposure to risk of losing the commission entirely if the listing contract should expire before another buyer is found.

do indeed keep their own properties on the market longer (9.55 days) and obtain a higher price (3.7%) after controlling for wide range of housing characteristics.

A weakness of the Jud and Winkler paper could be the lack of other agent level controls. Turnbull and Dombrow take a more detailed look at agent performance in their 2007 paper "Individual Agents, Firms, and the Real Estate Brokerage Process". Specifically they control for agent gender, agent specialization in listing versus selling, and localized market knowledge (specializing in specific neighborhoods) of the agent. Brokerage firm characteristics as well as house (traditional hedonic controls) and market characteristics (monthly fixed effects) are also controlled for. The authors find no gender effects on price or time on market, but do find a beneficial impact (for sellers) on sales outcomes from hiring agents specialized in listing and specialized in the local neighborhood. Selling agents (working with the buyer but paid for, usually, by the seller through the commission) that specialize in selling are associated with lower sales prices, suggesting a benefit to the buyer.

Munneke and Yavas (2001) explore the effects of agency structure on sales outcomes. Since RE/MAX offices collect a flat fee from their agents rather than a percentage of the commission, the authors hypothesize that better agents will self select into RE/MAX offices. These agents will then attract more listings, which will lower the amount of time and attention available to each up to the point where sales outcomes are equal to those of a traditional agent. Their empirical results are largely consistent with this as RE/MAX agents are seen to carry more listings, though the effect of a RE/MAX agent on sales price and time on market is statistically insignificant.

While the Jud and Winkler (1994) and Turnbull and Dombrow (2007) papers are perhaps most directly related to studying agent effects on sales outcomes, there are a few other papers that are pertinent in the context of a slowly changing real estate brokerage industry. For instance, non-Realtor agents have, to a limited extent, been able to penetrate the MLS. The term Realtor refers to an agent who is a member of the National Association of Realtors and subscribes to its code of ethics. Traditionally, MLS access was limited to Realtors but in the past 25 years, antitrust cases and the threat of further litigation has gradually opened to MLS platform the non-Realtors. While only around one percent of the MLS data (from an unspecified city in Texas) was associated with a non-

Realtor, Huang and Rutherford (2007) compare these observations to Realtors and find non-Realtors receive poorer sales outcomes than their Realtor counterparts. It is clear that selection into a non-Realtor agent could be non-random, but these results are consistent with the NAR assertion that Realtors are better agents.

Another fairly recent, if slowly developing, change in the industry is the emergence of buyer brokers. These are essentially selling agents who are paid for directly by the buyer and thus have a fiduciary responsibility to the buyer. A 1996 survey of recent home buyers provides Elder et al. (2000) the data to test the effect of buyer agents on home prices. They find the effect to be insignificant, though search times do seem to be slightly shorter.

2.3 Data

In order to conduct a more comprehensive analysis of the effect of listing and selling agents on transaction price and time on market, I obtained data from the MLS of a Midwestern city with a population of roughly 500,000 residents. Information was available for all homes listed through the MLS from January 1st, 2001 through December 31st, 2007. There were roughly 180,000 listings in these seven years with about half of them ending in a sale. Note that this discrepancy comes from homes that are listed but then withdrawn before sale. This can happen for a number of reasons. For instance, it is quite common for an agent to "refresh" a listing that has remained unsold for a period of time by withdrawing the listing and then re-listing the same property a short time later. It is hoped that the home might gain more exposure as a "new" listing. Difficult-to-sell houses might be refreshed several times before a sale is achieved. Furthermore, home sellers unsatisfied with their listing agent's performance can sever the relationship at the end of the contractual period and relist with another agent. Since many houses are listed more than once, it is expected that the total number of listings would exceed the number of sales. Of course there are also homes that simply never sell through the MLS in the time period.[8]

[8] It is possible that some homes could have switched from the MLS to the FSBO platform. Hendel et al. (2007) however, found that this type of switching occurred in only 0.2% of MLS listed homes in their data of houses sold in Madison, Wisconsin from 1998 to 2005.

One complication that arises with re-listed homes is that re-listing distorts the reported time on market. For instance, if a home is listed for 60 days without result, is withdrawn, and is then re-listed and sold 30 days after that, actual time on market was 90 days but the "days on market" reported with the listing that resulted in the sale will be 30 days. A new variable was created, *relist*, which indicates if a home (identified by address) was withdrawn and then relisted under the same agent within two months. If so, the time on market from the previous time (or times) listed is included in total time on market. Note that sometimes home sellers switch listing agents which further complicates true time on market. For the purposes of this paper, time a home is listed with a previous agent is not included in time on market.

The data allow for a number of hedonic controls (see Table 2.1). To allow for non-linear effects, all of the standard hedonic controls are binary indicator variables. *One bedroom, two bedrooms, three bedrooms, four bedrooms, five bedrooms,* and *sixplus bedrooms* are dummy variables indicating the number of bedrooms associated with the house. The variables, *one fullbath, two fullbaths, three fullbaths, zero halfbaths, one halfbath, two halfbaths, three halfbaths*, and *fourplus halfbaths* indicate the number of full or half bathrooms a house has in a similar manner.

Two-five years, six-ten years, eleven-twentyfive years, twentysix-fifty years, fiftyone-hundred years, and *hundredplus years* are indicator variables equaling one if the house falls into that particular age category. House size is controlled for by the variables *Sqft1- Sqft5*. These are variables that divide the range of square footage in the data into quintiles (see Table 2.1 for the specific ranges). Acreage is controlled for by dividing the range into six categories plus one additional category for observations without a reported acreage (see Table 2.1 for the specific ranges). C*entral air* equals one if the house has central air conditioning, and *pool* and *fireplace* indicate the presence of those characteristics. The variables *2001-2007* and *quarter1-quarter28* are time dummy variables equaling one if the observation comes from the associated time period.

A home's vacancy could have an impact on sales outcomes and thus is included in the empirical models. For example, holding costs associated with a vacant, for-sale home imply that owners might be willing to accept a lower price if it means a quick sale. Alternatively, vacancy could have an impact in the staging of the home. For instance, an

empty house reduces the (positive or negative) impact of decorating. Unfortunately, vacancy is not something explicitly reported in the data. It was observed, however, that agents often chose to reveal the vacancy of a home in the "agent remarks" section of the listing. The agent remarks cell is an opportunity for the agent to write freely about the property and agents generally use this to give a sales pitch or point out specific features that were not covered in the basic template of the listing. The variable *vacant* is then an indicator variable equaling one if the listing was revealed to be vacant by the agent's posted remarks. This occurred in eight percent of the sold homes. Given that revealing vacancy in this fashion is voluntary and doing so may seem to reduce the leverage home sellers have, it is not completely obvious why a listing agent would choose to reveal this. Perhaps it is viewed as something that cannot ultimately be hidden from a buyer and the vacancy will attract potential buyers looking for a bargain or looking to move in quickly. It could also be a signal of a principal-agent problem where the listing agent is eager to sell the property quickly and with little effort at cost to the final sales price.

The principal-agent problem is explored by Levitt and Syverson (2005) where they find evidence to support their claim that agents hold out for a higher price when they are selling their own homes versus when selling homes for clients. While this data set does not explicitly make mention of agent interests in the property, this information is often revealed once again in the agent remarks cell. *Agent owned* is an indicator variable equaling one if the agent reveals that he or she has an ownership interest in the property. This occurred in about one percent of the observations. It is important to note that while Levitt and Syverson suggest that the higher sales prices associated with agent-owned homes are evidence of a principal-agent problem, there are other explanations. For instance, agents may select into houses that are generally more marketable along difficult-to-measure characteristics.

This study focuses on existing homes. New homes are often marketed quite differently as developers tend to work with real estate brokers in a way that simply adding a dummy variable might not accurately capture. As such, they were removed from the sample. The sample was further restricted to homes selling for at least $50,000 but no more than $3,000,000. Observations with missing or obviously erroneous values were

dropped. The primary data set used for analyses begins with 64,990 sold houses.[9] Summary statistics can be found in Table 2.1.

The average house was between 1499 and 1900 square feet, had three bedrooms, two full baths, a basement, central air-conditioning, and was 26-50 years old. It sold for $171,588 and was on the market for 75 days.

2.4 Empirical Estimation and Results

There are two hedonic models to be estimated reflecting the two sales outcomes. The first uses the natural logarithm of the sales price as the dependent variable while the second uses days on market as the dependent variable. Observable home characteristics are controlled for in the basic hedonic specification with a series of dummy variables to allow for nonlinearity. This approach is similar to Levitt and Syverson (2005). Examining the *ln(price)* equation results that are contained in Table 2.2, one can see that larger houses and homes with more bedrooms sell for progressively more. For example, all else constant, a home in the third square footage quintile (1499 to 1900 square feet) would sell for about six percent more than a house in the second square footage quintile. While Levitt and Syverson control for house size in a slightly different way (thus making direct comparisons difficult), the results here are qualitatively similar.[10] Looking at the *DOM* equation, it appears that larger homes take progressively longer to sell, all else constant.

Since sales price and time on market are jointly determined, a simultaneous equations model would be appropriate. Unfortunately, it was not possible to find a suitable instrument that would influence one outcome but not the other, thus making an instrumental variables approach impossible. The reduced form equations will be estimated instead.

Unsurprisingly, larger garages as well as additional full or half bathrooms are associated with higher sales prices. The marginal effect of a second or third bathroom seems roughly equal (at around ten to eleven percent) but moving to the *fourplus fullbaths* category increases the sales price noticeably. Despite the very rich set of hedonic

[9] Since some individual houses sold more than once in the seven year period, these 64,990 sold homes are not necessarily unique.

[10] Levitt and Syverson (2005) use a series of dummy variable controlling for number of bedrooms and another series controlling for number of total rooms. Since this data set does not provide information on number of total rooms, a series of dummy variables controlling for square footage was used instead.

controls, there are no doubt still many unobservable characteristics and perhaps *fourplus fullbaths* correlates with positive unobservables in high end homes (granite countertops, expensive landscaping, etc.). Additional full bathrooms are associated with longer time on market.

Older houses tend to sell for less than the reference group (*2-5 years old*), but the marginal effect of age appears to level off after the 26-50 year period. While the estimated coefficients here are smaller in magnitude that those found by Levitt and Syverson, the qualitative picture is quite similar including the negative effect leveling off after the 26-50 year period. Relative to the reference group, all of the age categories except *over100 years* are associated with shorter time on market. This is perhaps surprising as one might expect newer house to more accurately reflect current tastes, be more desirable, and thus sell more quickly. The age variables in the Levitt/Syverson hedonic DOM equation, while larger in magnitude, are qualitatively similar and quite comparable (all negative and roughly consistent in magnitude).[11]

The presence of a basement is associated with an increase of seven percent in sales price which is reasonably in line with other studies (for example, Munneke and Yavas (2001) find the effect to be around ten percent), and homes with basements sell about four days faster. Central air conditioning is worth an 11.6% premium, though it has no noticeable effect on DOM. Homes with an in-ground swimming pool are associated with a 5.7% premium which is similar to what other studies find (4.7% to 8% in Huang 2005, Rutherford 2007, Stevenson 2004). Homes with a fireplace were associated with a 3.8% premium. This result is also consistent with other studies. Neither *pool* nor *fireplace* had a significant effect on DOM.

Moving up in the acreage categories is associated with progressively higher sales price and progressively longer time on market. These effects are highly significant. It appears that high end home characteristics, such as more acreage, more full bathrooms, and more square footage generally imply a longer time on market which is surprising since the market thins out as selling price increases.

[11] The Levitt/Syverson estimates range from -39.21 to -47.53. Excluding the *over100years* category, the estimates in table 2 range from -5.18 to -7.26.

While it is important to recall that the variable *vacant* indicates a home being revealed as vacant by the agent (and thus perhaps incidentally revealing the agent's eagerness to sell the home even at a lower than normal price), the coefficient does imply that vacant homes sell for around eight percent less. Other estimates for the effect of vacancy range from -3.8% to -8.36% (Munneke 2001, Turnbull 2007, Rutherford 2005, Huang 2007).

Subdivision fixed effects were included in the model to the extent that the subdivision was reported in the data. There were several instances where the subdivision/neighborhood cell was left blank. In these cases, the MLS area was used as a stand in.[12] Even given the rich set of hedonic controls included in the ln(price) model, these subdivision effects were statistically significant at the one percent level compared to the randomly chosen base group 88.1% of the time. The average value of the coefficients was -.367 (the average of the absolute value of the coefficients was 0.4). This result confirms that location does indeed play an important role in housing price. The coefficients ranged from -1.24 to 1.14. Twenty seven quarter fixed effects were also included to capture time trends and were all statistically significant (at the one percent level) compared to the reference group; the first quarter of 2001 (which corresponded to the first quarter in the data). Coefficient estimates on these quarter fixed effects ranged from 0.03 to 0.21 and had a clear upward trend over time. A simple regression of time on these quarter coefficients reveals each quarter to be associated with 0.007 unit increase in the coefficient. This likely reflects the general increase in property values along with any inflationary effects. Subdivision fixed effects seemed to generally have a somewhat lesser effect on DOM and were significant twenty seven percent of the time compared to the reference group.

While physical characteristics of the house are clearly important, agent characteristics are the focus of my research. It is plausible that more motivated, experienced, assertive, and hardworking agents get better sales outcomes for their clients. Ideally, one would want to control for level of agent effort, skills, and experience. Perhaps things like

[12] The MLS divides the city into approximately thirty geographical areas. The MLS area is available in the data for every listing as opposed to subdivision information which was only provided for 82% of the listings. It appears that many of the observations with missing subdivision information were in more rural, outlying areas of the city and not affiliated with a subdivision or neighborhood.

number of hours spent by the agent on the listing or level of extra marketing (such as advertizing the home in the newspaper or other media outlets, number of open houses, etc.) would be interesting independent variables to include in the model. Unfortunately, data constraints make controls of this type fairly limited. Two variables that were identified in the data as potentially correlated with agent effort are *multiphoto* and *relist*.

One way agents might reveal their assertiveness is by going beyond the minimum requirements for listing a home and such actions might be seen as a signal. One such voluntary action that is observable in the data is the agent's decision to include only the mandatory single photo of the home or to voluntarily provide extra photographs. The variable *multiphoto* was included in the empirical model as a control for its direct effect as well as a potential control for agent effort. It is important to point out that providing more than one photo is probably fairly low cost to the agent and as such it is clear that this is not the ideal variable to use to capture agent effort. Nevertheless, it has the advantage of being available. Looking at the results, the coefficient does turn out to be positive, but is not statistically significant. It is possible that the effect of having more photos is real but frequently used by agents who find themselves with undesirable homes (along some unobservable dimension) and use extra marketing to partially counteract this undesirability.

It is also possible that more assertive agents will "refresh" a stagnant listing. The frequency with which this occurs suggests that agents believe it to be beneficial, though relisting is very likely correlated with a house not selling quickly, possibly due to unobservable negative characteristics. Thus it is not surprising to see that relisted homes sell for 1.6% less and take around sixteen days longer to sell. These effects are measured quite precisely (p-value = 0.000).

Dual agency is quite common, occurring in twenty-three percent of the sample.[13] On one hand, since the same agent will be collecting both the sides of the commission, there is direct incentive for her to work hard in increasing the final sales price (the marginal benefit from any increase in sales price is roughly doubled). On the other hand, since hopeful dual agents are always vulnerable to other cooperating agents completing

[13] Dual agency is when a single agents acts as both the listing and selling agent. This is generally desirable to agents as it implies not having to share the commission fee with a cooperating agent. In some states, dual agency is prohibited.

the transaction (and thus denying the listing agent both commissions), they may have incentive to persuade sellers to take a low offer if it means completing the transaction with one of the listing agent's own home seekers. After all, receiving two three percent commissions on a $190,000 transaction is better than one on a $200,000 transaction. The *ln(price)* equation is consistent with this and finds homes sold under dual agency sell for around 1.4% less. However, the days on market equation reveals that homes sold under dual agency take nearly 5 days longer to sell, casting doubt on assertions that dual agents persuade clients to accept a quick, if cheap, sale. Perhaps this is consistent with agents intentionally allowing the house to linger on the market to increase the probability of the seller accepting an offer from one of her own buyers. Since in-house sales are beneficial to the selling office, there is reason to believe that this may be encouraged by the firm, even at the cost of a lower sales price. This is, however, no evidence that in-house sales (transacted by different agents within the same firm) affect price or time on market.

Rutherford et al.(2005) and Levitt and Syverson (2005) find that listing agents selling their own homes sell them for a premium, 4.5% and 3.7% respectively. The variable *agent_owned* was created to indicate that a listing was voluntarily revealed to be owned by the listing agent. While the 2.7% premium is smaller in magnitude than what is found in these previous studies, the effect is fairly similar and highly statistically significant. The Rutherford et al. and Levitt and Syverson results do differ along one important dimension; Rutherford et al. find no effect of agent-ownership on time on market while Levitt and Syverson find that agent owned homes stay on the market for around ten days longer. The results here are more similar to Rutherford et al. in that, while positive, *agent_owned* is not statistically significant in the *DOM* equation. While Levitt and Syverson attribute this sales price premium to a principal-agent problem, it is quite possible that agents are simply better at initially buying homes that are more desirable (along unobservable dimensions) and thus own homes that eventually sell for more.

The variable *holding* is the number of other homes the listing agent has in his or her inventory. One might expect that the greater the number of other homes the listing agent has, the less effort he is able to devote to each and thus the poorer the sales outcomes. As such, one might expect to see a negative correlation between *holding* and sales price and a positive correlation between *holding* and *DOM*. On the other hand, one

might expect that if the market is functioning efficiently, on the margin, the impact of agents will equalize as better agents simply take on more listings until the point where the outcomes they are able to generate are the same across agents (see Yinger 1981). Yet another hypothesis is that agents holding many listings have a better sense of the market by simply being involved with more houses and this knowledge could translate into better outcomes. Referring to Table 2.2, *holding* is highly significant and negative. It is also robust across various specifications. The estimated effect is, however, quite small. Each additional property being held by the listing agent reduces the sales price of the home by 0.04%. This translates to around a $70 reduction in sales price per house held for the average priced home. *Holding* appears to have no statistically noticeable effect on time on market. The median transaction involves an agent holding around two other homes at the time of sale (though the mean was 6.4) with a standard deviation of around 10.8 homes. Eighteen percent of the transactions were conducted with the listing agent holding no other homes at that time. Putting this in perspective, comparing an agent at the median (with two other homes) to an agent one standard deviation away (with 13 other homes), the agent with more listings would obtain a price around $770 less on an average priced home. While negative, robust, and precisely estimated, it is difficult to believe that such a small marginal effect has any meaningful economically significance. Unfortunately, it is difficult to discern if concurrent listings genuinely have a very small effect, or if agent productivity and a principal-agent problem are having counteracting effects.

Of particular interest are the recent-experience variables. Referring to the *ln(price)* equation in Table 2.2, it appears that recent listing activity is negatively associated with sales price. For the most part, the recent listing experience variables are statistically significant (at the ten percent level or better) and paint a fairly consistent picture. For each home the listing agent has sold in the past 30 days, the sales price decreases by 0.16%. This result is highly statistically significant (p-value = 0.001). With an average home price of around $171,588, this equates to a marginal effect of around $280 per previous recent transaction. The mean value of *recent_list_experience_30days* is 1.8 (though the median is between 0 and 1) with a standard deviation of 3.6. Comparing a listing agent with one previous transaction in the last 30 days to one with five transactions (one standard deviation away), one finds the more active listing agent associated

with a sales price of $1124 less. The variables capturing the effects of transactions beyond the most recent 30 day, while still negative, tend to be around half of the magnitude and of less statistical significance (though still significant at the ten percent level in four of the five cases).

The above results seem to imply that more active listing agents are associated with lower sales price, and very recent activity (activity in the last 30 days) has a noticeably stronger effect. Interestingly, this effect is somewhat mirrored in the *DOM* equation. Once again the coefficients on the recent experience variables are negative and largely significant, though it is important to keep in mind that in the case of DOM, a negative coefficient is associated with a better sales outcome (shorter time on market). Once again, the effect on the dependent variable seems to be strongest for the experience variable associated with the most recent activity. For each previous transaction the listing agent has conducted in the last 30 days, DOM is shortened by .68 days. This effect is significant at the one percent level. Once again, beyond the 30 day threshold, the effect of previous recent transactions levels off and is roughly half in magnitude. The exception here seems to be transactions occurring between 151 and 180 days previous (the most distant time period) which has a noticeably smaller coefficient and fails to approach statistical significance at any conventional level.

Putting the two sales outcome equations together, it appears that more active listings agents close deals quickly but at a detriment to the final sales price. As Levitt and Syverson point out, agents are likely to hold an informational advantage over their clients. Since these agents are likely to have strong incentives to close deals quickly (even if it means a slightly lower sale price) and thereby free themselves to proceed to the next listing, it follows that they may try to use that advantage to persuade clients into quick sales.

Generally speaking, the recent activity of the selling agent appears to have little impact on sales outcome variables. This may not be surprising due to the somewhat ambiguous loyalties of the selling agent. With the exception of the still fairly unusual case of the "buyer's broker", the selling agent is paid by (and therefore owes fiduciary responsibility to) the home seller. Furthermore, any marginal increase in the sales price mechanically translates into an increase in the commission fee collected. But the selling

agent's side-by-side interaction with the home buyer may complicate the agent's loyalties. For example, Turnbull (2007) finds that agents specializing in selling (vs. listing) tend to be associated with lower selling prices on transactions in which they are acting as the selling agent. The authors posit that this may reflect the specialized selling agent using his experience and knowledge in favor of the home buyer. It stands to reason that a selling agent that works hard for the home seller (and against the home buyer) by driving up the price may find it difficult to receive future referrals and recommendations from home buying clients or may even cause current clients to seek a more cooperative selling agent. Furthermore, selling agents might feel compelled to assist (or at least not work against) home buyers simply because to do otherwise might feel like a "betrayal" to the homebuyers that they have worked closely with. Since fiduciary duties and personal incentives can conflict, it is perhaps not surprising that the selling agent is basically neutral. One interesting exception is that *recent_sell_experience_30days* (the number of homes the selling agent has sold in the last 30 days) is significant (at the five percent level) and negative in the DOM equation. Since faster selling times are, all else equal, beneficial to all parties (buyers, sellers, and agents), it is perhaps not shocking to see that agents that close deals often are associated with lower time on market on the selling side of the transaction as well.

When examining time on market, an alternative to duration regression could be to employ a hazard model. Table 2.3 reports the hazard ratios and coefficients of a hazard model on time to sale duration. Unfortunately, it was impossible to estimate a hazard model with all of the roughly 2,000 neighborhood controls and 237 zip code controls were used instead. Table 2.3 also includes results from an OLS regression with the same zip code control variables. The results from the hazard model tell a qualitatively consistent story with the previously discussed OLS results. Each additional transaction within the past thirty days by the listing agent increases the probability of selling the home by 1.38% in any given period and this effect tapers off as transactions get further in the past. Additional concurrent listings reduce the probability of a sale by a very small, yet statistically significant amount. Again, the recent activity of the selling agent appears to have no noticeable effect.

Thus far, only general listing and sales experience have been explored. Table 2.4 reports regression results including agent experience variables that measure recent transaction activity in the same MLS area. For example, *recent_area_list_experience_30days* is a variable capturing the number of recent transactions the listing agent has conducted in the same MLS area as the observation. It is possible that recent previous activity in the same geographical area of the market might have some different effect than general recent transactions. The results indicate that more recent listing transactions in the same MLS area are associated with higher sales prices. The coefficients for *recent_area_list_experience_30days* and *recent_area_listing_experience_31-60days* are 0.0017 (p-value= 0.086) and 0.0026 (p-value 0.011) respectively. The coefficient for *recent_area_experience_61-90days* was not statistically significant implying that transactions 61 to 90 days previous have no noticeable effect. Intuitively, one might expect the most recent transactions to have the largest and most noticeable effect though the results indicate that transactions in the 31 to 60 day window are more influential. Nevertheless, it is interesting to note that the magnitudes on *recent_area_list_experience_30days* and *recenct_area_list_experience_31-60days* are similar to *recent_list_experience_30days* and *recent_list_experience_31-60days* but opposite in sign. These data appear to be indicating that generally agents who close deals do so at a detriment to final sales price, but those closing deals in a specific area of town where they do have experience do so at a higher sales price. There appears to be no connection between recent area transactions and DOM and in both the *ln(price)* and *DOM* equations, once again, the selling agent has no noticeable impact.

2.5 Conclusion

This paper examines the effect of recent agent activity on sales outcomes through an empirical hedonic housing model. Results indicate that listing agents with more recent activity are associated with faster home sales, though they sell the homes at a lower price. It appears that transactions in the last 30 days have a relatively larger effect. Interestingly, when recent activity is more narrowly defined to listed homes sold in the same MLS area, the effect on sales price is positive but there is no noticeable effect on time on market. The number of concurrent houses held by the listing agent was also examined. It

was found that an increase in concurrent listings is associated with a highly statistically significant negative effect on sales price, but the magnitude of this effect is small enough to cast doubt on its economic significance. This is consistent with a scenario of efficient information flow. Generally, the selling agent can probably be considered neutral as their recent activity had little noticeable impact on sale outcomes.

While these results present interesting findings, there are a number of directions for related future research. First, given the skewed distribution of agent activity, an exploration into non-linearities in recent agent experience may be interesting. Since the main results basically reverse sign when a specific geographic area is accounted for, perhaps more emphasis could also be placed on geographical specialization. As the data contain information on initial listing price, examination into the effects of recent agent activity on setting an accurate listing price might be interesting.

The large size of the data set could be utilized by examining repeat sales of the same house and including a house fixed effect. This would eliminate or reduce the unobservable heterogeneity even a very rich hedonic specification could fail to account for. The large data set would also allow for one to explore models with agent fixed effects.

Table 2.1: Summary Statistics

n=64990

Variable	Description	Mean	Std. Dev.	Min.	Max.
Price	sales price ($)	171588.6	129881.2	50000	2880500
Lnprice	ln of sales price	11.8882	0.533121	10.819	14.873
Dom	Days on market	74.58359	67.49014	0	1010
One bedroom	1 if house has 1 bedroom	0.003893	0.062272	0	1
Two bedrooms	1 if house has 2 bedrooms	0.100369	0.300494	0	1
Three bedrooms	1 if house has 3 bedrooms	0.57038	0.495026	0	1
Four bedrooms	1 if house has 4 bedrooms	0.261717	0.439573	0	1
Five bedrooms	1 if house has 5 bedrooms	0.05307	0.224174	0	1
Sixplus bedrooms	1 if house has 6+bedrooms	0.009925	0.099128	0	1
One fullbath	1 if house has 1 full bath	0.378381	0.484987	0	1
Two fullbath	1 if house has 2 full baths	0.479274	0.499574	0	1
Three fullbath	1 if house has 3 full baths	0.114018	0.317835	0	1
Fourplus fullbath	1 if house has 4+ full baths	0.027589	0.163793	0	1
Zero halfbath	1 if house has 0 half baths	0.643807	0.478877	0	1
One halfbath	1 if house has 1 half bath	0.334605	0.471856	0	1
Two halfbath	1 if house has 2 half baths	0.020357	0.141219	0	1
Three halfbath	1 if house has 3 half baths	0.000939	0.030623	0	1
Fourplus halfbath	1 if house has 4+ half baths	0.000292	0.017096	0	1
two_five years	2-5 years old at initial listing	0.119357	0.32421	0	1
six_ten years	6-10 years old at initial listing	0.118218	0.322869	0	1
eleven_twentyfive years	11-25 years old at initial listing	0.166672	0.372686	0	1
twentysix-fifty years	26-50 years old at initial listing	0.361563	0.480457	0	1
fiftyone_hundred years	51-100 years old at initial listing	0.210525	0.407684	0	1
Hundredplus years	101+ years old at initial listing	0.023665	0.152005	0	1
Central air	1 if has central air conditioning	0.919403	0.273008	0	1
Basement	1 if has basement	0.618018	0.485876	0	1
Vacant	1 if revealed vacant	0.080274	0.271719	0	1
Squarefootage 1	1 if in 1st SQFT quintile (<=1149)	0.2	0.4	0	1

Table 2.1 continued					
Variable	**Description**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Squarefootage 2	1 if in 2nd SQFT quintile (>1150 & <=1500)	0.2	0.4	0	1
Squarefootage 3	1 if in 3rd SQFT quintile (>1500 & <= 1900)	0.2	0.4	0	1
Squarefootage 4	1 if in 4th SQFT quintile (>1900 & <=2597)	0.2	0.4	0	1
Squarefootage 5	1 if in 5th SQFT quintile (>2597)	0.2	0.4	0	1
Acreage 1	1 if acreage <0.25 acres	0.134667	0.34137	0	1
Acreage 2	1 if acreage >=0.25, <0.5	0.143002	0.350078	0	1
Acreage 3	1 if acreage >=0.5, <1	0.05191	0.221847	0	1
Acreage 4	1 if acreage >=1, <5	0.076035	0.265056	0	1
Acreage 5	1 if acreage >=5, <20	0.027952	0.164835	0	1
Acreage 6	1 if acreage >20	0.00366	0.06039	0	1
acreage_unknown	1 if no acreage was reported	0.562775	0.496048	0	1
Relist	1 if listing was "refreshed"	0.09226	0.289395	0	1
Dual	1 if listing agent=selling agent	0.233498	0.423059	0	1
Pool	1 if house has pool	0.045531	0.208467	0	1
Fireplace	1 if house has fireplace	0.300989	0.458692	0	1
Agent owned	1 if revealed to be owned by list agent	0.009956	0.09928	0	1
2001	sold in 2001	0.123311	0.328797	0	1
2002	sold in 2002	0.122604	0.327984	0	1
2003	sold in 2003	0.142745	0.349815	0	1
2004	sold in 2004	0.152716	0.359716	0	1
2005	sold in 2005	0.141037	0.348063	0	1
2006	sold in 2006	0.162133	0.368575	0	1
2007	sold in 2007	0.155455	0.36234	0	1

Table 2.2:: Least Squares Results with White Standard Errors				
	Ln(price) equation		**DOM equation**	
	n=60,141 F-stat= 219.06 (P>F= 0.00) R-squared= 0.883		n=59,644* F-stat=60.97 (P>F=0.00) R-squared= 0.129	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
recent_list_experience_30days	-0.0016	-3.380***	-0.680	-5.430***
recent_list_experience_31-60days	-0.0009	-1.870*	-0.239	-1.730*
recent_list_experience_61-90days	0.0004	-0.750	-0.370	-2.630***
recent_list_experience_91-120days	-0.0009	-1.800*	-0.272	-1.930*
recent_list_experience_121-150days	-0.0009	-1.980**	-0.213	-1.490
recent_list_experience_151-180days	-0.0008	-1.780*	-0.009	-0.060
recent_sell_experience_30days	0.0005	0.670	-0.466	-1.970**
recent_sell_experience_31-60days	0.0006	0.770	-0.040	-0.170
recent_sell_experience_61-90days	0.0008	1.090	-0.356	-1.410
recent_sell_experience_91-120days	-0.0004	-0.570	-0.416	-1.660*
recent_sell_experience_121-150days	0.0005	0.650	0.311	1.250
recent_sell_experience_151-180days	-0.0004	-0.550	0.272	1.080
holding	0.0004	-2.610***	0.043	0.920
(*onebedroom* is ref group)				
twobedrooms	0.093	4.530***	0.931	0.240
threebedrooms	0.173	8.360***	-1.344	-0.340
fourbedrooms	0.186	8.910***	0.253	0.060
fivebedrooms	0.207	9.690***	1.431	0.340
sixplusbedrooms	0.286	11.190***	6.972	1.250
(*onefullbath* is ref group)				
twofullbaths	0.112	41.400***	1.736	2.030**
threefullbaths	0.215	45.230***	4.192	2.900***
fourplusfullbaths	0.489	44.310***	13.554	4.840***
(*zerohalfbaths* is ref group)				
onehalfbath	0.094	42.170***	3.748	5.230***
twohalfbaths	0.183	22.190***	5.459	2.470**
threehalfbaths	0.362	4.950***	-0.978	-0.080

Table 2.2 continued				
	Ln(price) equation		**DOM equation**	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
fourplushalfbaths	0.218	2.630***	5.339	0.240
(*no_garage* is ref group)				
onecargarage	0.051	19.890***	-0.405	-0.490
twocargarage	0.104	44.860***	-0.569	-0.770
threepluscargarage	0.238	40.220***	3.819	2.250**
(*2-5_yearsold* is ref group)				
six-ten_yearsold	-0.036	-10.490***	-5.180	-4.110***
eleven-twenty_yearsold	-0.062	-14.250***	-5.929	-3.980***
twentysix-fifty_yearsold	-0.091	-18.310***	-7.256	-4.440***
fiftyone_hundred_yearsold	-0.076	-11.950***	-6.745	-3.590***
hundredplus_yearsold	-0.077	-6.370***	-0.722	-0.240
centralair	0.117	29.060***	0.510	0.470
basement	0.069	30.030***	-4.033	-5.500***
multiphoto	0.029	1.240	18.549	2.230**
vacant	-0.081	-24.520***	-3.047	-2.910***
(*sqft<1150* is ref group)				
sqft>=1150, <1499	0.061	22.650***	-0.581	-0.650
sqft>=1499, <1899	0.126	39.580***	3.209	3.070***
sqft>=1899, <2579	0.195	51.450***	5.458	4.400***
sqft>=2579	0.346	66.740***	6.857	4.290***
relist	-0.016	-6.070***	-16.224	-21.210***
dual	-0.014	-7.080***	4.765	7.160***
same_office	-0.003	-1.010	0.557	0.530
pool	0.057	13.210***	-0.589	-0.430
fireplace	0.038	21.070***	-0.403	-0.650
agentowned	0.027	3.510***	2.900	0.890
(acreage<0.25 is ref group)				
unknown_acreage	0.003	1.470	2.910	3.750
acreage>=0.25, <0.5	0.008	3.040***	3.265	3.310
acreage>=0.5, <1.0	0.060	12.000***	6.469	4.080
acreage>=1.0, <5.0	0.181	28.060***	13.760	7.310
acreage>=5.0, <20.0	0.384	36.560***	14.605	5.080***

Table 2.2 continued				
	Ln(price) equation		**DOM equation**	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
acreage>20.0	0.719	19.760***	23.432	3.620***
constant	11.490	330.260	106.378	14.710
Note: Subdivision and quarter fixed effects present but repressed				

* omits 497 observations for which the DOM variable was missing

Table 2.3: Hazard Model Results					
	Hazard Model Results			**OLS Results with White Std.Errors**	
	n=59,644 p= 1.201			n=59,644 F stat= 68.32 (P>F=0.000) R squared= 0.088	
	Hazard Ratio	**Coefficient**	**z-stat**	**Coefficient**	**t-stat**
recent_list_experience_30days	1.0138	0.013752	5.550***	-0.6697	-5.430***
recent_list_experience_31-60days	1.0089	0.008897	3.440***	-0.3042	-2.240**
recent_list_experience_61-90days	1.0087	0.00865	3.260***	-0.3514	-2.570***
recent_list_experience_91-120days	1.0058	0.005748	2.250**	-0.2275	-1.650*
recent_list_experience_121-150days	1.0035	0.003502	1.320	-0.1921	-1.380
recent_list_experience_151-180days	1.0006	0.000625	0.240	-0.0403	-0.310
recent_sell_experience_30days	1.0071	0.007045	1.810*	-0.5129	-2.210**
recent_sell_experience_31-60days	1.0026	0.002618	0.670	-0.1065	-0.450
recent_sell_experience_61-90days	1.0036	0.003573	0.890	-0.3063	-1.240
recent_sell_experience_91-120days	1.0077	0.007697	1.950*	-0.5393	-2.180**
recent_sell_experience_121-150days	0.9939	-0.0061	-1.490	0.3954	1.620
recent_sell_experience_151-180days	0.9969	-0.0031	-0.760	0.2351	0.960
holding	0.9979	-0.00213	-2.690***	0.0546	1.190
twobedrooms	1.0254	0.025121	0.390	-0.1407	-0.040
threebedrooms	1.0783	0.075349	1.170	-2.9257	-0.760
fourbedrooms	1.0581	0.056467	0.860	-1.6419	-0.420
fivebedrooms	1.0351	0.034452	0.510	-0.1093	-0.030
sixplusbedrooms	0.9380	-0.06404	-0.800	7.3230	1.350
twofullbath	0.9674	-0.03309	-2.550**	2.0364	2.570***
threefullbaths	0.9150	-0.08883	-4.150***	5.4210	3.930***
fourplusfullbaths	0.7939	-0.23078	-6.570***	14.2579	5.540***
onehalfbath	0.9432	-0.05849	-5.500***	3.6389	5.420***
twohalfbath	0.9370	-0.0651	-2.070**	4.3419	2.040**
threehalfbaths	0.9893	-0.01072	-0.070	1.1231	0.090
fourplushalfbaths	0.9417	-0.06009	-0.210	7.7796	0.340
onecargarage	1.0144	0.01426	1.090	-0.6631	-0.840
twocargarage	1.0107	0.01064	0.950	-0.1200	-0.180

Table 2.3 continued

	Hazard Model Results			OLS Results with White Std.Errors	
	Hazard Ratio	**Coefficient**	**z-stat**	**Coefficient**	**t-stat**
threepluscargarage	0.9337	-0.06855	-2.980***	4.6336	2.840***
six_tenyears	1.0847	0.081327	4.710***	-4.6759	-4.160***
eleven_twentyyears	1.0631	0.061174	3.720***	-3.3511	-3.110***
twentysix_fifyyears	1.0602	0.058442	3.570***	-3.2871	-3.020***
fiftyone_hundredyears	1.0706	0.068187	3.430***	-3.1843	-2.370**
hundredplusyears	0.9920	-0.00803	-0.230	2.2681	0.880
centralair	1.0276	0.027234	1.680*	-0.3539	-0.330
basement	1.0802	0.077189	7.290***	-4.3398	-6.510***
multiphoto	0.7511	-0.28619	-2.480**	20.5762	2.460**
vacant	1.0517	0.050364	3.140***	-2.3894	-2.370**
sqft2	1.0113	0.011225	0.770	-0.6450	-0.760
sqft3	0.9467	-0.05482	-3.340***	3.2670	3.330***
sqft4	0.8982	-0.10739	-5.660***	5.8119	4.930***
sqft5	0.8611	-0.14949	-6.380***	8.5126	5.720***
relist	1.3193	0.277073	18.890***	-15.5717	-20.85***
dual	0.9326	-0.06983	-4.030***	4.5351	3.960***
pool	1.0183	0.018146	0.890	-0.6831	-0.530
fireplace	1.0058	0.005741	0.590	-0.3378	-0.560
agentowned	0.9732	-0.02716	-0.650	2.9651	0.940
noacreage	0.9347	-0.06756	-5.160***	3.3724	4.440***
acreage2	0.9230	-0.08016	-4.990***	3.7518	3.940***
acreage3	0.8612	-0.14945	-6.620***	8.4042	5.650***
acreage4	0.7766	-0.25277	-11.63***	15.6497	10.070***
acreage5	0.7732	-0.2572	-8.520***	15.9639	6.490***
acreage6	0.7076	-0.34584	-4.710***	28.2526	4.290***
dualoffice	0.9774	-0.02291	-1.420	0.9002	0.870

Note: Quarter and zip code location controls included but suppressed

Table 2.4: Least Squares Results for Area Variables with White Corrected Standard Errors				
	Ln(price) equation		**DOM equation**	
	n=60,141 F-stat= 219.34 (P>F= 0.00) R-squared= 0.881		n=59,644* F-stat= 78.71 (P>F=0.00) R-squared= 0.129	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
recent_list_experience_30days	0.002	1.720*	-0.450	-1.350
recent_list_experience_31-60days	0.003	2.530**	0.110	0.310
recent_list_experience_61-90days	0.001	1.180	-0.440	-1.360
recent_sell_experience_30days	0.001	-0.900	-0.140	-0.300
recent_sell_experience_31-60days	0.001	-0.310	0.580	1.140
recent_sell_experience_61-90days	0.001	1.520	-1.270	-2.670***
Holding	0.000	-20.200***	-0.390	-14.260***
(*one bedroom* is ref group)				
Two bedrooms	0.090	4.550***	1.250	0.310
Three bedrooms	0.170	8.390***	-1.060	-0.270
Four bedrooms	0.190	8.940***	0.510	0.130
Five bedrooms	0.210	9.710***	1.680	0.390
Sixplus bedrooms	0.290	11.220***	7.240	1.300
(*one fullbath* is ref group)				
Two fullbaths	0.110	41.260***	1.690	1.970**
Three fullbaths	0.210	45.120***	4.100	2.830***
Four plusfullbaths	0.490	44.260***	13.540	4.830***
(*zero halfbaths* is ref group)				
One halfbath	0.090	42.130***	3.700	5.170***
Two halfbaths	0.180	22.160***	5.430	2.460**
Three halfbaths	0.360	4.980***	-0.890	-0.070
Fourplus halfbaths	0.220	2.670***	7.250	0.330
(*one bedroom* is ref group)				
Two bedrooms	0.090	4.550***	1.250	0.310
Three bedrooms	0.170	8.390***	-1.060	-0.270

Table 2.4 continued				
	Ln(price) equation		**DOM equation**	
Variable	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
Four bedrooms	0.190	8.940***	0.510	0.130
Five bedrooms	0.210	9.710***	1.680	0.390
Sixplus bedrooms	0.290	11.220***	7.240	1.300
(*one fullbath* is ref group)				
Two fullbaths	0.110	41.260***	1.690	1.970**
Three fullbaths	0.210	45.120***	4.100	2.830***
Four plusfullbaths	0.490	44.260***	13.540	4.830***
(*zero halfbaths* is ref group)				
One halfbath	0.090	42.130***	3.700	5.170***
Two halfbaths	0.180	22.160***	5.430	2.460**
Three halfbaths	0.360	4.980***	-0.890	-0.070
Fourplus halfbaths	0.220	2.670***	7.250	0.330
Dual	-0.010	-7.100***	4.670	7.080***
same_office	0.001	-1.140	0.640	0.600
Pool	0.063	13.230***	-0.610	-0.450
fireplace	0.045	21.120***	-0.290	-0.460
Agent owned	0.034	3.710***	3.350	1.030
(acreage<0.25 is ref group)				
unknown_acreage	0.000	1.090	2.690	3.460***
acreage>=0.25, <0.5	0.010	3.160***	3.310	3.350***
acreage>=0.5, <1.0	0.065	11.990***	6.570	4.140***
acreage>=1.0, <5.0	0.184	27.990***	13.780	7.310***
acreage>=5.0, <20.0	0.380	36.550***	14.580	5.070***
acreage>20.0	0.720	19.750***	23.290	3.600***
Constant	11.492	330.440***	106.930	14.770***
Note: Subdivision and quarter fixed effects present but repressed				

* omits 497 observations for which the DOM variable was missing

CHAPTER 3. MARKET CONCENTRATION IN REGIONA REAL ESTATE BROKERAGE MARKETS

3.1 Introduction

Low barriers to entry and a large number of firms are characteristics of the residential real estate brokerage market and thus, one might expect markets to be fairly competitive. Furthermore, the Multiple Listing Services (MLS) found in practically every market would seem to go far in leveling the playing field since listings from small or new firms enjoy exposure comparable to any other firm. The unusually pervasive and seemingly rigid six percent commission rate structure, which is so often reported across markets, is then difficult to explain, and anecdotal evidence of a non-competitive market structure exists.[14] A few studies have examined concentration in a small number of markets but thus far there has been no attempt to obtain a broader picture from which a more general view of the brokerage industry could be evaluated.

The National Association of Realtors (NAR) reports that "there is little concentration in the real estate industry" and that "the top 100 real estate firms (in 2004) held only 17 percent of the market share" (NAR, 2005). But national measures are of little value; even if every local market in the country were monopolized, national measures could suggest a fairly competitive market. The immobility of real estate dictates that concentration should be examined at the individual market level. In their 2007 report "Competition in the Real Estate Brokerage Market", the Department of Justice cites three anecdotal instances of markets where two firms controlled over fifty percent of listings. Academic studies looking into market concentration are very few, no doubt due to lack of available data, and those that have been done have focused each on a single market. Even collectively, these studies give a very incomplete picture of the market structure and it is difficult to use them to draw inferences about the industry in general. This study uses listings taken from the website www.Realtor.com, a listings aggregator owned and maintained by the NAR, to get a sense of market structure over a number of diverse real estate markets.

[14] See the 2007 Dept. of Justice report "Competition in the Real Estate Brokerage Industry".

With this analysis, it is possible to then get a sense of the shape of the long run average cost curve from the size of the firms observed. Factors that give rise to market concentration are also examined.

3.2 Background and Literature Review

For any real market power to exist there must be barriers to entry present. Since real estate professionals require licensure to operate, it is possible that state licensing laws stifle entry. There are two types of licenses; agent and broker. Agent licensure always precedes broker licensure and has lower requirements. These requirements vary from state to state. In California, the country's largest statewide real estate market, an applicant wishing to take the agent license exam must first have completed three college-level real estate courses[15] and pay a $25 examination fee. Successful applicants must then pay a $120 annual licensing fee. In Kentucky, primary requirements to become an agent are to spend ninety-six classroom hours in real estate courses, pass the state real estate licensing exam,[16] and pay the state licensing fee of $55 (www.krec.ky.gov). In Kentucky, private accredited real estate courses tend to range from around $500 to $750 and the state licensing exam fee is $75, suggesting that the total monetary cost of becoming a real estate agent is under a thousand dollars and takes less than three weeks. These requirements are typical for the country in general, and several of the panelists participating in the 2007 DOJ workshop (U.S. Department of Justice, 2007) report suggested that licensing barriers are not particularly deterring, citing the general fluidity of the entry and exit of agents.

Every agent requires a broker, however, and brokerage licensing requirements are more stringent. While, again, there is variation state to state, typically one must have been an active agent for some period of time (two years seems typical), completed additional course work (usually from a local community/technical college), and passed the state brokerage exam.

Another explanation for any market concentration one might find could come from reputational effects. Since buying or selling a home usually represents the largest

[15] These course are offered at many colleges, community colleges, and private institutions.
[16] The Kentucky Real Estate Commission reports the pass rate for the agent exam to be 83%.

transaction in a person's life, reputational effects of brokers might have special importance. Survey data utilized by Nelson and Nelson (1988) support this assertion in that they find recent home buyers to report "general reputation of the firm" to be second only to "agent friendliness" as the most important attribute in choosing an agent. This is likely to favor established, existing firms and make it more difficult for new entrants to attract listings.

Lastly, there may be some minimum efficient scale in which new firms with few listings are too small to compete with firms farther down the average cost curve. If this is true, one might observe higher concentration in smaller markets as the small size of the market dictates that only a few firms can carry enough listings to reach minimum efficient scale (MES). This effect would then decrease as market size increases. Lower concentration may be observed as there becomes more room for additional firms to obtain the minimum efficient scale. Observing concentration levels over a wide cross section of markets may shed some light on this.

The aforementioned 2005 NAR study claims that the cost structure of the industry is such that there are fairly constant economies of scale offering no cost advantage to larger firms. The cost structure in this industry has not attracted much attention from economists. Zumpano and Elder (1993) search for economies of scale using a translog cost function to model the production functions for real estate brokerage firms. Using sales force as a measure of firm size, they find evidence of modest economies of scale except for very large firms (of 559+ agents). Interestingly, they note that most of the firms in the sample, which come from a cross-sectional NAR survey of 279 observations, were operating below their most efficient scale. Later, Zumpano and Elder (1994) follow a similar methodology but take into account the possibility of scope economies by modeling a brokerage firm as producing two products; listings and selling transactions. They find that a balanced mix is the least costly type of operation. More recently, however, Anderson, Lewis and Zumpano (2000) utilize a more advanced estimation technique and find that firms may be much closer to the efficient production frontier.

Information on firm sizes across a number of markets may provide some insight on the long run average cost structure and minimum efficient scale (MES) in residential brokerage. By observing the size of existing firms one can conduct something similar to

a survivor analysis for the industry. This technique, first formalized by Stigler (1968), involves observing which firms survive and grow over time versus which firms exit the industry. The assumption is that competitive pressures will cause firms operating outside the range of lowest average cost to eventually either change or exit the industry, thereby implying that survivors will operate within the range of lowest average cost. Since the data available for this study (see Section 3.3) reveal only what the various markets look like at a given point, it is not possible here to follow firms over time and observe their entry or exit. Thus, while a traditional survivor analysis is not possible, looking at the size distribution of existing firms across markets at a point in time may provide some useful insight.

If the average cost curve is u-shaped with a unique minimum point (Figure 3.1), one would expect to see firms cluster around a certain size since firms that deviate from this point of minimum average cost would face a cost disadvantage. Alternatively, if the AC curve contained a flat portion of constant average cost, (Figure 3. 2), one would expect to see firms operating at various levels between q1 and q2. Any firm operating between 0 and q1 would be below MES and could reduce costs per transaction by expanding production. Similarly, any firms operating beyond q2 could reduce average costs by reducing production. Competition will push firms to operate in the minimum cost region.

Perhaps the most explicit look at market concentration in this industry comes from Forgey, et al. (1997). They use MLS data to construct measures of market concentration over four years, 1992-1995, for an unnamed Texas city of approximately two hundred and fifty thousand residents. Using dollar volume of home listings that eventually result in a sale, they find the Herfindal-Hirschman Index (HHI) for listing firms to average 1015 over the four years and to average 725 for selling firms (sometimes referred to as "buy-side" or "cooperating" firms). There is a bit of fluctuation over the time span as the HHI's range from 1069 to 951 and from 821 to 652 for listing and selling firms respectively. Furthermore, two concentration ratios are calculated for the listing and selling firms: the CR4 measuring the percentage of the market held by the top four firms, and the CR8 measuring the percentage of the market held by the top eight firms. For listing firms, the CR4 averaged around 0.57 and the CR8 averaged around 0.81. For selling firms, the CR4 averaged around 0.46 and the CR8 averaged around 0.70. The Gini coef-

ficients were 0.848 and 0.825 for listing and selling firms respectively. While the above values are not particularly startling, it is worth noting that they are for only one city of a given state and not necessarily representative of the market as a whole.

Another pertinent study, by Colwell and Marshal (1986), empirically looks into the effects of various firm specific factors (firm size, level of advertizing, etc.) on market share in Champaign, Illinois. They find that the level of a firm's advertizing is positively related the market share as well as, unsurprisingly, the firm's size measured by number of employees. Lorenz curves and Gini coefficients are also constructed to measure market concentration. The Gini coefficients were lower than that found by Forgey et al, (0.68 for listings, 0.64 for selling) and thus they find no persuasive evidence to suggest the presence of high levels of monopoly power.

In finding no particularly high concentration levels, the above studies, while limited, are consistent with the report "Structure, Conduct, and Performance of the Real Estate Brokerage Industry" published by the NAR (2005). The objective of this report was to assuage the concerns of policymakers, analysts, and media observers about the potentially anti-competitiveness of the brokerage industry. They point out that there are approximately 2.5 million real estate professionals and since nearly all work on commission, they could, in one light, be viewed as self-employed individual contractors. The NAR asserts that the sheer number of agents competing for listings and sales makes collusion through commission rates improbable. If agents do compete with each other, even within the same firm, high levels of market concentration at the firm level may not necessarily lead to uncompetitive results for the consumer. It is likely, however, that brokerage firm owners have some degree of influence over their agents and thus there may be an extra dimension over which agents can collude than if each agent were totally autonomous. Encouraging all of one's agents to charge a minimum commission rate would be one example.

3.3 Data

Perhaps the best source of local market concentrations would be, collectively, the local realtor associations and the associated local MLS's. Unfortunately, these associations are reluctant to divulge information to researchers and local MLS access is limited

to agents who have paid fees/dues to the local real estate board and hold a valid state license.[17] A wide reaching data collection effort in this case would involve obtaining membership in each of the local real estate boards as well as obtaining a license in each state one wished to have observations from, which would be extraordinarily costly. The NAR, however, maintains a website, www.realtor.com, which assembles homes listed on regional MLS's (henceforth "listings") and allows users to search/browse through listings practically anywhere in the country by city or ZIP code[18]. Specifically, for a given listing, basic housing characteristics, such as number of bedrooms, number of bathrooms, the age of the home, the ZIP code in which the house is located, the square footage, the listing price, and the type of home (condominium vs. single family dwelling) are usually available along with a number of photographs. Importantly for this paper, the brokerage firm through which the house is being listed is also reported. As such, it is possible for one to record all the listings in a city at a given point in time and use this to analyze market structure.

The website Realtor.com is desirable because it is the official listing website of the NAR and likely to be the single most uniform source for this information. In fact, NAR rules specifically create an exception for realtor.com amongst realtors wishing to block their listings from appearing on publicly accessible web sites.[19] The result is that Realtor.com will contain all the houses in a given geographic market where the listing real-estate agent uses the MLS.

Data on one hundred diverse markets were collected from realtor.com between October 17th and December 21st, 2007. The 2005 Rand McNally Atlas and the American Community Survey:

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[17] These fees can range from a few hundred to several thousand dollars per year.

[18] The following statement accompanies the search results at Realtor.com (Lexington, KY is used as an example). "REALTOR.com® is the leading website to find real estate in Lexington or property listings provided by the local MLS. Here, you'll discover detailed Lexington listings and other featured properties, homes for sale and rentals in Lexington. You'll get all the listing details you need including home price, year built, pictures, number of bedrooms, and other home features for free. You can even request a showing for homes for sale or easily find a REALTOR® and other real estate information on REALTOR.com®."

[19] By 2005, web-based brokers had emerged who often made available information about listings to potential customers via websites. The NAR gave individual agents the right to "opt-out" of having their listings displayed by particular websites. In response to imminent legal action by the Department of Justice in September 2005, the NAR changed the policy to a blanket opt-out allowing realtors to prohibit their listings from appearing on any website, the exception being realtor.com.

American Fact Finder (http://factfinder.census.gov/home/saff/main.html?_lang=en) (ACS) were used to select the cities. Random selection was used whenever possible but since small towns greatly outnumber large cities some stratification was necessary. Specifically in the case of large cities, seventeen were selected at random from the nation's 50 largest. A similar process was used to allow for sufficient representation of midsized cites.[20] It was discovered that many of the small towns randomly drawn were quite close to much larger cites. Since geographical separation is desirable, any towns within 20 miles of a city with over 200,000 residents were removed and new random draws were taken.

The collection process for an individual market was typically completed within a three day window, the exceptions being a few very large markets (Atlanta and Los Angeles). The maximum window was five days. While the universe of listings at a point in time was collected, this basically amounts to a single observation in a time series. It is possible that market concentrations could fluctuate.[21] Unfortunately, market fluctuations over time cannot be addressed here.

Table 3.1 presents a list of the observed markets in the data set. Note that the markets have been divided into three categories (small, medium, and large) based on the number of listings observed, not population. Note that the correlation between being a large market based on population size and a large market based on number of listings is not perfect. City population size was used for observation selection only. For instance, St. Petersburg, FL was considered a medium sized city for observation selection, but due to the high volume of house listings, was later classified as a "large" market. Any further division or segmentation based on the size of the real estate market is based on the number of listings.

This study focuses on the brokerage of existing homes primarily because the selling process of newly built homes is often drastically different. For example, in a new development it is common for one agent or firm to handle the entire development and the relative homogeneity of the homes likely makes the marginal effort to sell a house differ-

[20] A midsized city was defined as one having a population too small to be counted as one of the 50 largest (less than 362,850) but greater than 40,000 inhabitants.
[21] Forgey, et al. find the HHI for listings in their Texas city to remain fairly stable across four years. The average annual fluctuation was 6.03%.

ent than for existing houses. Furthermore, it is quite common for new home builders to vertically integrate and have a hand in the brokerage of their own homes. Fortunately, the home's construction status is available in the data and new construction was excluded from the analysis.

Since firms are identified (and differentiated) by the reported name attached to the listing, a potential pitfall could be discerning the existence (or lack) of competition among specific local brokers. This may not be as obvious as it would seem. For instance, it is common for one city to have two or more firms operating independently under one franchise affiliation (Century 21, RE-Max, etc). While two firms could both be under the umbrella of Century 21, they could have separate ownership and if so, probably view each other as competitors. The 2005 NAR report "Structure, Conduct, and Performance of the Real Estate Brokerage Industry" and informal interaction with real estate agents is consistent with this.[22] As such, they should be considered two separate firms for purposes of calculating market concentration. Some firms, however, simply have multiple offices but a single owner. For example, in a market there could be a "Jones Realty: North" and a "Jones Realty: South". It seems unlikely that these branches would be competing with each other and in calculating a measure of market concentration should probably be considered a single firm. For the purposes of this study, franchisees will be counted as separate firms, but observations that appear to be different branches of a local firm will be considered the same.[23]

Defining the geographic extent of a market is often difficult and this case is no exception. Many large and medium sized cities have surrounding areas which may be outside of the city proper but should probably still be considered as part of the market as housing in a particular suburban community may be a substitute for housing in the city

[22] When one agent employed through a franchised office was asked about competition with other offices under the same franchise system, she responded that "we treat them like any of the other realtors in town".

[23] As the data were being examined there were several instances where ownership across firms could not be easily determined. In those cases, the associated websites were examined and occasionally a direct inquiry was made via an email or phone call. An exhaustive investigation over all one hundred markets would have been exceedingly costly and thus a small amount of mischaracterization is possible. When in doubt, it was decided to err on the side of caution and the questionable firms were marked as separate, competing, entities. As such, any bias on market concentration measures from mischaracterization should be downward. Additionally, since the reported firm name was the sole mechanism used to identify the brokerage firm, potential cases in which a single owner owned two or more firms with different names would be mischaracterized as separate ownership. Any potential bias coming from this is also downward.

proper or a different suburb. Making this issue particularly pertinent is the fact that often these areas are highly residential and thus likely to include many listings. For convenience, this study's definition of a particular market will coincide with realtor.com's definition of that market. This made the data collection process more tractable and appears to reflect the market size as defined by the individual local MLS's.

The primary measure of market concentration for an individual market will be the Herfindahl-Hirschman Index (HHI). This has been the standard measure since the Department of Justice (DOJ) announced its new merger guidelines in 1982. The guidelines suggest that the DOJ would be unlikely to challenge any merger in markets with an HHI below 1000. The guidelines further state that in markets with an HHI above 1800, any merger that would raise HHI by 100 points or more would likely be challenged by the DOJ. As such, these two values, 1000 and 1800, have become focal points of interest. Since no objective rule exists to define "high" market concentration, these numbers will serve as guides for this paper.

There are two dimensions over which one can calculate market share; dollar volume and number of listings. Both are presented in Table 3.1. It is worth noting that dollar volume calculations are based on reported asking price, not the final sales price. While sales price would have been preferable, data limitations make this impossible. The market shares of listings for the four and eight largest firms are also reported (CR4 and CR8).

The average HHI by dollar volume was 1021 and the average HHI by listings was 899. In large markets, (defined as markets with more than 5,000 listings), average HHI (by dollar volume) was 437, while in medium and small markets (5,000-1,001 and 1,000-0), average HHI was 879 and 1,345 respectively. Fifteen of the one hundred markets had HHIs over 1,800 (mostly in small markets), thirty-nine had HHIs over 1,000, and forty-three had four firm concentration ratios over fifty percent.

Note that these data only allow for one to get a picture of the brokerage markets strictly from the perspective of listings. A more complete analysis would measure the buy-side of the transaction as well but, unfortunately, the information needed to calculate this is unavailable. It is worth noting that acting as the listing broker for a home involves

higher monetary costs and an extra level of licensure.[24] Given this, one would expect concentrations to be higher on the listing side. The results from Forgey et al. (1997) support this.[25]

Market characteristics, such as population and population growth rate[26] were taken from the US Census MSA estimates (1990 and 2000). More specific demographic information about individual markets was taken from the American Community Survey: American Fact Finder via the US Census department (ACS). The ACS generates estimates for year 2007 over a wide range of demographic characteristics by city. While the population estimates from the Census reflect MSA's, demographic information from the ACS is calculated based on residents of the city proper. For large metropolitan areas, this implies a large segment of the market's population will not be factored into these estimates. Nevertheless, these data were judged to be more reliable than alternatives and it is hoped that they can serve as a proxy for the MSA as a whole. This becomes less of an issue as the community size decreases since the ACS estimates based on the city limits begin to more closely match the community as a whole.

The total number of listings across markets ranged from 103 (Montpelier, VT) to 27,236 (Atlanta, GA), with an average of 2,927 listings per market. There were 21,159 different firms operating with a fairly wide breadth of size, measured by number of listings. Around thirty-four percent of observed real estate brokers had only a single home listing and around half had either one or two listings. Note that in the data, only firms with a positive number of listings are visible, thus firms that were operating but had zero listings on the day of data collection cannot be accounted for. Ninety-nine percent of all firms had fewer than 200 listings and only about a tenth of one percent of all firms had over a thousand listings. The largest firm, which happened to operate in the largest market (Atlanta, GA), held 2,485 listings at the time of data collection. This firm operated several branches differentiated by geographical focus throughout the Atlanta MSA with a wide variety of types of listings.

[24] Listings agents/brokers have to be MLS members to post listings while selling agents can view posted listings without paying for membership. Furthermore, broker licensure has additional requirements and costs beyond that of an agent and only the listing firm must have a broker.
[25] For all three years of data they find listing brokerage to have a higher market concentration than selling brokerage.
[26] See Section 3.4 for more information on the specifics of the empirical model

3.4 Model

The empirical model will analyze the relationship between market characteristics, most notably market size, and brokerage concentration. The basic specification of the empirical model is:

$$HHI = B_0 + B_1(listings) + B_2(growth\ rate) + B_3(avg\ hh\ size) + B_4(median\ rooms) + B_5(same\ house) + B_6(unemp) + B_7(median\ hh\ inc) + B_8(occ\ rate) + B_9(owner\ occ\ rate) + B_{10}(median\ home\ val) + B_{11}(median\ rent\ val) + B_{12}(over65) + B_{13}(homog\ index) + B_{14}(hispanic) + B_{15}(fsbos) + e$$

The unit of observation is a market and while housing data on one hundred markets were collected, six of the communities did not meet the requirements for ACS participation and thus, for these observations, city level demographic information was unavailable. The final sample is then ninety-four observations.

If significant economies of scale exist, one might expect to see smaller markets (with few total listings) dominated by relatively few firms since the small size of the market would dictate that only a few firms could effectively reach MES. If diseconomies of scale exist, one might expect to see an absence of very large firms in large markets as their size would be a hindrance compared to smaller firms. Market size can be captured two ways; number of listings or population. The correlation coefficient between the two, 0.65, indicates a positive correlation. Since number of listings more closely reflects the level of brokerage activity, listings will be the metric for market size.

A number of other market characteristics are included in the empirical model. The first category attempts to control for turnover in the market. To some extent, this is captured by the number of listings in the market, but a greater number of listings could mean higher existing population growth, more migration into the area, or simply that the people in a particular market move from house to house more frequently. *Growth rate* is the percentage change in the market's population from 1990 to 2000 (measured by the decennial Census).[27] *Same house* is the percentage of residents of the market reporting to have lived in the same house for the last year, which should serve as a proxy for the de-

[27] More recent information would have been desirable but official estimates of MSA's were only available through the census.

gree of the resident's mobility. *Over65* is a variable measuring the percentage of residents in the market over the age of sixty-five, which might capture characteristics associated with a large number of seniors. For instance, markets in traditional retirement areas, like Florida, may see higher turnover due to the larger numbers of retirees that enter the market for relatively short tenures.

It is possible that racial and cultural heterogeneity may give rise to pockets of minority groups. This may create niche markets and be a dimension over which individual firms can specialize. Two variables attempt to capture this. First, the variable *Homog index* was created as a measure of racial homogeneity. The ACS breaks racial composition into seven categories; "White", "African American"," Native American"," Asian", "Pacific Islander", "Other", or "more than one race". *Homog index* is calculated in a way similar to the HHI, in that each race's "market share", or percentage of prevalence, is squared and then all squares are summed. In this way, more homogeneous markets receive a higher value. A market consisting of entirely one race would receive a value of 10,000. Unlike the HHI, which theoretically has a lower bound approaching zero, the minimum value *Homog index* can attain is 1,429 since there are only seven racial categories. The percentage of the market that is Hispanic or Latino is controlled for by the *Hispanic* variable.

While there is no clear theoretical prediction as to their effect, controls for local economic and housing conditions are included. *Unemp* is the local unemployment rate, *Median HH Inc* represents median household income in thousands of dollars, and *Median Home Val* and *Median Rent Val* represent the median home value (in thousands of dollars) and median rental value respectively. *Avg HH size* and *Median Rooms* controls for the average household size and the median number of rooms of houses in the market. Vacancy rates are controlled for by Occ Rate, the occupancy rate, and the degree of renting will be controlled for with *Owner Occ Rate*, the owner occupancy rate.

Communities differ in their residents' propensity to self market homes. For instance, Hendel et al. (2007) show that twenty percent of sold homes in Madison, Wisconsin are transacted without a Realtor while the NAR claims that overall, Realtors are involved in ninety percent of home sales. The degree of FSBO activity could have some implication on brokerage market concentration. For instance, heavier reliance on self

marketing in a particular community will likely reduce the total number of homes available to brokers. If there exists some minimum efficient scale it would then be harder to reach putting downward pressure on the number of viable firms. Alternatively, the causation could run the other way; high concentration could encourage sellers to self market. Unfortunately, it is difficult to gauge the level of FSBO activity from any single data source, as there are a number of different ways a seller could attempt to make the home known to buyers. Examples range from simply putting a sign in the front yard to more active marketing, such as advertising in the local paper or listing the home on a website. Ideally, a measure of FSBO activity would be as complete as possible,[28] but for this paper, the number of listings reported through the website www.forsalebyowner.com is used as a proxy. While not complete (for instance, it clearly misses those owners who simply put a sign in front of their house or advertize in an alternate format), it might pick up those self marketers that are most actively trying to find a buyer.[29] While there are a number of national websites of this type, this site is selected because it has the most listings per market. The number of FSBO listings reported by www.forsalebyowner.com for the market area is represented by the variable *fsbos*. Summary statistics are provided in Table 3.3.

There could be concern over endogeneity with the dependent variable, HHI, and the number of listings in that high concentration in a market could stifle the number of home sellers that choose to use realtors. To correct for this, instrumental variables is used, with the market population, in residents, as the instrument for number of listings. Results for both the OLS and IV specifications are presented in Table 3.4.

[28] One could, of course, argue that since practically all home owners have some theoretically irresistible price, practically all homes could be, in a sense, considered FSBOs.

[29] While not particularly large, listing on a web site such as www.forsalebyowner.com does imply some cost to the seller in terms of money and effort. A single month of listing one's home on the website with minimal frills costs $90. Obviously, longer durations or additional marketing information or intra-site marketing mechanisms (pricing reports, extra photos, etc) imply a higher cost.

3.5 Results and Analysis

Overall there appears to be a slight negative relationship between the number of listings in a market and HHI. That is to say, as a real estate market gets larger, it becomes less concentrated. According to the OLS results, on average, holding all else constant, one hundred more listings in a market will increase HHI by about four points. This result, however, appears to be driven by the relatively small markets. Table 3.5 presents regression results from a subsample of only small markets (less than 1,000 listings) vs. markets with over 1,000 listings. In smaller markets, more listings imply less concentration, but in medium and large markets, there is no discernable pattern. These results are consistent with the idea that beyond some minimum point there may be no advantage to expansion and small markets make it difficult for new entrants to reach MES. None of the other independent variables included in the model appear to affect market concentration in a noticeable way.

Evidence of a non-zero MES is mixed, however. If there is some minimum efficient scale, one would expect to find very few firms operating at very small levels, such as carrying only one or two listings. Table 3.2 outlines the composition of firms across markets and shows that around half of all firms had either one or two listings at the time of data collection (histograms are presented in Figure 3.3). Note that since only firms with at least one listing are visible, it is possible that there are additional "small" firms which are normally active, but happened to not have any listings at the time of data collection.

Given the large number of firms operating at such a low capacity, arguing that there is some minimum efficient scale (beyond one or two listing) could be difficult. A time series would be helpful in that it would allow one to observe the survivability of these small firms. With these data, one cannot rule out the case of frequent entry of hopeful firms, starting out very small, that either grow quickly and achieve the MES or fail and exit the market. Another possibility is that some market participants do not fit with the traditional model of the fulltime real estate broker and voluntarily conduct very few transactions. One example of this could include vertically integrated contractors that buy, renovate, and resell homes, i.e. house "flippers". The data collected for Essay I of this dissertation allow for a bit of an exploration into this. While the data cover only a

single market, they do so over time which allows one to get a sense of the degree of sustainability of very small firms. In the year 2006, there were around 10,000 homes sold through this local MLS by over 505 different brokerage offices. Of these 505 firms, 184 sold only one or two homes the entire year. Of those 184 "very small" firms, twenty four percent were not active in either of the adjacent years (2005 or 2007). So of the approximately 10,000 homes sold in 2006 in this market, only around a half a percent were sold by a small firm that was only active in that year. This suggests that while very small, new firms do come and go, there is evidence that the typical very small firm does operate consistently year to year at a small capacity.

Unfortunately it is impossible to perfectly discern if these small firms are traditional brokerage offices simply operating at a very low level or are some alternate type, such as a vertically integrated house flipper who brokers his or her own properties. This type of brokerage firm is quite different from the traditional firm in that the real estate brokerage is only a small part of profits (presumably most of the revenue comes from a markup on the house) and thus these firms are not relevant in defining a MES for traditional brokerage firms. Since the nature of flipping is to buy and resell a home within a relatively short period of time, one way to potentially identify likely instances of flipping is to look for homes that were sold twice within some short period, such as a year. Turning again to the richer MLS data from Essay I, all homes that were sold for the second time within one year during 2006 were flagged as possible instances of flipping. Of the nearly 10,000 sold homes in 2006 in this MLS, 258 were identified as potentially flipped, with 119 of those being sold (the second time) by a small firm. Recall that there were a total of 184 small firms active in 2006 and thus over half of them sold homes identified as flipped homes. It appears likely that a nontrivial percentage of small firms are of a non-traditional nature.

If there is a region of diseconomies of scale, one might then expect to see few firms with more than some upper threshold level. In the data, the largest firm held 2,485 listings of a possible 27,236 in the market. Since there are no observed firms with more listings, this could imply a point of diseconomies of scale of around 2,485. However, it is worth noting that only one percent of firms had more than 192 listings and only one tenth of one percent had more than 982 listings. One might then tentatively consider that dis-

economies of scale begin to set in around 200 listing, with a few anomalous firms operating outside that range.

Interestingly, Table 3.2 and the associated histograms in Figure 3.3 show that firms do not appear to behave drastically differently across market sizes. All three size categories find the vast majority of active firms having less than 100 listings, with around half of all firms holding 2 or fewer. ANOVA analysis fails to reject the null that the treatment group means differ at the five percent level of significance (p-value=0.098). The only dimension over which the groups noticeably deviate is the absolute range of number of listings. The tail of the distribution gets longer as the market size increases, but there is very little weight in them. Only about one percent of firms in the large or medium market categories have more than 200 listings.

3.6 Conclusion

Previous attempts at defining market structure in the residential real estate brokerage industry have either been national measures of little use or specific local market measures insufficient for drawing conclusions about the industry as a whole. This paper presents measures of market concentration over a wide, nationally representative cross-section of geographic markets. While some markets do appear to be quite concentrated (Des Moines, IA and Buffalo, NY, for example), the average HHI in the data hovered around 1,000, a critical benchmark for the Department of Justice. The prevalence of the seemingly rigid six percent commission rate structure across almost all real estate markets raises questions, but it appears that high concentration is not the explanation. HHI varies from less than 300 to over 3,000, prompting an analysis of factors driving market concentration. OLS and IV estimation did not turn up any particularly influential factors, though there is some evidence that in smaller markets, more listings are associated with lower market concentration. This suggests that there may be some economies of scale over some initial range of output.

While there is modest evidence that minimum efficient scale is positive, further analysis of the size of operating firms revealed that around half typically carried two or fewer listings, implying that any arguments of a non-trivial MES be made with caution. There is, however, evidence that many of the small firms may be of a non-traditional na-

ture, such as vertically integrated house flippers. It was also noted that individual distributions of firm size across markets were remarkably similar regardless of market size. For example, about a third of the firms held only a single listing and only about two percent of firms held more than 100 listings.

An area for future research might involve further study into the anatomy of very small firms. A time series and/or micro level data could allow one to draw more definitive conclusions about their nature and survivability. Studying concentration over time would also be interesting because it could shed some light on how large/small firms respond to natural fluctuations in the housing market, as well as provide a better sense of the stability of intra-firm market share hierarchy. Additionally, since there is variation in statewide licensing costs and market specific MLS membership fees, an interesting study might explore the connection between entry costs and concentration. Finally, and perhaps most importantly, a study addressing the effect (or lack thereof) of high market concentration on consumers could be particularly helpful to antitrust authorities and market regulators.

Table 3.1: Market Concentrations									
Large Markets (5,001+ listings)									
City	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Atlanta	GA	27,732	4,112,198	290.81	251.18	26.33	37.94	No	No
Baltimore	ML	8,951	2,552,994	651.35	592.28	36.83	43.59	No	No
Los Angeles	CA	8,110	9,519,338	204.27	229.30	23.46	26.97	No	No
Philadelphia	PA	9,865	5,100,931	611.39	291.48	24.45	34.88	No	No
Dallas	TX	7,870	3,519,176	338.73	251.68	24.32	36.33	No	No
Phoenix	AZ	12,822	3,251,876	284.23	258.37	24.85	35.85	No	No
San Diego	CA	6,864	2,813,833	332.80	328.31	30.10	35.42	No	No
St. Louis	MO	8,525	2,603,607	550.66	483.65	28.61	35.88	No	No
Portland	OR	6,792	2,159,720	364.55	347.03	27.52	39.50	No	No
Denver	CO	11,637	2,109,282	176.54	165.62	19.72	28.01	No	No
Cincinnati	OH	8,201	1,646,395	888.44	762.71	47.68	70.74	No	No
Indianapolis	IN	10,140	1,607,486	456.68	304.80	28.35	39.99	No	No
San Antonio	TX	8,951	1,592,383	255.49	234.53	21.72	33.97	No	No
Columbus	OH	7,483	1,540,157	645.03	514.67	36.46	46.65	No	No
Charlotte	NC	10,511	1,499,293	368.28	297.29	28.35	37.93	No	No
Jacksonville	FL	10,260	1,100,491	516.29	485.87	33.66	41.43	No	No
Birmingham	AL	5,758	921,106	1,000.30	784.82	40.81	51.44	No	**Yes**
St. Petersburg	FL	7,241	246,407	224.03	221.19	24.04	33.90	No	No
Seattle	WA	2,168	2,552,994	524.62	532.17	38.19	51.71	No	No
Norfolk	VA	1,573	1,569,541	982.44	867.42	52.96	74.57	No	No
Salt Lake City	UT	3,683	1,333,914	304.05	279.15	26.15	35.79	No	No

Table 3.1 continued									
Medium Markets (5,000-1,001 listings)									
City	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Nashville	TN	4,159	1,231,311	347.66	322.90	28.78	43.59	No	No
Providence	RI	1,685	1,188,613	417.80	398.00	33.65	46.29	No	No
Hartford	CT	1,178	1,183,110	617.01	528.82	38.62	50.08	No	No
Buffalo	NY	1,923	1,170,111	2,337.93	1,743.98	64.64	71.09	**Yes**	**Yes**
Oklahoma City	OK	4,296	1,083,346	191.85	172.64	18.18	29.03	No	No
Dayton	OH	4,941	950,558	761.57	619.36	42.30	59.18	No	No
Fresno	CA	3,166	922,516	661.40	620.32	42.92	53.41	No	No
Albuquerque	NM	4,536	712,738	872.11	720.40	40.78	52.12	No	No
Bakersfield	CA	4,489	661,645	431.43	414.48	34.19	45.47	No	No
Baton Rouge	LA	2,610	602,894	685.33	696.81	44.98	59.46	No	No
Little Rock	AK	1,710	583,845	675.95	507.39	36.14	56.32	No	No
Charleston	SC	4,360	549,033	865.52	822.68	37.55	46.31	No	No
Wichita	KS	2,639	545,220	660.12	554.79	38.84	57.79	No	No
New Haven	CT	1,261	542,149	506.70	418.88	32.28	48.22	No	No
Lexington	KY	2,593	479,198	660.53	671.74	39.38	56.81	No	No
Augusta	GA	1,300	477,441	2,092.27	1,652.01	69.54	87.00	**Yes**	**Yes**
Des Moines	IA	2,967	456,022	3,015.23	3,320.47	72.63	78.63	**Yes**	**Yes**
Boise	ID	2,900	432,345	459.13	403.21	34.17	48.03	No	No
Spokane	WA	2,373	417,939	871.68	766.30	42.82	58.62	No	No
Arlington	TX	2,258	371,038	439.53	408.48	32.82	54.30	No	No
Salem	OR	2,170	347,214	1,294.98	1,156.14	59.12	72.12	No	**Yes**
Huntsville	AL	1,302	342,376	584.08	539.95	40.71	53.15	No	No

Table 3.1 continued									
City (Medium Markets)	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Ocala	FL	4,020	258,916	575.04	578.26	44.65	55.90	No	No
Glendale	AZ	2,505	253,152	298.08	293.78	25.99	37.41	No	No
Lubbock	TX	1,380	242,628	756.00	807.54	48.62	70.22	No	No
Springfield	MO	1,868	201,437	1,796.06	1,559.82	66.01	75.21	No	**Yes**
Grand Rapids	MI	4,529	193,671	577.55	532.38	37.62	55.27	No	No
Sioux Falls	SD	1,289	172,412	819.65	763.08	48.18	70.21	No	No
Santa Fe	NM	2,078	147,635	751.82	734.48	44.85	67.28	No	No
Pueblo	CO	1,517	141,472	1,078.67	953.31	54.45	65.92	No	**Yes**
Lansing	MI	2,048	115,366	1,359.58	1,156.56	60.40	74.95	No	**Yes**
Peoria	IL	1,098	111,351	1,498.26	1,168.04	61.38	82.79	No	**Yes**
Small Markets(1,000-0 listings)									
City	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Albany	GA	656	120,822	1,262.05	1,272.70	61.59	78.96	No	**Yes**
Scranton	PA	468	624,776	1,286.99	1,129.39	58.76	78.42	No	**Yes**
McAllen	TX	760	569,463	517.15	485.50	35.79	50.53	No	No
LaPine	OR	222	447,728	509.20	558.27	36.94	57.66	No	No
Springfield	IL	942	325,721	1,842.67	1,438.66	64.65	77.28	**Yes**	**Yes**
Lincoln	NE	422	250,291	1,192.95	1,156.12	55.21	73.46	No	**Yes**
Yakima	WA	669	222,581	903.24	801.26	49.18	69.36	No	No

Table 3.1 continued									
City (Small Markets)	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Mansfield	OH	761	175,818	1,645.88	1,437.07	70.83	83.18	No	**Yes**
Joplin	MO	635	157,322	1,619.25	1,450.05	66.61	82.20	No	**Yes**
Eau Claire	WI	664	148,337	754.92	716.99	41.27	64.16	No	No
Hampton	VA	933	146,439	676.89	661.76	42.66	65.49	No	No
Yuba City	CA	551	139,149	880.02	997.41	53.18	65.15	No	No
Goldsboro	NC	412	113,329	948.13	779.65	45.87	69.90	No	No
Manchester	NH	686	108,874	384.15	359.45	30.47	45.63	No	No
Sumter	SC	684	104,646	877.69	782.46	45.47	71.93	No	No
San Angelo	TX	400	104,010	1,378.62	1,028.13	55.00	74.50	No	**Yes**
New Bedford	MA	530	91,849	282.22	274.75	23.21	38.68	No	No
Owensboro	KY	489	91,545	1,283.84	1,161.40	60.12	87.12	No	**Yes**
Pine Bluff	AR	248	84,278	1,869.67	1,281.63	65.73	84.68	**Yes**	**Yes**
Avondale	AZ	973	79,798	286.53	255.85	23.84	39.57	No	No
Corvallis	OR	289	78,153	1,011.60	920.20	52.25	76.82	No	**Yes**
St. Joseph	MO	784	73,912	2,230.90	1,800.18	75.51	91.96	**Yes**	**Yes**
Blue Springs	MO	843	55,031	940.23	807.99	51.13	64.53	No	No
Auburn	AL	730	54,348	819.40	724.93	42.88	65.34	No	No
Delano	CA	149	52,409	501.00	474.26	31.54	53.02	No	No
Bellevue	NE	539	48,391	1,405.60	1,195.36	57.88	79.22	No	**Yes**
Salina	KS	330	46,458	2,212.29	2,106.04	88.79	96.97	**Yes**	**Yes**
Roswell	NM	279	45,569	2,571.71	2,029.87	74.91	86.02	**Yes**	**Yes**
Hutchinson	KS	425	40,668	2,717.49	2,005.14	46.35	53.41	**Yes**	**Yes**

Table 3.1 continued									
City (Small Markets)	**State**	**#Listings**	**Metro Pop**	**HHI(Dollar)**	**HHI(Listings)**	**CR4(Listings)**	**CR8(Listings)**	**HHI Over 1,800?**	**HHI Over 1,000?**
Brookfield	WI	318	39,209	1,123.00	1,066.74	55.03	72.64	No	**Yes**
Findlay	OH	402	37,492	1,913.80	1,723.95	69.90	87.06	**Yes**	**Yes**
Minot	ND	177	36,682	1,679.30	1,604.71	71.19	97.74	No	**Yes**
Longview	WA	313	36,638	2,121.24	2,091.08	76.68	88.50	**Yes**	**Yes**
Del Rio	TX	211	36,582	1,022.20	1,049.25	53.55	83.89	No	**Yes**
Mankato	MN	594	35,881	1,083.76	1,026.20	58.25	78.79	No	**Yes**
Clovis	NM	318	33,182	2,505.30	2,250.23	81.45	97.48	**Yes**	**Yes**
Butte	MT	165	31,967	1,347.70	1,119.48	60.61	82.42	No	**Yes**
Lewiston	ID	209	31,794	1,446.48	1,313.63	62.68	86.12	No	**Yes**
Marion	IN	383	30,363	1,300.10	1,204.01	61.10	87.47	No	**Yes**
Bangor	ME	378	30,165	1,719.90	1,600.10	68.52	83.33	No	**Yes**
Eureka	CA	193	25,396	910.23	854.10	50.26	70.47	No	No
Carlsbad	NM	125	25,033	2,443.30	2,244.72	90.40	98.40	**Yes**	**Yes**
Grandview	MO	307	24,116	1,801.31	1,297.87	46.25	57.00	**Yes**	**Yes**
Portsmouth	NH	186	20,495	625.60	607.21	40.32	58.06	No	No
Blytheville	AR	222	16,076	3,086.28	2,114.17	74.77	93.69	**Yes**	**Yes**
Montpelier	VT	103	7,806	1,409.20	1,285.90	62.14	79.61	No	**Yes**
Inverness	FL	608	7,248	850.85	857.19	52.80	68.75	No	No

Table 3.2: Firm Size Characteristics				
	All Firms **N= 100**	**Firms in Large Markets (27,732-5,000 listings)** **N= 18**	**Firms in Medium Markets (5,000-1,001 listings)** **N= 35**	**Firms in Small Markets (1,000-0 listings)** **N=47**
Mean number of listings per firm:	12.76	12.89	13.32	10.16
Median number of listings per firm:	2	2	3	2
Range of number of listings:	1-2,485	1-2,485	1-1,240	1-291
Firms with 1 listing:	34.19%	33.89%	33.64%	37.74%
Firms with 2 listings or less:	51.03%	51.60%	49.78%	51.47%
Firms with more than 100 listings:	2.13%	1.95%	2.68%	1.52%
Firms with more than 200 listings:	0.94%	0.96%	1.17%	0.09%
Firms with more than 500 listings:	0.26%	0.31%	0.20%	0%
Firms with more than 1,000 listings:	0.09%	0.12%	0.04%	0%

Table 3.3: Summary Statistics						
Variable	**Definition**	**n=**	**Mean**	**Median**	**Min**	**Max**
HHIListings	HHI measured in listings	100	899.33	763.08	165.62	3320.47
HHIDollar	HHI measured in dollar volume	100	1020.94	850.85	176.54	3086.28
Listings	number of listings in the market	100	2899.70	1261.00	103.00	27732.00
MSAPop	pop of market, in thousands of people	99	782.35	250.29	0.91	9519.34
Growthrate	growthrate of pop	99	12.02	8.31	-12.02	122.38
AvgHHSize	avg household size	96	2.46	2.40	2.08	3.80
MedianRooms	median number of rooms	96	5.16	5.15	4.10	6.70
SameHouse	perc living in same house as 1 year ago	96	79.99	79.30	66.74	92.00
Unemp	unemp rate	96	4.97	4.80	1.60	10.50
MedianHHInc	median household income	96	41.01	39.90	28.38	82.09
OccRate	occupancy rate	96	89.01	88.89	78.51	96.40
OwnerOccRate	owner occupancy rate	96	51.27	52.64	21.28	95.28
MedianHomeVal	median home value, in thousands of dollars	96	161.44	130.90	58.30	594.90
MedianRentVal	median rental value	96	686.65	656.00	492.00	1203.00
Over65	percentage of residents over 65 years	96	12.14	11.77	4.55	19.01
Homogindex	homogeniety index	94	5842.23	5429.77	3063.91	9051.44
Hispanic	percentage Hispanic	94	15.69	6.72	1.25	81.45
fsbos	number of FSBO listings	100	50.72	31.00	0.00	262.00

Table 3.4: OLS and IV Results with White Standard Errors								
Dependent Var: HHI (by dollar volume)								
	OLS		n= 94 Prob>F= 0.00 R Sqd= 0.501		IV		n= 94 Prob>F= 0.00 R Sqd= 0.491	
Variable	**Coef**	**Std Err**	**t- val**	**p- val**	**Coef**	**Std Err**	**t- val**	**p- val**
listings	-0.043	0.021	-2.080	**0.041**	-0.025	0.026	-0.970	0.338
growthrate	-4.280	4.983	-0.860	0.393	-5.126	5.663	-0.910	0.368
avghhsize	-511.936	350.251	-1.460	0.148	-480.654	360.315	-1.330	0.186
medianrooms	-93.744	429.628	-0.220	0.828	-53.334	452.812	-0.120	0.907
percsamehouse	9.735	19.718	0.490	0.623	9.127	19.970	0.460	0.649
unemp	30.565	42.994	0.710	0.479	29.367	44.028	0.670	0.507
medianhhinc	-13.947	14.523	-0.960	0.340	-14.675	14.809	-0.990	0.325
occrate	-12.496	21.081	-0.590	0.555	-3.791	21.564	-0.180	0.861
owneroccrate	27.886	16.948	1.650	0.104	25.960	17.347	1.500	0.139
medianhomeval	-0.659	1.153	-0.570	0.569	-0.946	1.201	-0.790	0.433
medianrentval	-0.454	0.871	-0.520	0.604	-0.373	0.887	-0.420	0.675
percover65	15.581	28.811	0.540	0.590	19.894	27.961	0.710	0.479
homogindex	0.005	0.061	0.080	0.937	0.005	0.060	0.080	0.938
perchisp	2.796	5.481	0.510	0.611	2.939	5.581	0.530	0.600
fsbos	-0.426	1.312	-0.320	0.746	-0.844	1.568	-0.540	0.592
constant	2427.968	2093.145	1.160	0.250	1465.254	2260.566	0.650	0.519

Table 3.5: OLS and IV Results by Subsample

Dependent Var: HHI (by dollar volume)

	Results for Small Markets (1,000 listings or less)						Results for Medium and Large market (>1,000 listings)					
	OLS			IV			OLS			IV		
	n=	40		n=	40		n=	54		n=	54	
	Prob>F=	0.00		Prob>F=	0.00		Prob>F=	0.00		Prob>F=	0.00	
	R Sqd=	0.667		R Sqd=	0.636		R Sqd=	0.398		R Sqd=	0.393	
Variable	**Coef**	**Std Err**	**p- val**	**Coef**	**Std Err**	**p- val**	**Coef**	**Std Err**	**p- val**	**Coef**	**Std Err**	**p- val**
listings	-0.720	0.484	0.150	-1.301	0.739	**0.091**	-0.050	0.033	0.139	-0.065	0.052	0.225
growthrate	1.370	9.053	0.881	4.743	8.710	0.591	6.656	12.621	0.601	10.010	16.262	0.542
avghhsize	-409.752	839.900	0.630	-598.77	836.991	0.482	-691.78	463.884	0.144	-756.21	485.922	0.128
medianrooms	53.432	437.753	0.904	91.887	493.345	0.854	-68.555	861.650	0.937	-87.866	877.260	0.921
percsamehouse	-28.773	29.410	0.338	-24.897	31.003	0.430	59.720	54.355	0.279	65.257	59.378	0.279
unemp	-4.063	79.717	0.960	10.386	78.533	0.896	40.964	65.910	0.538	42.472	67.400	0.532
medianhhinc	0.265	31.054	0.993	-0.575	33.460	0.986	-29.309	28.113	0.304	-33.089	31.042	0.293
occrate	16.783	52.614	0.753	17.946	55.780	0.751	-20.493	32.977	0.538	-32.578	46.231	0.485
owneroccrate	28.064	16.143	**0.096**	27.569	15.648	**0.091**	21.811	45.544	0.635	27.472	52.863	0.606
medianhomeval	-5.089	2.980	0.101	-5.577	2.935	0.070	-0.030	1.624	0.985	0.291	1.509	0.848
medianrentval	-0.140	2.297	0.952	0.121	2.421	0.960	0.181	1.407	0.898	0.234	1.458	0.873
percover65	58.686	51.894	0.270	41.863	54.302	0.449	-57.556	64.670	0.379	-72.641	81.186	0.377
homogindex	-0.173	0.115	0.147	-0.170	0.121	0.172	0.077	0.093	0.413	0.075	0.096	0.439
perchisp	-3.856	11.206	0.734	-4.640	10.200	0.653	-2.479	7.282	0.735	-2.608	7.424	0.727
fsbos	-1.789	2.919	0.546	-1.514	2.707	0.581	-0.960	1.623	0.558	-0.747	1.773	0.676
constant	2962.97	4312.16	0.50	3161.78	4694.61	0.51	165.35	3272.55	0.96	1011.79	4250.95	0.81

Figure 3.1: Long Run Average Cost with a Unique Minimum

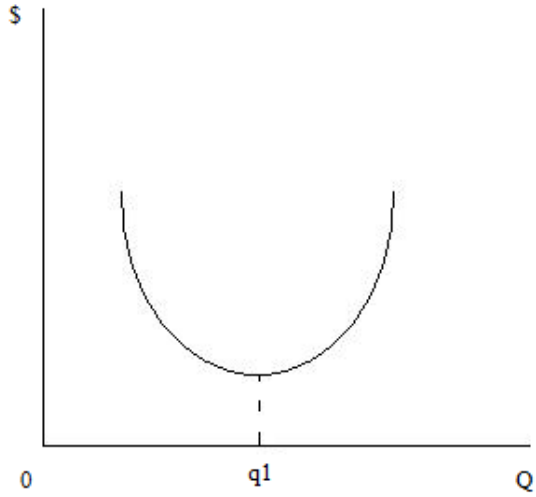


Figure 3.2: Long Run Average Cost with a Range of Constant Average Costs

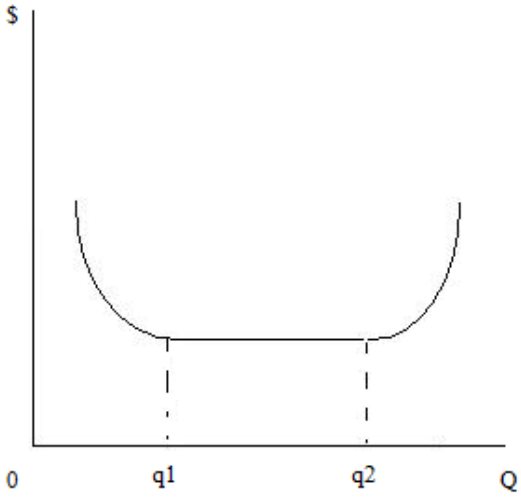


Figure 3.3: Histogram of Firm Size

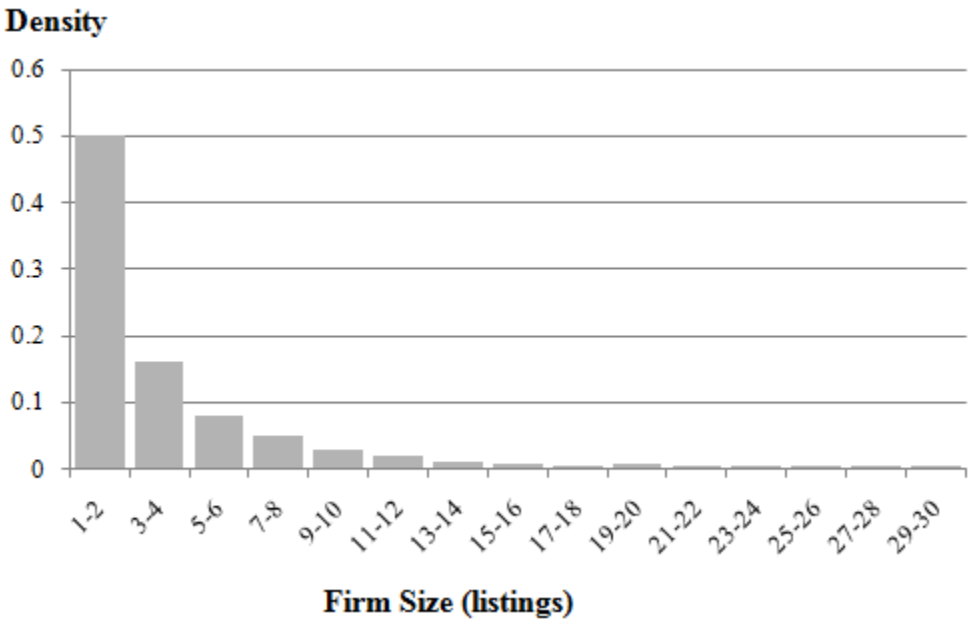


Figure 3.4: Histogram of Firm Size (Large Markets Only)

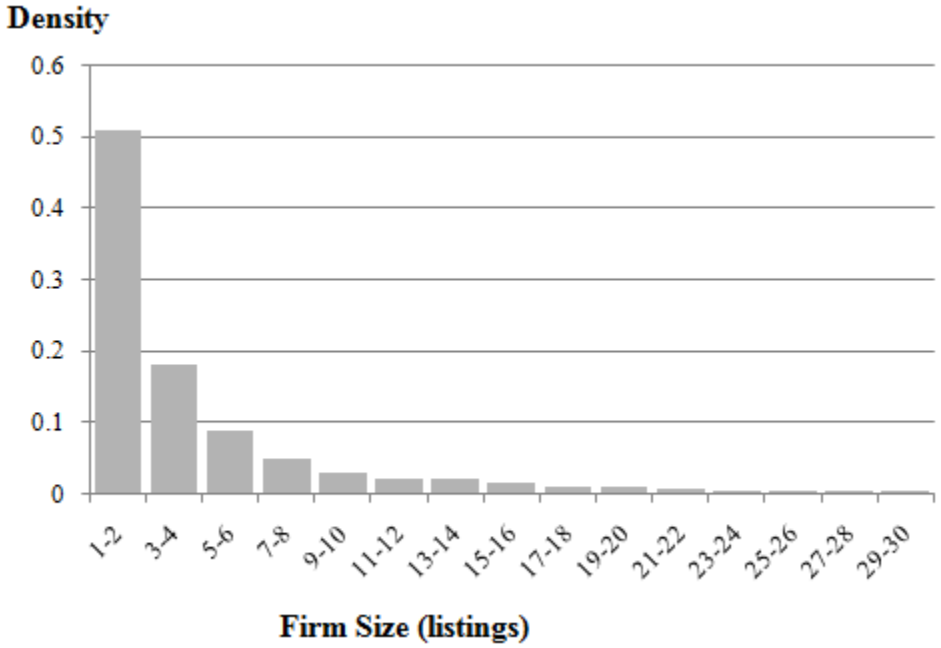


Figure 3.5: Histogram of Firm Size (Medium Markets Only)

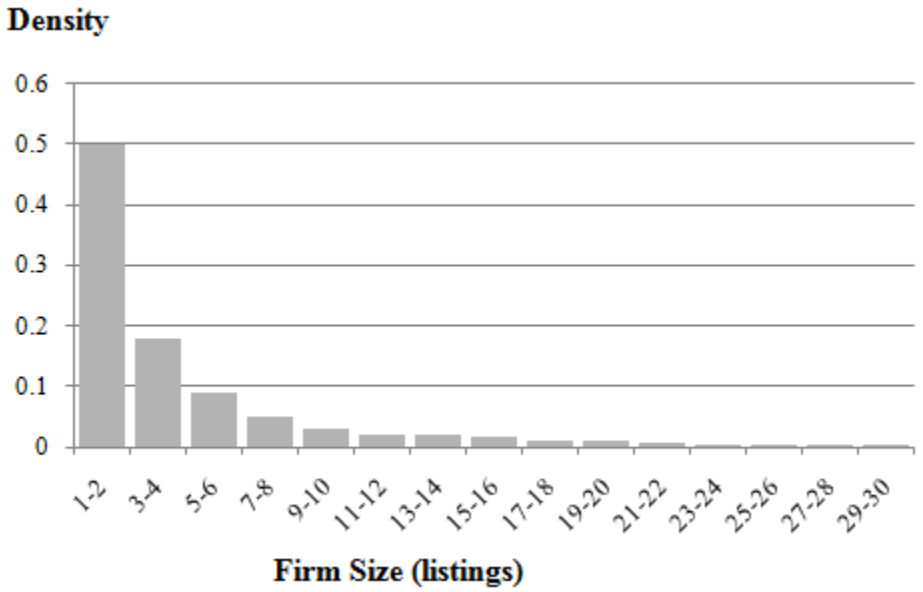
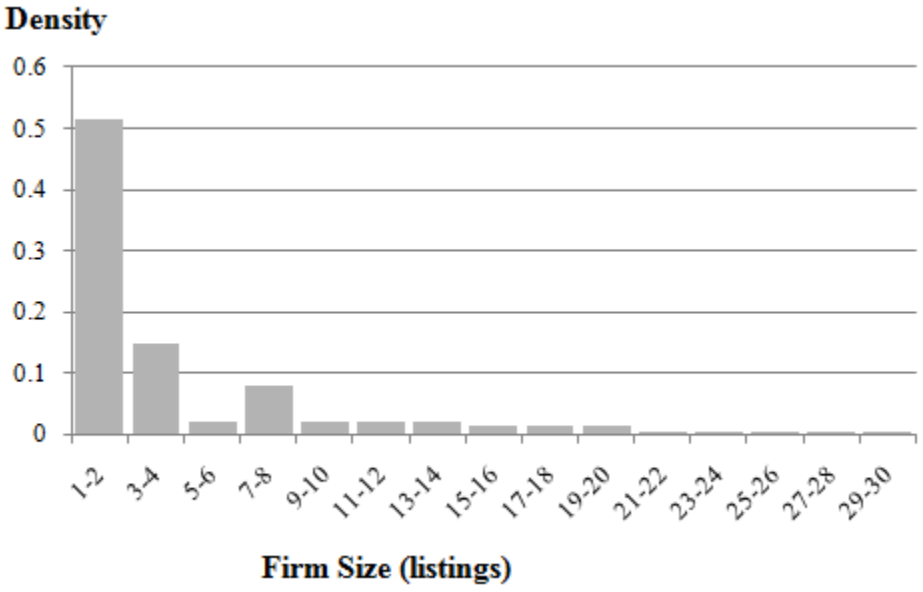


Figure 3.6: Histogram of Firm Size (Small Markets Only)



CHAPTER 4. JUST-BELOW PRICING IN THE CONTEXT OF RESIDENTIAL REAL ESTATE BROKERAGE

4.1 Introduction

The prevalence of "just-below" pricing (prices that are set below some even amount, such as $9.99, $499, etc) is well documented across a wide range products and does not happen by chance. This essay explores the pervasiveness and the effectiveness of just-below pricing in the context of residential real estate transactions.

The marketing literature has long since recognized the use of just-below pricing and several studies show it can increase demand. These studies generally deal with fairly inexpensive consumer goods (cans of tuna, hairdryers, etc) that are unlikely to represent a large share of an individual's budget. The effectiveness of just-below pricing in these settings is perhaps not totally unexpected given that many of the proposed explanations of the phenomenon generally rely on consumers imprecisely processing or remembering the price; something more likely to happen with relatively small transactions where the marginal cost of less scrutiny is relatively low. Very few papers have looked into the effectiveness of just-below pricing in the context of larger purchases to see if the effects are similar. Two that examine just-below pricing in the housing market reach opposing conclusions as to the effect of such strategic pricing, suggesting that more work in this area may be called for. This paper weighs in on the issue and finds evidence that just-below prices do have a beneficial impact on final selling price and little consistent effect on time on market.

4.2 Background and Literature Review

4.2.1 Do Home Sellers Use Just-Below Pricing Gimmicks?

Sellers try to maximize final sales price and minimize time on the market. It might be assumed that any strategic pricing strategy is an effort to influence one or both of those outcomes. The frequency with which just-below pricing is used implies that it is an intentional pricing strategy to improve sales outcomes.

Figure 4.1 illustrates the most common four-digit endings of initial asking price in the sample of homes transacted through the MLS of a large Midwestern city from 2001 to

2007 (see Section 4.3 for a detailed description of the data). If all integer prices were equally likely, the probability of observing any particular four digit ending would be 1/1000. In the sample, the most common four digit ending for an asking price was 9,900 (i.e. $89,900, $149,900, etc). Twenty-three percent of all homes listed in the MLS had prices ending in those particular four digits with slightly over thirty percent of listings ending in some price within $100 below a $10,000 increment (i.e. priced at $89,950, $89,999, etc.). The second most common ending, comprising roughly eleven percent of the sample, was also a just-below price (4,900) coming in right under $5,000 incremental focal points. The 9,000 ending also came in as a frequently observed price ending (nearly six percent of listings) and might also be considered a just-below price. Figures 4.3 through 4.6 are histograms around focal points. They illustrate the clear tendency to price just below a $10,000, and to a lesser extent $5,000, increment.

While many homes were priced within $100 directly below a $10,000 increment, pricing right on the increment did occur, happening a little more than four percent of the time (refer to Figure 4.1). Pricing directly above the $10,000 increment (within $100) was, however, very rare, occurring in only 0.7% of listings. Thus home sellers (and realtors) are generally eager to price directly below a $10,000 or $5,000 focal point, sometimes price on it, but are reluctant to price directly above it.

4.2.2 Why Might Just-Below Prices Be Effective?

The marketing literature has clearly recognized the existence of just-below pricing. Studies by Anderson and Simester (2003), Schindler and Kirby (1997), Stivings and Winer (1997), Kruel (1982),Twedt (1965), and others, show that the number nine is overrepresented as a rightmost digit in a wide range of retail contexts. The origins of this practice are not entirely clear, but one frequent explanation is that it was first created to reduce employee theft by forcing the clerk to issue change and engage the cash register thereby making it more difficult to simply pocket the payment from the customer[30]. According to this story, an unexpected increase in demand was recognized and just-below pricing was adopted by other retailers.

[30] This notion is discussed in Sturdivant (1970), Twedt (1965), and elsewhere.

Many current researchers believe that there is a psychological element to just-below pricing, though there are several different hypotheses as to how exactly it affects a consumer's perception of the transaction. Following Anderson and Simester (2003), most of these arguments can be generalized into two categories[31].

The first type involves the just-below price signaling a discount or bargain price. This is sometimes referred to as "image effects" (Stivings and Winer, 1997 and others). Stiving (2000), Quigly and Notarantonio (1992), Schindler and Kibarian (2001), and Gendenk and Sattler (1999) all find evidence that consumers perceive an association between a price ending in "99" and the good either being on sale or a retailer actively trying to compete on price. Along similar lines, Schindler (1984) finds evidence that consumers are more likely to view a price ending in 99 as one that has not been recently increased. Schindler (2005) finds justification for the perception of an association between just-below prices and discounts as he notes a statistically significant positive correlation between just-below prices and discount cues (i.e. "year end sale", "20% off", etc.) in newspaper advertisements.

The other general view researchers take on just-below pricing, which is sometimes referred to as "level effects", asserts that consumers imperfectly process prices and a just-below price capitalizes on this by making small deviations from a round price seem larger (i.e. the difference between $9.99 and $10.00 seems larger than $0.01). The story here alleges that individuals are constantly bombarded with information but since memory and mental processing capacity are finite, consumers attempt to use mental shorthand when assessing price information and just-below prices cause buyers to underestimate the price. Two such methods of mental shorthand are rounding and truncating, and both result in round (or closer to round) numbers which are easier to remember[32]. Interestingly,

[31] Beyond the two general categories outlined here, Thaler and Sunstein discuss the possibility that individuals use broad strokes to whittle down an overwhelming numbers of options (2008). For example, in a large city there may be thousands of homes listed for sale. For better or worse, one might choose to eliminate large groups that are outside some range. Such rules have the potential to be somewhat arbitrary, such as a person only looking at houses under $200,000. While it may be argued that houses priced at $199,900 versus $200,000 differ in price in no appreciable way, it is possible that a person operating under an "under $200,000" rule would choose the $199,900 house over the $200,000 house despite the negligible price difference.

[32] Schindler (1984) finds in a laboratory setting that consumers have a poorer memory for non-even prices compared to even ones. Furthermore, the recall error associated with non-even prices was more likely to be downward thereby resulting in more underestimation of the price compared to even-priced items.

if consumers use only the rounding technique, the perceived price is actually higher than the just-below price (i.e. $499 gets rounded to $500). Some researchers have suggested that truncation is less costly in terms of mental effort since there is no rounding rule to recall and implement (i.e. round down if the last digit is 0 to 4 and round up if the last digit is 5 to 9). Brenner and Brenner (1982) provide evidence that individuals process information left to right with decreasing emphasis on digits as one moves to the right. If people truncate, the perceived price will most often be lower than the actual price.[33] For instance, $499 will be perceived as $490 or, in extreme cases, $400. Work by Gabor and Grangers (1964), Lamber (1975), Schindler and Kibarian (1993) provide support for the assertion that the right-most digit in a price is either ignored or at least less carefully processed. This could have a particularly pronounced effect on consumers comparing products side by side. For instance, two competing products priced at $999 vs. $1,000 are only a tenth of a percent apart in price, but could be perceived as $10 or even $100 apart depending on how many digits are truncated.[34]

4.2.3 How Effective is Just-Below Pricing in a Retail Context?

A number of studies suggest just-below pricing can have a positive impact on demand. Schindler and Kibarian (1996) and Anderson and Simester (2003) are able to conduct similar controlled experiments with women's clothing catalogs. In both studies, cooperation with the clothing companies allowed them to issue different versions of the catalog randomly. One version of the catalog had just-below prices on a number of items (i.e. $59.99) while another version had whole prices (i.e. $60.00). The catalogs were otherwise identical and received orders could be matched with the type of catalog the customer had received (experiment vs. control). In all cases, the just-below priced items outsold their control counterparts, sometimes by as much as fifteen percent.

Stiving and Winer (1997) and Kaylanam and Shively (1998) find just-below pricing to have a positive effect on demand for inexpensive grocery items (coffee, bathroom tissue, tuna, etc). Gendall, Holdershaw, and Garland (1997) likewise find 9-ending prices

[33] The exception being when a truncated digit is a zero.

[34] Stiving and Winer (1997) illustrate another interesting consequence of truncation by comparing the following two pairs of prices; $0.93 vs. $0.79 and $0.89 vs. $0.75. Even though the difference is fourteen cents in both cases, the low price in the first pair may seem like a relatively better bargain compared to the second pair if all last digits are truncated.

to be associated with higher demand over a range of retail products (frozen chicken, cheese, hairdryers, etc). The effect tended to be stronger for the lower-priced items. Since most explanations of a just-below effect hinge on incomplete mental processing of the price, it is perhaps unsurprising that sales of inexpensive items appear to be more affected since they represent a relatively small share of one's total budget.

4.2.4 How Effective is Just-Below Pricing in a Real Estate Context?

Two studies specifically attempt to determine the effect of just-below pricing on the sales outcomes of sold homes, and they reach opposite conclusions.

The first, by Allen and Dare (2004), uses MLS data from 2000 and 2001 in Broward County, Florida. They construct a housing hedonic with logged final transaction price as the dependent variable. The independent variables of interest were a series of dummy variables capturing homes that were initially priced at specific just-below focal points (i.e. prices ending in 9,900, 9,000, 4,900, or some other just-below price). They find fairly consistent evidence that the use of just-below pricing is associated with a higher final transaction price. Recognizing the possibility that transactions in different parts of the price distribution might behave differently, they divide the sample into four separate subjectively determined groups. For the bottom three ($0-$300,000 initial listing price) the coefficients on the just-below dummy variables were exclusively positive and nearly always statistically significant at the five percent level. Coefficient estimates ranged from 0.0262 to 0.0807 and averaged 0.0427. The largest coefficients across the three groups were the ones indicating a price ending in 9,000. While transactions of houses in the first three groups all behaved similarly, the results for the top group, homes listed for $300,001 and above (truncated at $1,000,000) appeared to receive no beneficial effect from a just-below price. In fact, the coefficients on the dummy variables indicating a price ending in 4,900 and 900 (excluding 9,900 and 4,900) were statistically significant and negative suggesting a just-below price may in some cases reduce final sales price.

As a robustness check, the authors respecify the model to include dummy variables that indicate even pricing (i.e. "D0000"=1 if the price ends in 0,000) in place of the variables indicating just-below pricing. They find explicitly that homes with even prices sell for less in the $0-$300,000 range). One weakness of the paper is that only the

sales price outcome is considered. Presumably sellers care not only about the price but also about time on market and an examination of how the just-below pricing affected time on market would have been interesting.

The second paper to examine real estate just-below pricing by Palmon, Smith, and Sopranzetti (2004) uses MLS data from a particular school district in a Houston, TX suburb from 1992 to 1995. The authors note that 51.86% of the listings are priced just below an even price ending.[35] A housing hedonic was created, with logged transaction price as the dependent variable, including a dummy variable for a just-below price (defined as a price within $100 below a $1,000 increment) and another one for an even ending price (defined as a price ending in 000). They find that while the just-below price is associated with a higher final transaction price, the coefficient is small (0.007) and statistically insignificant. The coefficient on the dummy variable associated with an even ending price, however, was 0.018 and statistically significant (five percent level). The authors comment that while listings prices are heavily clustered around a just-below price, those that are priced on an even point (000 ending) sell for 1.8% more. This is inconsistent with the results of Dare and Allen (2004).

Palmon et al. then turn to marketing time and use the same hedonic but with days on market as the dependent variable. They find that houses with a just-below price take, on average, 7.865 days longer to sell. This result was statistically significant. Houses with an even ending, however, sold faster (1.2 days) on average, though this result was not statistically significant. The above results suggest sellers should stay away from just-belows and price on even points.

One factor to consider with this study is that the sample may not be particularly representative. Data were drawn from a fairly narrow group of houses (a single school district) which undoubtedly limited the heterogeneity of observations. Furthermore, Allen and Dare show evidence that a strategic pricing effect can behave differently across price ranges, which is not addressed in the Palmon et al. study.

[35] They define a just-below price as one within $100 below a $1,000 increment. In other words, any price with a "9" in the third digit from the right is considered a just-below price.

4.3 Data

The data used in this essay are the same as that used in Essay I. They were obtained from the MLS of a Midwestern city with a population of roughly 500,000 residents. Information was available for all homes listed through the MLS from January 1st, 2001 through December 31st, 2007. There were roughly 180,000 listings in these seven years with about half of them ending in a sale. Note that this discrepancy comes from homes that are listed but then withdrawn before sale. This can happen for a number of reasons. For instance, it is quite common for an agent to "refresh" a listing that has remained unsold for a period of time by withdrawing the listing and then re-listing the same property a short time later. It is hoped that the home might gain more exposure as a "new" listing. Difficult-to-sell houses might be refreshed several times before a sale is achieved. Furthermore, home sellers unsatisfied with their listing agent's performance can sever the relationship at the end of the contractual period and relist with another agent. Since many houses are listed more than once, it is expected that the total number of listings would exceed the number of sales. Of course there are also homes that simply never sell through the MLS in the time period.[36]

The hedonic controls are presented in Table 4.1. To allow for non-linear effects, all of the standard hedonic controls are binary indicator variables. *One bedroom, two bedrooms, three bedrooms, four bedrooms, five bedrooms,* and *six plus bedrooms* are dummy variables indicating the number of bedrooms associated with the house. The variables, *one fullbath, two fullbaths, three full baths, zero half baths, one half bath, two half baths, three half baths,* and *four plus half baths* indicate the number of full or half bathrooms a house has in a similar manner.

Two-five years, six-ten years, eleven-twentyfive years, twentysix-fifty years, fiftyone-hundred years, and *hundred plus years* are indicator variables equaling one if the house falls into that particular age category. House size is controlled for by the variables *Sqft1- Sqft5.* These are variables that divide the range of square footage in the data into quintiles (see Table 4.1 for the specific ranges). Acreage is controlled for by dividing the range into six categories plus one additional category for observations without a reported

[36] It is possible that some homes could have switched from the MLS to the FSBO platform. Hendel et al. (2007) however, found that this type of switching occurred in only 0.2% of MLS listed homes in their sample of houses sold in Madison, Wisconsin from 1998 to 2005.

acreage (see Table 4.1 for the specific ranges). C*entralair* equals one if the house has central air conditioning, and *pool* and *fireplace* indicate the presence of those characteristics. The variables *2001-2007* and *quarter1-quarter28* are time dummy variables equaling one if the observation comes from the associated time period.

This study focuses on existing homes. New homes are often marketed quite differently as developers tend to work with real estate brokers in a way that simply adding a dummy variable might not accurately capture. As such, they were removed from the sample. The sample was further restricted to homes selling for at least $50,000 but no more than $3,000,000. Observations with missing or obviously erroneous values were dropped. The primary data set used for analysis begins with 64,990 sold houses.[37] A particularly common and pertinent source of potential reporting error came in the form of large discrepancies between listing price and reported selling price. While one may fully expect list and sales price to differ, there were around 5,000 houses in which the reported list price deviated from the reported final sales price by more than thirty percent.[38] Since it was judged more likely that these cases represent reporting error than wildly mispriced houses, they were removed from the sample. Other observations had missing values for the initial listing price and were likewise removed, leaving 57,716 observations. Summary statistics can be found in Table 4.1.

The average house was between 1499 and 1900 square feet, had three bedrooms, two full baths, a basement, central air-conditioning, and was 26-50 years old. It sold for $170,522 and was on the market for 72 days.

4.4 Analysis

Table 4.2 presents unconditional means of sales outcomes evaluated at $5,000 intervals of list price from $80,000 to $300,000.[39] Column (2) illustrates the tendency for sellers to price directly below $10,000 increments. For example, there were 884 homes listed at an amount within $100 below $100,000, but only 90 listed right at $100,000.[40]

[37] Since some individual houses sold more than once in the seven year period, these 64,990 sold homes are not necessarily unique.
[38] For instance, one house was reported as having an original list price of $49,900 but allegedly sold for $235,000. Cases like this are almost certainly examples of recording error.
[39] This covers 80.53% of all observations.
[40] 720 of the 884 were priced specifically at $99,900.

On $10,000 increments, the average ratio of just-below prices to even prices was 8.63 to 1. For $5,000 increments (excluding those that are also $10,000 increments), the average ratio of just-below to even prices was 1.54 to 1.

Column (3) presents the average amount the sellers at and just below a certain price point came down from the initial asking price to complete the transaction. In other words, it is list price minus sales price. In most transactions, the list price appears to be a starting point for negotiation and 73.1% of homes in this sample sold for an amount below the initial asking price.[41] As such, one would fully expect values in this column to be positive. Larger values imply a larger reduction in price and thus a lower final transaction price.

If just-below prices have a beneficial impact on final sales price, one would expect the list price minus sold price value to be smaller for the just-below prices compared to their associated even price. Columns (3) and (6) show this is sometimes, but not always, the case. In thirty-one of the forty-five instances, the just-below price was associated with a smaller price reduction implying a higher sales price. Using ANOVA to test differences in means at each focal point, column (5) shows that the means were statistically different (at the ten percent level or better) in nine of the instances. In eight of those statistically significant cases the just-below price implied a higher sales price.

Based on the explanations suggested in the marketing literature concerning rounding and truncation, one might expect to see any just-below pricing effects to have a stronger effect at the $10,000 increments compared to the $5,000 ones. Limiting the analysis to only these twenty-three focal points, one finds the just-below price to be associated with a higher sales price fifteen times, with six of those differences being significantly different at the ten percent level (and one instance a significantly different mean with the even price being associated with a higher sales price).

By looking at the unconditional means, it appears that there may be modest evidence of a beneficial effect of just-below pricing on final transaction price, though this is only half of the story. Columns (7) through (10) illustrate a similar analysis focusing on the time on market. If the just-below price is to have a beneficial effect along this dimen-

[41] 12.7% of homes in the sample sold for exactly the asking price, and 14.2% sold for an amount greater than what was initially listed.

sion, one would expect shorter marketing durations associated with the just-below priced homes. Of the forty-five focal points, the just-below priced homes sold quicker, on average, twenty-six times, with seven of those instances representing statistically significant differences (ten percent level or better). Nineteen times the even priced houses sold faster with two of those instances representing a statistically significant difference (ten percent level or better). Looking at just the subsample of focal points on $10,000 increments, the just-below priced homes sold faster in ten of the twenty-three possibilities (only one of the ten represented a statistically significant difference at the five percent level). Of the thirteen times the even priced homes sold faster, this difference was significant at the ten percent level (or better) twice. It appears that the data do not suggest a clear just-below pricing effect on marketing time working in either direction.

Table 4.3 presents similar unconditional averages, but rather than group similar prices together (i.e. all prices in a $100 range directly below an even focal point), only specific pricing points are examined. The results here are qualitatively similar to those discussed above.

Allen and Dare conclude just-below pricing leads to higher sales prices. Palmon et al. conclude even pricing generates higher sales price and shorter time on market. Thus far, the analysis here has not strongly supported either side but perhaps is more in line with Allen and Dare. A fairly standard housing hedonic was constructed to more closely mirror the approach taken in these previous papers. Table 4.4 presents the pertinent results from these hedonic regressions including variables indicating particular price endings. *99xx* equals "1" if the price ends in a value between 9,900 and 9,999. *9000* equals "1" if the last four digits in the price were 9,000. *49xx* equals "1" if the price ends in a value between 4,900 and 4,999. *5000* equals "1" if the price ends in 5,000. *0000* equals "1" if the price ends in 0,000.[42] Following Allen and Dare, the sample has been broken up into subjectively determined price segments ($50,000-$100,000, $100,001-$200,000, $201,000-$300,000, $300,001-$400,000).

The use of a 9,9xx ending or a 9,000 ending is associated with a higher final sales price in all four pricing categories (up to $400,000). The estimates generally indicate a

[42] Complete regression results for the pricing around $100,001-$200,000 can be found in the appendix, Table A1. Results from the other pricing groups are available upon request.

one to two percent premium with either a 9,9xx or a 9,000 ending, the exception being the relatively large premium (7.8%) associated with the 9,9xx ending in houses listing under $100,000. Perhaps since the vast majority of homes in this pricing category have a five digit price, emphasis is placed on the third digit from the right. Beyond this pricing group, home prices are six digits which perhaps directs attention away from the third digit towards the fourth. This price premium does not always come without a cost however; statistically noticeable increases in time on market were often identified, particularly in homes under $200,000. This trade-off is probably a good one for most sellers; the average sales price for a home in the second price group was $140,649. The 1.6% premium associated the 9,9xx price implies an extra $2,250 in exchange for around two additional days on the market. Neither *99xx* nor *9000* had a statistically noticeable effect on marketing time for homes above $200,000.

Generally there was little noticeable effect associated with pricing one's home at a $5,000 increment or directly below it. In the homes listing between $201,000 and $300,000, 49xx was associated with a 1.3% price penalty, and in the $300,001 to $400,000 range, it was associated with a slightly shorter (3.7 days) time on market. These exceptions notwithstanding, it is difficult to argue using a 4,900 ending has a strong overall effect. Pricing directly on a $5,000 increment appears to have no noticeable effect in either direction on either sales outcome over any price range.

In contrast to Palmon et al.'s findings, the results here provide little incentive for a seller to price right on a $10,000 increment. Doing so is associated with a remarkably consistent 1.6-1.7% price penalty on homes under $300,000 with no effect on marketing time throughout the entire range.

4.5 Conclusion

Just-below pricing can be found over a very wide range of items for the routine (grocery and retail goods) to the infrequent (houses). Existing research on just-below pricing in real estate is conflicting and this study weighs in by examining the prevalence and effectiveness of just-below pricing in the residential real estate transactions of a large Midwestern city. It reinforces the assertion that home sellers (and their real estate agents) frequently use just-below pricing and can lead to higher final transaction price. In com-

paring unconditional means between homes priced right on and just below various focal points, it appears that those priced below the focal point obtained higher sales price.

Regression results support this and find homes priced directly below a $10,000 price point (i.e. priced at $89,900, $149,999, etc) receive a premium of between 1% and 7.8%. Some results, particularly those involving homes priced below $200,000, indicate a slightly longer time on market when using a just-below price, but this effect is somewhat sporadic and inconsistent.

Table 4.1: Summary Statistics

n=56,716

Variable	Description	Mean	Std. Dev.	Min	Max
price	**sales price ($)**	**170522.6**	**129881.2**	**50000**	**2880500**
lnprice	ln of sales price	11.8882	0.533121	10.819	14.873
dom	Days on market	71.8359	67.49014	0	1010
onebedroom	1 if house has 1 bedroom	0.003893	0.062272	0	1
twobedrooms	1 if house has 2 bedrooms	0.100369	0.300494	0	1
threebedrooms	1 if house has 3 bedrooms	0.57038	0.495026	0	1
fourbedrooms	1 if house has 4 bedrooms	0.261717	0.439573	0	1
fivebedrooms	1 if house has 5 bedrooms	0.05307	0.224174	0	1
sixplusbedrooms	1 if house has 6+bedrooms	0.009925	0.099128	0	1
onefullbath	1 if house has 1 full bath	0.378381	0.484987	0	1
twofullbath	1 if house has 2 full baths	0.479274	0.499574	0	1
threefullbath	1 if house has 3 full baths	0.114018	0.317835	0	1
fourplusfullbath	1 if house has 4+ full baths	0.027589	0.163793	0	1
zerohalfbath	1 if house has 0 half baths	0.643807	0.478877	0	1
onehalfbath	1 if house has 1 half bath	0.334605	0.471856	0	1
twohalfbath	1 if house has 2 half baths	0.020357	0.141219	0	1
threehalfbath	1 if house has 3 half baths	0.000939	0.030623	0	1
fourplushalfbath	1 if house has 4+ half baths	0.000292	0.017096	0	1
two_fiveyears	2-5 years old at initial listing	0.119357	0.32421	0	1
six_tenyears	6-10 years old at initial listing	0.118218	0.322869	0	1
eleven_twentyfiveyears	11-25 years old at initial listing	0.166672	0.372686	0	1
twentysix-fiftyyears	26-50 years old at initial listing	0.361563	0.480457	0	1
fiftyone_hundredyears	51-100 years old at initial listing	0.210525	0.407684	0	1
hundredplusyears	101+ years old at initial listing	0.023665	0.152005	0	1
centralair	1 if has central air conditioning	0.919403	0.273008	0	1
basement	1 if has basement	0.618018	0.485876	0	1
vacant	1 if revealed vacant	0.080274	0.271719	0	1
sqft1	1 if in 1st SQFT quintile(<=1149)	0.2	0.4	0	1
sqft2	1 if in 2nd SQFT quintile(>1150 & <=1500)	0.2	0.4	0	1

Table 4.1 continued					
price	**sales price ($)**	**170522.6**	**129881.2**	**50000**	**2880500**
sqft3	1 if in 3rd SQFT quintile(>1500 & <= 1900)	0.2	0.4	0	1
sqft4	1 if in 4th SQFT quintile(>1900 & <=2597)	0.2	0.4	0	1
sqft5	1 if in 5th SQFT quintile(>2597)	0.2	0.4	0	1
acreage1	1 if acreage <0.25 acres	0.134667	0.34137	0	1
acreage2	1 if acreage >=0.25, <0.5	0.143002	0.350078	0	1
acreage3	1 if acreage >=0.5, <1	0.05191	0.221847	0	1
acreage4	1 if acreage >=1, <5	0.076035	0.265056	0	1
acreage5	1 if acreage >=5, <20	0.027952	0.164835	0	1
acreage6	1 if acreage >20	0.00366	0.06039	0	1
acreage_unknown	1 if no acreage was reported	0.562775	0.496048	0	1
relist	1 if listing was "refreshed"	0.09226	0.289395	0	1
dual	1 if listing agent=selling agent	0.233498	0.423059	0	1
pool	1 if house has pool	0.045531	0.208467	0	1
fireplace	1 if house has fireplace	0.300989	0.458692	0	1
agentowned	1 if revealed to be owned by list agent	0.009956	0.09928	0	1
2001	sold in 2001	0.123311	0.328797	0	1
2002	sold in 2002	0.122604	0.327984	0	1
2003	sold in 2003	0.142745	0.349815	0	1
2004	sold in 2004	0.152716	0.359716	0	1
2005	sold in 2005	0.141037	0.348063	0	1
2006	sold in 2006	0.162133	0.368575	0	1
2007	sold in 2007	0.155455	0.36234	0	1
99xx	list price ending in 9,900 through 9,999	0.304	0.46	0	1
9000	list price ending in 9,000	0.058	0.234	0	1
49xx	list price ending in 4,900 through 4,999	0.728	0.26	0	1
5000	list price ending in 5,000	0.089	0.285	0	1
0000	list price ending in 0,000	0.042	0.202	0	1

Table 4.2: Unconditional Means									
1	2	3	4	5	6	7	8	9	10
List Price	**n=**	**List price-sold price**	**Std Dev**	**ANOVA P-Value**	**Smaller Reduction with Just-Below?**	**DOM**	**Std Dev**	**ANOVA P-Value**	**JustBelowPrice Sells Quicker?**
79,900-79,999	689	2097.08	4703.163	0.63	No	74.26	62.58	0.77	Yes
80,000	99	1853.4	4980.06			76.25	75.51		
84,900-84,999	426	1536.97	4498.46	0.3	Yes	66.81	58.72	0.029	Yes**
85,000	249	1924.32	5063.42			78.34	77.63		
89,900-89,999	944	1728.52	4722.84	0.221	Yes	75.45	60.8	0.42	No
90,000	111	2338.74	6855.87			70.48	67.4		
94,900-94,999	383	1246.76	5177.49	0.008	Yes***	69.08	57.79	0.242	No
95,000	242	2372.03	5120.64			63.64	54.7		
99,900-99,999	884	2293.93	5340.42	0.448	No	69.5	60.26	0.889	No
100,000	90	1847.12	5999.12			68.57	59.83		
104,900-104,999	453	2536.12	5432.24	0.168	Yes	68.89	60.96	0.278	Yes
105,000	272	3143.82	6378.65			74.14	66.5		
109,900-109,999	735	2259.39	5038.98	0.025	Yes**	69.61	59.82	0.658	No
110,000	303	3144.06	7307.51			67.81	59.26		
114,900-114,999	592	2281.83	5749.19	0.295	Yes	67.71	53.75	0.509	Yes
115,000	324	2707.04	6145.83			69.71	64.32		
119,900-119,999	895	2501.76	5667.57	0.773	No	68.99	61.89	0.814	Yes
120,000	153	2354.64	6945.68			70.27	64.91		

Table 4.2 continued

List Price	n=	List price-sold price	Std Dev	ANOVA P-Value	Smaller Reduction with Just-Below?	DOM	Std Dev	ANOVA P-Value	JustBelowPrice Sells Quicker?
125,000	348	3154.55	6409.23			67.94	63.3		
129,900-129,999	1046	3191.91	6163.58	0.395	No	71.1	63.45	0.016	No**
130,000	148	2720.64	7308.35			57.86	56.74		
134,900-134,999	569	3650.94	6353.63	0.836	No	64.37	58.456	0.047	Yes**
135,000	262	3552.91	6367.41			73.79	73.17		
139,900-139,999	953	3278.01	5890.69	0.034	Yes**	66.97	56.44	0.036	Yes**
140,000	100	4702.01	10369.48			79.89	82.23		
144,900-144,999	401	3615.1	5936.73	0.988	Yes	65.89	53.06	0.23	No
145,000	202	3625.86	6128.03			60.18	58.55		
149,900-149,999	811	3479.25	3479.12	0.028	Yes**	69.39	61.62	0.063	Yes*
150,000	117	4986.74	8048.67			70.92	59.19		
154,900-154,999	374	3516.37	5738.86	0.779	Yes	67.86	59.31	0.547	No
155,000	189	3680.05	7640.5			64.69	58.52		
159,900-159,999	801	4453.73	6832.44	0.44	No	71.76	61.47	0.87	No
160,000	64	3762.22	7732.24			70.48	67.25		
164,900-164,999	375	3998.4	6739.08	0.283	Yes	69.69	54.8	0.834	Yes
165,000	175	4637.16	59.25			70.88	75.88		
169,900-169,999	690	4669.02	8154.99	0.164	Yes	70.57	64.35	0.93	Yes
170,000	45	6389.02	7849.54			71.4	81.59		

Table 4.2 continued									
List Price	**n=**	**List price-sold price**	**Std Dev**	**ANOVA P-Value**	**Smaller Reduction with Just-Below?**	**DOM**	**Std Dev**	**ANOVA P-Value**	**JustBelowPrice Sells Quicker?**
174,900-174,999	371	3508.32	5729.43	0.68	Yes	66.32	60.32	0.572	No
175,000	188	3782.48	7493.33			62.43	59.91		
179,900-179,999	574	5337.36	6941.7	0.011	No**	67.66	59.65	0.075	No*
180,000	50	2594.92	11050.96			52.2	46.79		
184,900-184,999	245	4934.2	6999.62	0.505	Yes	68.7	65.04	0.705	No
185,000	136	5447.6	7538			66.11	62.44		
189,900-189,999	522	6204.42	8136.47	0.94	Yes	74.54	70.36	0.73	No
190,000	39	6269.15	9737.17			70.56	58.32		
194,900-194,999	137	4823.77	5682.16	0.021	Yes**	65.82	52.94	0.755	No
195,000	118	6776.67	7710.37			63.64	58.45		
199,900-199,999	458	5630.46	8234.08	0.018	Yes**	70.76	58.75	0.303	Yes
200,000	59	8437.18	11466.4			79.47	77.75		
204,900-204,999	102	5376.14	9088.77	0.598	Yes	57.64	48.9	0.0168	Yes**
205,000	104	5936.83	5921.99			78.5	72.78		
209,900-209,999	270	6862.34	8252.06	0.205	Yes	76.522	74.35	0.566	No
210,000	112	8103.45	9825.42			71.71	75.12		
214,900-214,999	198	6379.56	7008.98	0.287	No	66.04	59.42	0.203	Yes
215,000	135	5434.49	9195.55			74.73	63.29		

Table 4.2 continued

List Price	n=	List price-sold price	Std Dev	ANOVA P-Value	Smaller Reduction with Just-Below?	DOM	Std Dev	ANOVA P-Value	JustBelowPrice Sells Quicker?
219,900-219,999	342	7066.17	8971.44	0.145	Yes	77.49	77.71	0.683	No
220,000	59	8950.01	10648.5			72.966	82.61		
224,900-224,999	197	7342.66	7612.96	0.612	Yes	74.07	67.3	0.722	Yes
225,000	162	7838.02	10885.93			76.64	68.76		
229,900-229,999	327	7209.5	7911.08	0.3	Yes	71.97	60.1	0.38	No
230,000	47	8480.85	7446.46			63.8	57.1		
234,900-234,999	134	7195.43	10598.4	0.728	No	61.48	59.14	0.009	Yes***
235,000	74	6663.98	10543.3			88.32	86.07		
239,900-239,999	341	7725.76	9326.69	0.759	Yes	70.6	63.91	0.231	Yes
240,000	39	8211.8	9803.43			83.56	63.08		
244,900-244,999	97	8094.19	9014.62	0.727	No	76.18	70.34	0.616	Yes
245,000	75	7650	7200.93			82.49	94.7		
249,900-249,999	348	7973.6	8492.75	0.081	yes*	72.01	70.1	0.325	Yes
250,000	67	10235.07	14620.4			81.46	80.87		
254,900-254,999	91	6816.7	9077.06	0.552	No	69.41	66.9	0.702	Yes
255,000	51	5650.31	14300.14			73.55	51.76		
259,900-259,999	265	8163.43	7369.33	0.722	Yes	75.33	77.97	0.655	No
260,000	24	8716.67	6310.15			67.95	72.49		

Table 4.2 continued									
List Price	**n=**	**List price-sold price**	**Std Dev**	**ANOVA P-Value**	**Smaller Reduction with Just-Below?**	**DOM**	**Std Dev**	**ANOVA P-Value**	**JustBelowPrice Sells Quicker?**
264,900-264,999	91	8836.97	11193.13	0.957	Yes	76.25	74.32	0.795	Yes
265,000	61	8935.48	11506.08			79.49	77.22		
269,900-269,999	216	10283	12416.2	0.543	No	73.72	61.13	0.597	No
270,000	19	8505.26	6663.37			65.89	70.09		
274,900-274,999	106	7963.27	7750.64	0.139	Yes	58.78	47.23	0.019	Yes**
275,000	107	10006.2	11952.43			77.03	64.43		
279,900-279,999	182	8987.76	7845.45	0.987	Yes	64.37	54.14	0.192	Yes
280,000	22	9021.74	9547.1			81	72.71		
284,900-284,999	57	9971.15	12015.54	0.318	Yes	58.21	50.9	0.149	Yes
285,000	53	12230.31	11949.24			74.92	68.65		
289,900-289,999	163	9507.71	10725.7	0.134	No	64.44	64.46	0.75	No
290,000	18	5079.89	18790.7			59.44	50.57		
294,900-294,999	23	9971.28	9403.62	0.434	No	56.91	44.34	0.833	Yes
295,000	62	8278.46	9034.8			59.58	53.74		
299,900-299,999	244	9039.16	10182.35	0.008	Yes***	73.47	65.42	0.421	Yes
300,000	30	14340	1115.28			83.67	64.73		

*,**,*** represent the result is significant at the ten percent, five percent, and one percent level respectively

Table 4.3: Comparisons of Specific Price Points					
ListPrice	**n=**	**DOM**	**Std Dev**	**List-Sold**	**Std Dev**
74,900	259	68.73	56.01	2060.55	4917.23
75,000	199	74.92	72.82	2236.19	5318.37
79,000	67	57.44	55.06	3025.22	4457.79
79,900	569	74.14	64.88	2272.76	4838.15
80,000	99	76.25	75.51	1853.40	4980.06
84,900	341	64.63	55.27	1739.27	4572.72
85,000	249	78.34	77.63	1924.32	5063.42
89,000	109	72.81	84.07	2177.00	4588.54
89,900	767	76.17	61.55	1909.37	4853.77
90,000	111	70.47	67.40	2338.74	6855.84
94,900	309	69.15	59.65	1360.99	5204.38
95,000	242	63.64	54.70	2372.03	5120.64
99,000	112	72.75	66.99	3141.21	7745.21
99,900	720	68.58	61.00	2263.66	5293.07
100,000	90	68.58	59.84	1847.28	5999.19
104,900	371	65.92	60.35	2660.48	5428.04
105,000	272	74.14	66.49	3146.82	6376.48
109,000	133	72.69	66.09	2465.32	5926.34
109,900	618	67.95	57.00	2376.47	4723.71
110,000	303	67.81	59.26	3144.06	7307.51
114,900	501	65.29	52.04	2465.89	5946.24
115,000	324	69.71	64.32	2707.04	6145.83
119,000	164	67.39	63.78	2627.31	5457.21
119,900	771	67.72	63.31	2590.42	5677.65
120,000	153	70.27	64.91	2354.63	6945.68
124,900	574	63.13	50.97	2898.66	5470.48
125,000	348	67.94	63.29	3154.55	6409.22
129,000	126	78.71	72.86	4120.31	5922.36

Table 4.3 Continued					
ListPrice	**n=**	**DOM**	**Std Dev**	**List-Sold**	**Std Dev**
129,900	890	71.27	63.51	3191.08	6227.85
130,000	148	57.86	56.74	2720.64	7308.35
134,900	483	63.60	52.55	3595.71	6232.34
135,000	262	73.79	73.17	3552.91	6367.41
139,000	149	65.63	63.01	4161.93	6204.20
139,900	817	66.55	56.24	3319.94	5952.24
140,000	100	79.89	82.23	4702.07	10396.48
144,900	456	66.46	55.69	4209.96	6615.23
145,000	202	60.18	58.55	3625.85	6128.03
149,000	116	75.52	63.50	5436.12	7603.32
149,900	707	69.20	62.53	3454.99	6726.05
150,000	117	70.93	59.19	4986.74	8048.67
154,900	327	67.59	60.02	3460.20	5992.71
155,000	189	64.68	58.52	3680.05	7640.49
159,000	126	75.17	60.24	4218.21	6370.57
159,900	714	70.79	61.17	4494.61	6954.81
160,000	64	70.48	67.24	3762.22	7732.23
164,900	329	71.54	55.73	4167.40	7046.68
165,000	175	70.88	75.88	4637.16	5969.25
169,000	102	70.79	64.54	5961.99	7533.11
169,900	621	71.48	65.87	4603.38	8212.33
170,000	45	71.40	81.59	6389.02	7849.54
174,900	315	70.78	63.25	4548.47	7435.02
175,000	177	72.14	76.42	4869.78	7783.83
179,000	115	70.11	76.41	5734.30	6051.54
179,900	509	68.55	61.30	5441.69	6885.52
180,000	50	52.20	46.80	2594.92	11050.96
184,900	215	67.97	64.77	4950.46	7300.40

Table 4.3 Continued					
ListPrice	**n=**	**DOM**	**Std Dev**	**List-Sold**	**Std Dev**
185,000	136	66.11	62.44	5447.62	7538.00
189,000	103	74.26	68.63	6527.32	8781.61
189,900	486	74.35	69.76	6253.29	8350.11
190,000	39	70.56	58.32	6296.15	9737.17
194,900	112	68.25	54.47	4760.15	5093.06
195,000	118	63.64	58.44	6776.66	7710.37
199,000	95	69.64	69.50	6725.67	9585.54
199,900	407	71.37	58.87	5588.10	8365.49
200,000	59	79.47	77.75	8437.18	11466.41
204,900	88	59.14	48.85	5196.57	9056.16
205,000	104	78.50	72.78	5936.82	5921.99
209,000	93	65.72	55.77	5720.22	11062.33
209,900	238	73.19	69.42	7118.67	8535.96
210,000	112	71.71	75.12	8103.45	98.25.41
214,900	179	66.21	59.55	6882.65	5941.43
215,000	135	74.72	63.29	5434.48	9195.55
219,000	81	66.37	59.75	9225.84	9681.62
219,900	314	77.29	79.47	7184.96	9169.63
220,000	59	72.96	82.61	8950.08	10648.52
224,900	181	73.05	67.68	7519.42	7849.29
225,000	162	76.63	68.75	7838.02	10885.90
229,000	90	65.32	63.24	7569.44	8306.21
229,900	295	73.24	60.58	7291.81	8113.19
230,000	47	63.80	57.10	8480.85	7446.46
234,900	119	63.22	61.68	7224.64	11029.30
235,000	74	88.32	86.07	6663.98	10543.30
239,000	91	78.60	73.65	9271.24	9413.24
239,900	311	71.04	64.07	7908.65	9370.88
240,000	39	83.56	63.08	8211.76	9803.43

Table 4.3 Continued					
ListPrice	**n=**	**DOM**	**Std Dev**	**List-Sold**	**Std Dev**
244,900	85	74.40	71.35	7706.96	9216.70
245,000	75	82.49	94.69	7650.00	7200.93
249,000	63	71.82	71.86	7416.32	6565.26
249,900	314	71.50	72.02	8106.87	8622.60
250,000	67	81.46	80.87	10235.07	14620.38
254,900	81	68.01	69.29	6229.63	6496.21
255,000	51	73.54	51.75	5650.31	14300.14
259,000	86	86.72	75.74	12431.40	12538.32
259,900	243	75.32	79.15	8324.05	7560.42
260,000	24	67.95	72.48	8716.66	6310.15
264,900	79	77.86	75.48	8888.97	11844.69
265,000	61	79.49	77.22	8935.48	11506.08
269,000	59	77.25	71.33	10923.80	10789.28
269,900	200	73.69	60.48	10470.83	12696.00
270,000	19	65.89	70.09	8505.26	6663.37
274,900	91	60.49	48.01	7954.89	8032.17
275,000	107	77.02	64.42	10006.20	11952.43
279,000	79	74.74	64.09	11207.59	11043.65
279,900	170	64.72	54.61	8919.30	7965.92
280,000	22	81.00	72.70	9021.74	9547.11
284,900	50	58.86	51.73	8446.07	9941.86
285,000	53	74.92	68.65	12230.31	11949.24
289,000	72	88.19	85.15	9381.51	9265.15
289,900	152	65.88	66.06	9634.21	10943.17
290,000	18	59.44	50.57	5079.88	18790.72
294,900	19	55.00	33.41	9815.00	8941.35
295,000	62	59.58	53.74	8278.46	9034.79
299,000	65	91.63	77.35	12398.51	12059.15
299,900	209	72.36	67.25	9037.41	10742.95

Table 4.3 Continued					
ListPrice	**n=**	**DOM**	**Std Dev**	**List-Sold**	**Std Dev**
300,000	30	83.66	64.72	14340.00	11150.28
304,900	13	74.23	74.34	9728.57	4781.32
305,000	17	66.41	47.57	10205.88	5332.85
309,000	36	62.69	38.85	9363.05	6756.51
309,900	69	64.60	55.06	9540.58	8698.71
310,000	40	74.40	60.67	11828.13	10123.95
314,900	43	68.14	56.19	9296.41	7652.65
315,000	64	68.07	61.86	9543.18	10034.77
319,000	37	47.02	46.59	10243.24	8080.86
319,900	99	58.98	44.74	10104.69	8138.16
320,000	20	63.55	48.95	10287.50	9636.58

Table 4.4: OLS Results					
Listing Price Range	**Price Ending**	**Coef in the LnSalesPrice Reg**	**P-val**	**Coef in the DOM Reg**	**P-val**
$50,000-$100,000	9,9xx	**0.078**	**0.000**	**3.456**	**0.016**
	9000	**0.015**	**0.042**	-1.537	0.647
	4,9xx	0.007	0.132	**-3.769**	**0.072**
	5000	-0.003	0.589	-1.614	0.482
	0,000	**-0.017**	**0.016**	-0.543	0.865
$100,001-$200,000	9,9xx	**0.016**	**0.000**	**1.988**	**0.019**
	9000	**0.010**	**0.002**	**3.187**	**0.076**
	4,9xx	0.000	0.991	-0.183	0.870
	5000	-0.004	0.115	1.020	0.466
	0,000	**-0.016**	**0.000**	-1.004	0.601
$200,001-$300,000	9,9xx	**0.010**	**0.000**	0.376	0.839
	9000	**0.014**	**0.001**	3.966	0.153
	4,9xx	**-0.013**	**0.000**	-1.975	0.441
	5000	-0.002	0.609	2.910	0.274
	0,000	**-0.017**	**0.001**	0.934	0.789
$300,001-$400,000	9,9xx	**0.021**	**0.000**	1.188	0.757
	9000	**0.017**	**0.002**	0.378	0.936
	4,9xx	0.003	0.687	-3.087	0.567
	5000	0.007	0.216	0.627	0.892
	0,000	-0.003	0.659	-9.392	0.114

Figure 4.1: List Price Ending Frequencies

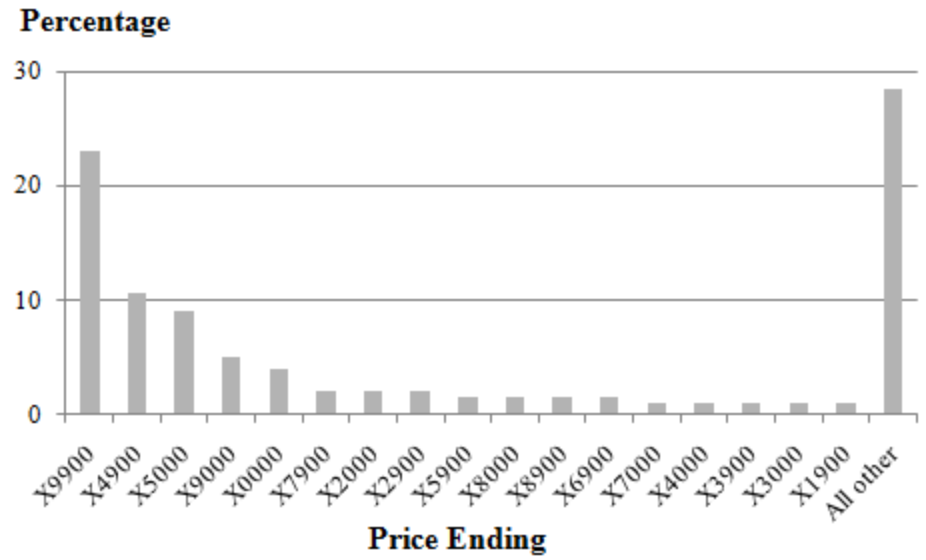


Figure 4.2: Scatter Plot of Residuals

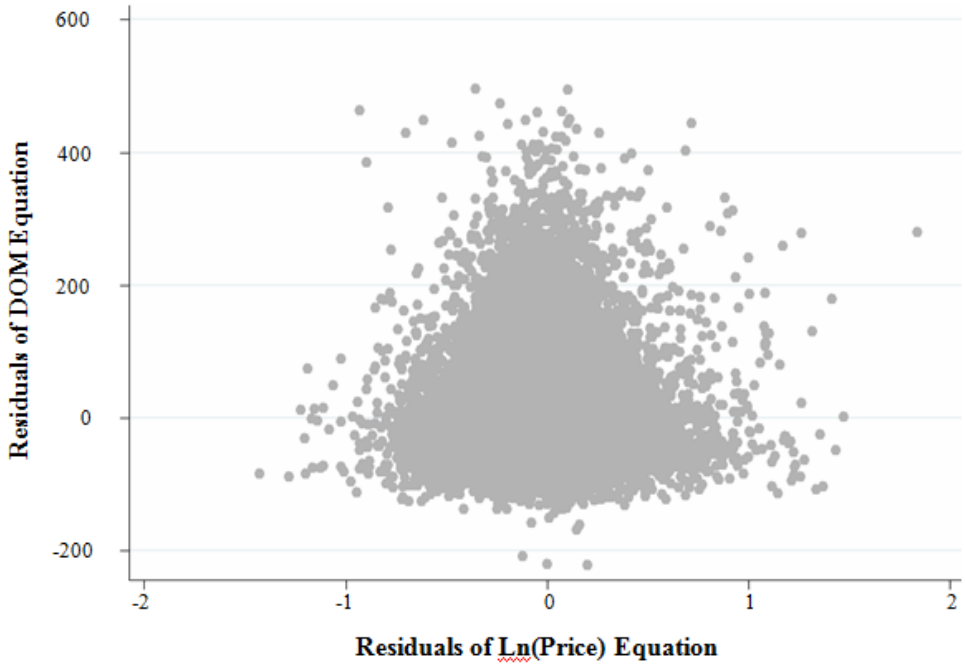


Figure 4.3: Histogram of List Price Around $100,000

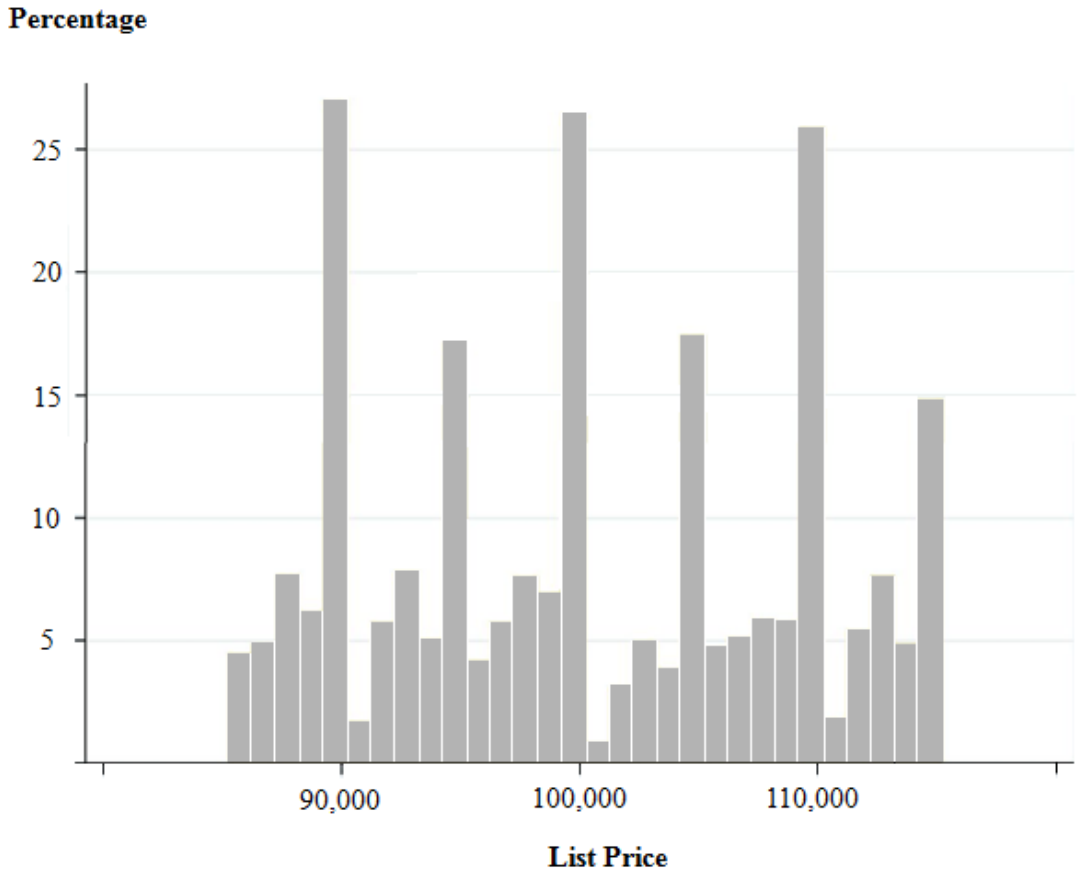


Figure 4.4: Histogram of List Price Around $150,000

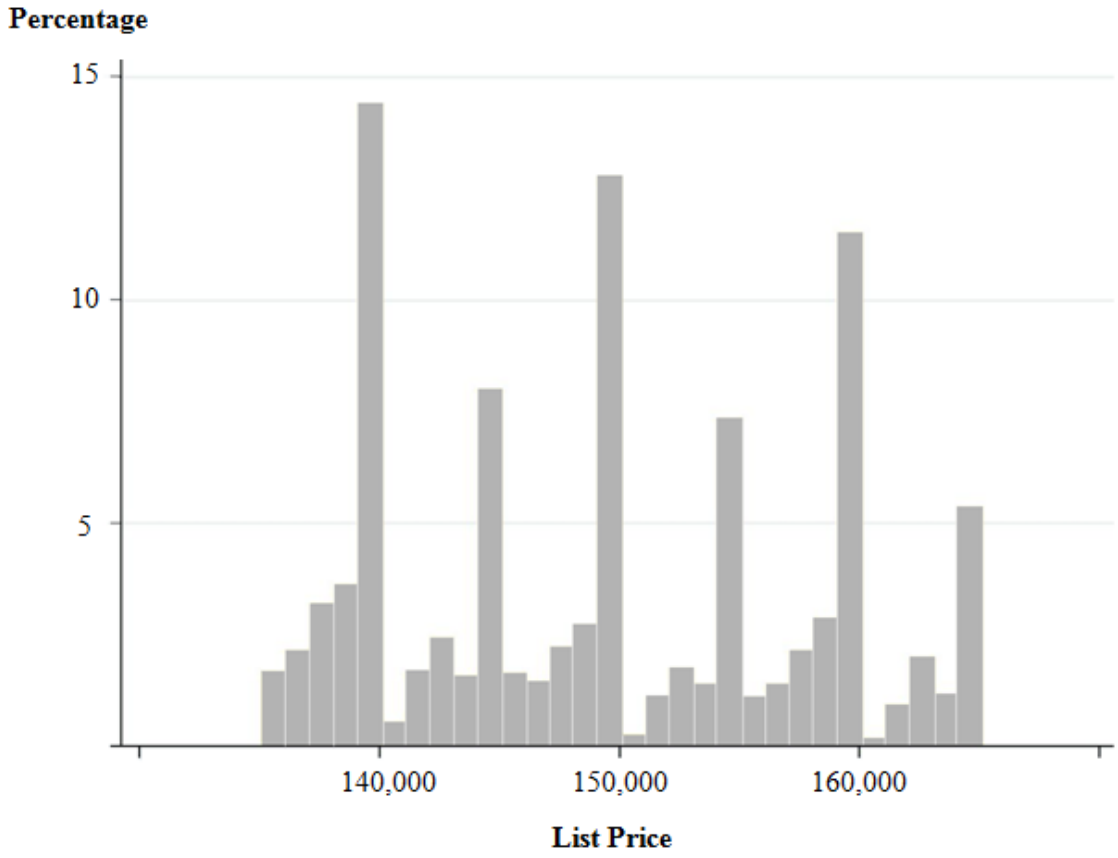


Figure 4.5: Histogram of List Price Around $200,000

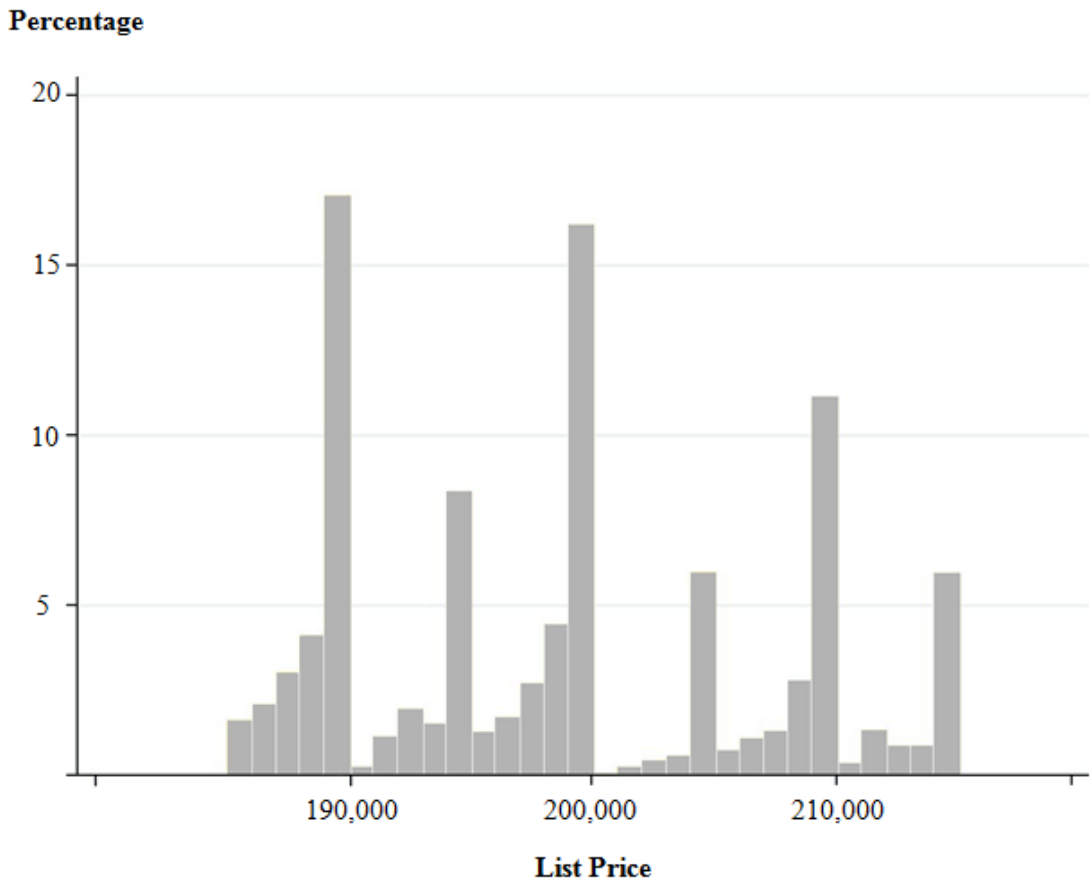
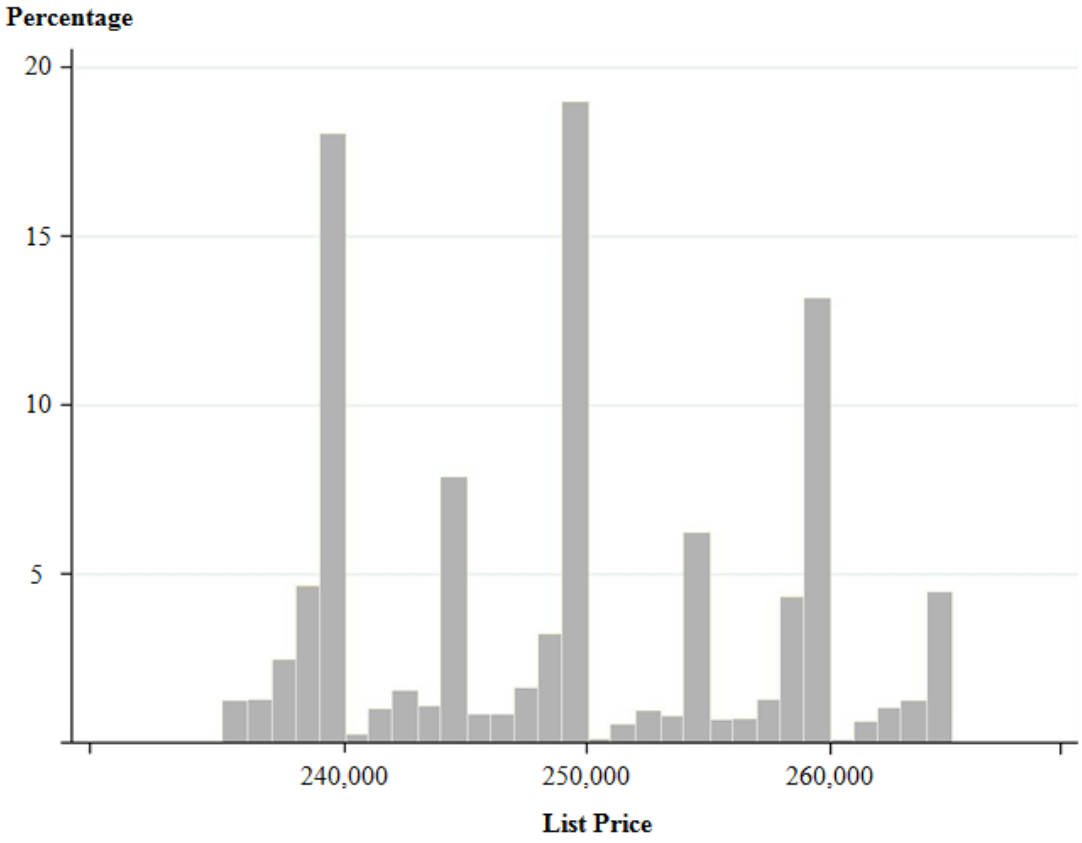


Figure 4.6: Histogram of List Price Around $250,000



CHAPTER 5. CONCLUSION

The first essay examined the effect of real estate agent characteristics on residential real estate sales outcomes. Specifically, level of agent activity, measured by number of recently concluded transactions (at intervals ranging from the past thirty to one hundred and eighty days), and number of congruently held homes in a listing agent's portfolio were included in housing hedonics, controlling for observable home characteristics. Data were drawn from seven years of Multiple Listing Service transactions from a large Midwestern city. Results indicated that agents with more recent activity are able to consummate the transactions faster. Each previous transaction in the last thirty days reduced the average time on market by around 0.7 days. Transactions further in the past (up to one hundred and eighty days) where consistently beneficial and this effect tapered off as the transaction became more distant. Home sellers using more active agents did, however, tend to get lower prices, controlling for observable housing characteristics. Each additional transaction in the past thirty days reduced expected sales price by 0.16%, or around $280 on a median priced home. Again, this effect was strongest for the most recent transaction and then tapered off for those more in the past. A further specification concentrated on the degree of recent agent activity in specific locations and found specialization (recent activity) in particular geographic region of the city had a beneficial impact (for the seller) on final sales price with no noticeable effect on time on market.

Attention was then turned to the residential real estate industry market structure in the second essay. Given the seemingly rigid commission structure, as wells anecdotal evidence of high market concentration in local markets offered by the Department of Justice, it would seem to be helpful to know about the general competitiveness of the local real estate markets. Few studies address this issue directly. An aggregator website, realtor.com, was used to collect data on listings throughout one hundred diverse U.S. markets. Measures of market concentration, such as the Herfindahl-Hirschman Index and concentration ratios, were constructed. While there were a few instances of fairly high market concentration (such as Des Moines, IA with a Herfindahl-Hirschman Index of over 3,000), overall, the concentration levels were not particularly excessive (averaging around 1,000). An examination into the factors that influenced concentration was conducted and there was some evidence that market size has as impact, with the smaller

markets being more highly concentrated. This was particularly pronounced in very small markets, giving rise to the possibility that there is a non-zero minimum efficient scale in the production process. Closer examination, however, revealed that across all sizes of markets, many very small firms existed (with either one or two listings) meaning any assertions about a non-zero minimum efficient scale must be made with caution.

The third essay examined the effect of "just-below" pricing on home sales outcomes. While just-below pricing has been studied extensively in the marketing literature, and often found to be effective at increasing demand, proposed theories as to how it works (which mostly center around consumers misperceiving the price) would seem to lose effectiveness in the context of a very large and highly scrutinized transaction. The same data from the first essay (seven years of Multiple Listing Service transactions) were used to construct housing hedonics with variables indicating just-below prices, as well as observable housing characteristics. Results generally indicated a one to two percent price premium with houses priced directly below a $10,000 increment. Furthermore, houses under $300,000 priced right on a $10,000 increment were associated with a further 1.6 to 1.7 penalty. Just-below pricing had no noticeable impact on time on market. A direct comparison of homes priced both right on and right below various focal points was generally consistent with the above results.

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VITA

JASON S. BECK

Date and Place of Birth

February 9, 1979, Owensboro, Kentucky

Education

M.S. Economics, University of Kentucky, December 2005

M.A., Economics, Miami University, December 2003

B.A., Economics, Bellarmine University, May 2001

Professional Experience

Teaching Assistant

University of Kentucky, Fall 2005 – Spring 2009

Honors and Award

University of Kentucky Association of Emeriti Faculty Fellowship, 2007

Von Allmen Summer Research Fellowship, University of Kentucky, 2006

Professional Affiliations

American Economic Association (AEA)

Southern Economic Association (SEA)

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Jason S. Beck

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Date