J Real Estate Finan Econ (2010) 40:245–259
DOI 10.1007/s11146-008-9146-y

Listing Specialization and Pricing Precision

Sean P. Salter · Ken H. Johnson · Ernest W. King

Published online: 23 August 2008

Abstract This paper investigates the relationship between property pricing precision (deviation from an expected property value) and specialization in the listing process by agents. It is hypothesized that financially constrained, risk-averse sellers prefer finer gradations of pricing precision, i.e., less deviation from expected property value, and that a set of agents will rise to meet this preference. The findings in this work indicate that agents specializing in listing properties increase pricing precision. The contributions of this work are twofold: (a) it provides a unique and heretofore uninvestigated metric as its dependent variable, thus allowing for further investigation into the brokerage intermediation process beyond the scope of price and marketing time, and (b) it provides an identifiable agent trait that can allow for a better matching of sellers' preferences with agents' abilities.

Keywords Specialization · Brokerage · Intermediation · Pricing precision

Introduction

The investigation of the ability of agents to affect differential market outcomes has come to be commonly known as the study of broker intermediation (or simply brokerage). The topic of broker intermediation is worthy of research; with the ability to identify differential agents' skill sets, it may be possible to better match consumers

S. P. Salter (✉)
Middle Tennessee State University, MTSU Box 27, Murfreesboro, TN 37132, USA
e-mail: salter@mtsu.edu

K. H. Johnson
Florida International University, 11200 SW 8th Street, MARC 230, Miami, FL 33199, USA
e-mail: kenh.johnson@fiu.edu

E. W. King
University of Southern Mississippi, 118 College Drive, #5072, Hattiesburg, MS 39406, USA
e-mail: ernest.king@usm.edu

of professional real estate services with the agents best able to serve them. Additionally, the ability to differentiate among agents by type and skill set can reasonably be expected to lead to a non-uniform pricing scheme for brokerage services. Unfortunately, the results of brokerage studies to this point may best be described as mixed, leaving us with a limited understanding of the function of agents and no systematic way to discern differences in their skill.

This purpose of this study is to investigate the effect of specializing in the listing of property by an agent on property pricing precision, a heretofore uninvestigated market outcome.[1] To this point in the literature, broker intermediation studies have generally been confined to the investigation of some brokerage subset (or broker versus non-broker marketed property) on two market outcomes—property price and property time on the market. Pricing precision differs from these two metrics, as it is a relative deviation of a broker-intermediated transaction price from a property's expected market value rather than an absolute measure of performance.

It is reasonable to expect, ex ante, that financially constrained, risk-averse sellers might be willing to trade pricing maximization for pricing certainty (i.e., pricing precision) and a higher likelihood of sale.[2] As such, employing pricing precision allows for the ability to identify agents who help intermediate prices closer to the expected selling price and thus improve certainty, a highly desirable trait among risk-averse sellers and especially financially constrained, risk-averse sellers. For the purposes of this study, financially constrained, risk-averse sellers can be thought of in a practical sense as those sellers facing pending constraints such as the purchase of another property, job loss, job transfer, or divorce. Is there an identifiable group of agents within the agent force that can systematically deliver superior pricing precision? This work investigates that issue.

Employing transaction-level data from a Southeastern MSA, this study finds that agents who specialize in listing property effectively lower the percentage of deviation from the expected market price (*PDEMP*). That is, agents who concentrate on listings affect greater pricing precision for those sellers who employ their services. This work contributes to the literature in two main ways. First, we introduce a new dependent variable to the brokerage debate. Second, we identify listing specialization as a signal of an agent's ability to affect transaction outcomes that, all else equal, are closer to the expected value of the property. This second finding should assist financially constrained, risk-averse sellers in their choice of agent.

The study is organized in the following manner. The next section presents a review of relevant literature. The third section discusses the theoretical framework, followed by a section discussing data and methodology. The fifth section discusses

[1]The terms "broker" and "agent" are used interchangeably in the literature to describe individuals who take part in the broker intermediation process. We use the term "broker" to represent the qualifying broker, while the term "agent" refers to salespersons. The terms "brokerage," "broker intermediation," etc., refer to the actions of brokers and agents in real estate markets.

[2]It is clear that, while not all risk-averse sellers are financially constrained, all rational, financially-constrained sellers should be risk-averse; it is precisely this subset of risk-averse sellers that would be most interested in pricing precision and the group of brokers that can better deliver pricing precision.

the results of the empirical estimations, and the final section provides some concluding remarks.

Literature

Broker Intermediation

For over a quarter of a century, academic researchers have investigated the nuances of real estate brokerage. Yinger's (1981) seminal study presents the brokerage environment in the context of a matching model and concludes that real estate agents affect the probability of a match occurring. Yinger's conclusions provide one explanation for real estate agents' existence. However, subsequent brokerage works quickly deviate from Yinger's probabilistic approach in favor of seeking the explanation of how agents (or subgroups of agents) affect transaction outcomes. Specifically, most of this body of research focuses on agents' impact on pricing of properties, those properties' times on market, and the exogenous factors that affect these measurable proxies for agent performance. A complete, exhaustive review of these pricing and duration studies at this point is beyond the scope of this work. Instead, what follows is a cursory review of this body of literature to date and is meant to provide the reader with a general understanding of the state of affairs in this line of the literature.[3]

Jud (1983) asserts that while agents do not affect property pricing, they do stimulate demand for real estate. In their 1986 study, Jud and Frew recast the broker intermediation problem and uncover a positive pricing effect for broker-marketed properties. More specifically, sellers shift a portion of the burden of the brokerage fee to the buyer, and broker intermediation increases demand for properties. For the next decade, investigations of real estate brokerage intermediation concentrated on Jud and Frew's major outcomes: the impact of brokerage intermediation on property price and demand for housing.

Salant (1991) examines For Sale By Owner (FSBO) properties as a springboard to examine when an agent should be used and how a property should be priced; specifically, Salant models the seller's decision to change from a FSBO marketing approach to a broker-intermediated marketing approach and how the listing price will change during this transition. Salant concludes that the listing price of an FSBO property will increase after an agent becomes involved in the transaction. Geltner et al. (1991) models the effort of the agent and the pricing strategy of the seller and finds that agent and seller incentives are misaligned throughout the listing period. Yavas (1992) examines the search intensity of buyers and sellers and concludes that broker-listed properties are associated with greater search intensity and that broker-intermediated properties receive a pricing premium, although this premium is insufficient to offset brokerage fees. Yavas and Colwell (1995) investigate MLS, non-member agent, and non-agent transactions for their effects on price, finding that MLS properties, on average, closed at prices lower than both non-agent and non-

[3]To those omitted authors, we extend our apologies. The interested reader may reference Sirmans et al. (2005) for an exhaustive review of hedonic studies in real estate, many of which are brokerage studies.

member-agent transacted properties. These studies are all indicative of the types of broker intermediation research during this period.

In 1996, however, Jud, Seaks, and Winkler provided one of the first formalized brokerage intermediation studies that introduced marketing time as another metric against which to measure the impact of real estate agents; the authors assert that brokerage has no impact on property price but that pricing strategies (and, therefore, brokerage intermediation) impact time on market, which is simultaneously determined with selling price (Belkin et al. 1976; Miller 1978). Following the study by Jud, Seaks, and Winkler, a property's duration (time on market) is added as a second, readily measurable endogenous variable to many real estate brokerage studies. The most recent analyses focusing on brokerage have generally—though not exclusively—followed this course of investigation. These works include, but are not limited to, Munneke and Yavas (2001); Rutherford et al. (2005, 2007); Levitt and Syverson (2005); Gardiner et al. (2007); and Huang and Rutherford (2007).

Munneke and Yavas (2001) provides an examination of the effects of agent compensation contract type, hypothesizing that agents more able to affect a match between buyers and sellers will self-select into a full-commission contract type. While Munneke and Yavas' hypothesis is intuitively appealing, their study concludes that any advantages of these superior agents in property pricing or marketing time are dissipated through competition among agent types. In short, better agents may self-select to a particular contract type, but there is no advantage gained by the consumer from employing the agent with the superior skill set.

Rutherford et al. (2005) posits a conflict of interest between agents and sellers, citing the fact that agent-owned properties sell at a significant premium when compared to non-agent-owned properties, with the premium being attributed to asymmetric information and additional effort on the part of agents. These results are reaffirmed in Levitt and Syverson (2005).

More recently, Gardiner et al. (2007) examines the effect of mandatory dual agency disclosure on property price, concluding that mandatory disclosure reduces the negative pricing impact of dual agency significantly. Huang and Rutherford (2007) models the performance of REALTORS® and non-REALTORS® in the context of an MLS-dominated market; the authors suggest that REALTORS® negotiate higher final prices for their clients. Rutherford et al. (2007) follows up the authors' 2005 study with a focus on condominiums. The authors assert that the homogeneous nature of condominiums may affect the agent impact from their earlier study. Agent-owned properties are again found to sell at a premium, albeit a smaller one than in the authors' previous study, relative to non-agent owned properties; marketing time is found to be longer for agent-owned properties than for non-agent-owned properties. These latter studies all provide valuable insight into the ways that real estate agents affect real estate markets through brokerage intermediation.

Specialization

Colwell and Marshall (1986) provides one of the first examinations of specialization as they study market share in the real estate brokerage industry. The authors examine market share of listings and sales in light of factors such as firm size, advertising, franchise status, and the number of open houses held. Colwell and Marshall

conclude that there is very little firm-level specialization in their market of interest, though the authors state clearly that there are some specialists in their study market. Colwell and Marshall state that, "An alternative proposition is that the brokerage firm is relatively unimportant and the important capital and goodwill belong to the salesperson."[4] While Colwell and Marshall's model provides a basis for studies such as Zumpano and Elder (1994), we believe this "alternative proposition" is an interesting motivation—Is it the agent who makes the difference? If so, then how do salespeople make a difference? We address these topics in our Background discussion.

Zumpano and Elder (1994) presents a particularly interesting brokerage intermediation argument. Through an examination of firm-level data, Zumpano and Elder provide a cost model of the real estate firm and suggest that there are economies present for firms that do not specialize in listing properties or in selling properties; a balance of listings and sales is the least costly way to provide services to consumers. However, as firms grow in size, they are able to provide services to consumers more effectively by allowing individual agents to specialize in either listings or sales, thus taking advantage of sharable inputs and maximizing opportunities for in-house sales.

In their 2007 work, Turnbull and Dombrow investigate a number of agent characteristics, including gender, selling own listings, and agency type (seller representation or buyer representation, etc.). While agent gender is found to be unimportant in determining price, listing specialists are found to attain higher prices for sellers and selling specialists are found to achieve lower final prices for buyers.

Combining the results of these two studies, we see that specialization can lower the cost of delivering brokerage services but that specialization may or may not lower the cost of brokerage services to the consumer, as listing specialization results in a higher price received by the seller and, therefore, paid by the buyer. Using Zumpano and Elder (1994) and Turnbull and Dombrow (2007) as a basis, we present a simple model of brokerage intermediation that focuses on listing agent activity and the effect of listing specialization on pricing precision compared to a constructed expected market price. More specifically, we test pricing precision against demonstrated success as a listing agent. Estimated using MLS data, our paper provides direct evidence of the benefits of specialization as a characteristic that provides value to the aforementioned risk-averse sellers.

Background

Consider a setting in which risk-averse sellers are price takers. In particular, it is convenient to think of these sellers as facing additional financial constraints, such as an additional purchase, job loss, or job transfer, making immediacy of sale important.[5] Intermediaries (agents) are the source of information production in this market. The cost of this information production is such that these information

[4]Colwell and Marshall (1986), p. 597.

[5]This setting significantly mimics the present market.

producers have developed a well-functioning information system that readily transfers information related to property prices. The efficiency of the market for property is such that any given participant (agents, buyers or sellers) cannot influence prices on average and property prices are set in the market by way of the following process:

$$P_i^M = f(\pi, \lambda) \tag{1}$$

where π is a vector of physical characteristics and λ is a vector of location characteristics that affect a property's value. π is generally considered to include factors such as the age of the property, its square footage, the number of bedrooms and bathrooms present in the structure, quality building characteristics, etc. λ is generally proxied by school zones, area indicator variables, geocodes, or other identifying factors.

Further, none of the vagaries typical in the relationship between agents and sellers exist; for example, there is no principal-agent problem, and sellers follow the advice of their agents. This simplifying assumption is made in order to concentrate on the pricing, and thus the return, of the property of financially constrained, risk-averse sellers.[6] At any point in time a property owner/seller's expected return to property can be estimated as:

$$R_{i,t} = \left(P_{i,t} - P_{i,0}\right)/P_{i,0} \tag{2}$$

where $R_{i,t}$ is the present return on the ith property, $P_{i,t}$ is the transaction (selling) price at time t, and $P_{i,0}$ is the original price paid for the property. At any point after the initial purchase of the property but before the actual closing for a resale, the only unknown is $P_{i,t}$.

One of the well-known characteristics of residential real estate markets is that the assets traded in these markets are heterogeneous and, therefore, reasonably difficult to properly price. The seller may expect to receive the price generated by Equation (1), but he may actually receive a transaction price that is greater than or less than $P_{i,t}^M$. Notice that if the seller receives the exact price that he expects (i.e., the average price) based on the market process provided by Equation (1), his return will be the expected (average) return for his specific property type:

$$R_{i,t} = \left(P_{i,t}^M - P_{i,0}\right)/P_{i,0} \tag{2.1}$$

An element of asset pricing that has been investigated, beginning with Grossman and Stiglitz (1980) and advanced by Ball et al. (1985), among others, is the fineness of partitioning of pricing information in a given market. The argument advanced by these two works is that the level of information present in the market (and available to market participants) determines the precision with which an asset may be priced. Indeed, Palmon et al. (2004) apply this argument to pricing in residential real estate markets, determining that the relative costs of obtaining precise information limits the precision with which a participant may price a given property. Thus, the costly nature of information causes property pricing to be imprecise.

[6]Other simplifying assumptions here are that sellers of property have forgone the For Sale By Owner (FSBO) market and that buyers are exogenous to the present problem.

We should expect, then, that actually achieving $P^M_{i,t}$ is an uncertain prospect, since all market participants do not have homogeneous information regarding the local residential market or its component properties. As uncertainty creeps into our analysis of $P^M_{i,t}$, it likewise presents itself in our analysis of $R_{i,t}$, since uncertainty in final transaction price clearly leads to uncertainty in the seller's return. While the seller might expect to receive $P^M_{i,t}$, he should also expect that there exists some distribution of other prices for the final transaction price. Assuming that this distribution of prices is symmetric about $P^M_{i,t}$, let the owner/seller divest himself of this property by selling the property and recognizing an actual transaction price, $P^*_{i,t}$, an element of the distribution about $P^M_{i,t}$. In this case, the return to property for this seller is:

$$R_{i,t} = \left(P^*_{i,t} - P_{i,0}\right) \Big/ P_{i,0} \tag{3}$$

When limited liquidity is introduced in the form of possible extended marketing times or even a marketing failure—as is the case in residential transactions—the analysis diverges and differences in $P^M_{i,t}$ and $P^*_{i,t}$ become important for two reasons: (a) these differences affect the shape of the distribution of prices and returns and (b) these differences may result in a loss of liquidity, where liquidity is defined as the ability to convert an asset into cash quickly and without loss of value.[7] Specifically, financially constrained, risk-averse sellers facing a need for immediacy in a market of limited liquidity have a need to balance return, the likelihood of a transaction, and the time for that transaction to take place.

For example, suppose that $P^M_{i,t}$ is \$250,000 and that (because of our assumption of symmetry) $P^*_{i,t}$ (the actual final transaction price) equals \$240,000 or \$260,000 with equal probability. If an offer from a buyer is presented at $P^*_{i,t} = \$240,000$, then the seller's return will be lower than the expected return associated with $P^M_{i,t}$, although the lower return will almost surely be received on a relatively short timeline. Thus, there is a loss of liquidity from the loss of value. If, however, $P^*_{i,t} = \$260,000$, then the seller's return will be higher than the expected return associated with $P^M_{i,t}$, though this outcome may result in an extended marketing period that is unbearable to the financially constrained, risk-averse seller, and there is a loss of liquidity from the extension of time to sell.

In our hypothetical case, though, the seller would expect to receive \$250,000, based on the fact that the two outcomes are equally likely and are symmetrically distributed around $P^M_{i,t} = \$250,000$. Thus, any financially constrained, risk-averse seller would prefer a certain \$250,000 to the uncertain lottery with expected value equal to \$250,000 for traditional reasoning associated with uncertain versus certain outcomes as well as for arguments that stem from a loss in liquidity. A much more amenable hypothetical for our financially constrained, risk-averse seller would be for $P^*_{i,t}$ to equal \$249,999 or \$250,001 with equal probability, since the variation in

[7]Generally speaking, all equities trade with frequency. Since equity securities are homogeneous for a given firm (and a given class for that firm), market liquidity is high. The same is not true for residential property. Here, we additionally assume that prices and marketing times are positively related as in Anglin et al. (2003). That is to say, higher prices are attained with longer marketing periods, while lower prices can easily be garnered in shorter marketing periods.

prices is much smaller than in the hypothetical with $P^*_{i,t} = \$240,000$ or \$260,000 and the expected prices (and, therefore, the expected returns) are equal and the loss of liquidity is negligible. Thus, aside from a certain final transaction price, a financially constrained, risk-averse seller will prefer a distribution of prices that is narrower (though still symmetric) to one that is less narrow, since a narrower distribution of prices is preferred by risk-averse asset holders and also leads to a lower level of liquidity loss, another preferable transaction characteristic.

In our theoretical setting, this is equivalent to the seller seeking to

$$MIN\left\{\left|P_i^M - P_i^*\right|\right\} \tag{4}$$

so that the seller desires an actual selling price that is as close as possible to the expected selling price and would, all else equal, choose the listing agent that can provide an appropriate level of pricing precision to allow (4).[8]

If we examine (4) more closely, we see that (4) represents a deviation from an expected value as P_i^M is conditioned on comparable sold properties. In most applications, the expected value is a strict mathematical expected value (mean), and deviations are represented as the standard deviation and/or variance from the mean. In our case, taking an average price is unrealistic, as calculating a mean price based on one observation is uninformative. Likewise, the concept of a standard deviation for only one observation is impossible. So, we create the expected value for each seller, P_i^M and the absolute deviation from P_i^M, $\left|P_i^M - P_i^*\right|$, which are intuitively similar to mean and standard deviation, although they are technically different. What should be clear, however, is that minimizing $\left|P_i^M - P_i^*\right|$ leads to a minimization of the difference between the expected return based on the market determined value of the property and the expected return based on the achieved final transaction price, which is an element of the distribution of prices about P_i^M.

We suggest that the characteristic that will allow a seller to better choose an appropriate listing agent in this setting is a listing agent's degree of specialization. Our previous discussion of the specialization literature clearly indicates that there are benefits to specialization. If we consider the agent who specializes in listings, then it is economically intuitive that such an agent would be able to focus his or her efforts, including economic resources, intellectual resources, and other human capital elements, on maximizing his or her level of efficacy in the listing process. Simply stated, an agent who focuses on listings will be better at minimizing deviation from the expected value of the property than an agent who focuses on selling properties or who attempts to balance listings and sales.

Accordingly, we direct our empirical investigation to listing specialization and pricing precision. Using MLS data and a model that directly tests our hypothesis, we follow with an empirical evaluation of our theory. Our expectations are that agents who specialize in listing properties will demonstrate an ability to produce residential closings with more precision relative to an expected market price.

[8]Time subscripts are omitted for convenience.

Data and Methodology

Data

Our sample consists of MLS data from a Southeastern MSA. The raw sample includes all MLS listings sold from January 1, 2003, until December 31, 2004, a total of 2,191 transactions. We remove incomplete entries and obvious data errors (e.g., negative values of price or time on market) that will affect our estimations. Afterward, we have 728 usable observations from 2003 and 682 usable observations from 2004, a total of 1,410 total usable observations. Selected descriptive statistics are presented in Table 1.

From this sample, we draw information about the agents involved in the transaction, the property's physical characteristics, and the property's location. We use selling price in dollars (*Price*), days on market (*DOM*), number of bedrooms (*Bed*), number of bathrooms (*Bath*), age of the property in years (*Age*), and square footage of the property (*SqFt*) as continuous predictors. Additionally, we use indicators for the three areas that make up our sample. All three areas are contiguous. *Area1*, our control area, is the primary area for our sample. However, *Area2* and *Area3* are easily accessible from *Area1* and are generally considered preferable living areas to *Area1* in terms of quality of schools and other amenities; *Area1*, *Area2*, and *Area3* are distinct in terms of school districts, although the distinctions are broader than simple school zone delineation. Finally, we use information for each listing agent, including each agent's total number of listings (sold and unsold) (*TList*) and total number of properties sold (*TSold*). From these, we may calculate the total number of transactions for a given period (*TTrans*), total listings as a percentage of total transactions (*%List*), and, therefore, sales as a percentage of total transactions (*%Sold*).

Methodology

Our empirical estimation for the theoretical model begins with an estimate of expected market price. As all participants are price takers, P_i^M represents the market-

Table 1 Selected descriptive statistics

	Mean	Median	Std Dev	Min	Max
Price	$146,416.9100	$127,300.0000	$93,963.6300	$6,000.0000	$920,000.0000
DOM	99.5560	69.0000	106.2033	0.0000	1,187.0000
Age	19.0615	8.0000	22.1601	0.0000	115.0000
SqFt	1,992.7000	1,846.0000	744.2620	761.0000	5,946.0000
Bed	3.2738	3.0000	0.6266	2.0000	8.0000
Bath	2.0849	2.0000	0.5616	1.0000	4.0000
Area1	0.3192	0.0000	0.4665	0.0000	1.0000
Area2	0.4876	0.0000	0.5002	0.0000	1.0000
Area3	0.1933	0.0000	0.3951	0.0000	1.0000
TList	24.0044	17.0000	25.9775	0.0000	83.0000
%List	0.4609	0.5577	0.2028	0.0000	1.0000
N	682				

determined price (value) for each property. To represent this process, we estimate equation (5).

$$lnPrice_i = \beta_0 + \beta_1 lnAge_i + \beta_2 lnSqFt_i + \beta_3 lnBed_i + \beta_4 lnBath_i + \beta_5 Area2_i + \beta_6 Area3_i + \varepsilon_i \quad (5)$$

Denote $\widehat{P}_i$ (the fitted values of (5)) as the market's estimate of the ith property's price. Using $\widehat{P}_i$ along with the actual selling price of property i, P_i, we calculate the absolute value of the percentage deviation from the expected market price (*PDEMP*).

$$PDEMP_i = \frac{|P_i - \widehat{P}_i|}{\widehat{P}_i} \quad (6)$$

We use the absolute value of the deviation in equation (6) because our hypothetical financially constrained, risk-averse seller is interested in the tradeoff between certainty and P_i, therefore, selling his or her property at a price that is close to the expected market price is very important. Additionally, scale matters. Therefore, we calculate (6) as a percentage value, since a $100 absolute value deviation represents a greater "error" for a $100,000 property than for a $200,000 property. As such, equation (6) presents a scale-neutral measure of pricing precision.

The expected market price and the calculated variables that result from it are estimated using data from 2004 (January 1, 2004 to December 31, 2004). Following these estimations, we present three models testing our main hypothesis that listing specialization affects pricing precision. In the subsequent models, (7), (8), and (9) that follow, our dependent variable is $PDEMP_i$. Our independent variables are calculated factors that represent different aspects of listing specialization (total listings taken by an agent, an agent's total listings as a percentage of total transactions, and the interaction of these two variables). These factors (*TList*, *%List*, and *TList* × *%List*) are calculated using 2003 data (January 1, 2003, through December 31, 2003). By using variables calculated based on 2003 data to predict 2004 pricing precision, we are, in effect, testing that an agent's established track record of specialization (and, therefore, the associated experience and reputation) matters.

$$PDEMP_i = \theta_0 + \theta_1 TList_i + \varepsilon_i \quad (7)$$

$$PDEMP_i = \eta_0 + \eta_1 \%List_i + \delta_i \quad (8)$$

$$PDEMP_i = \omega_0 + \omega_1 TList_i + \omega_2 \%List_i + \omega_3 TList_i x \%List_i + \upsilon_i \quad (9)$$

Model (7) tests listing specialization in terms of the total number of listings taken for the listing agent of property i. Model (8) regresses $PDEMP_i$ on the demonstrated balance (or imbalance) of listings and sales for each property's listing agent. Model (9) uses *TList* and *%List* plus the interaction of those two variables to explain $PDEMP_i$. We associate the specific property's pricing precision with the actual listing agent in all three of these factors. We should note that in model (9), we

reasonably expect that some statistical significance will be lost in the main effects as we add the interaction term.[9]

For clarity, we reiterate that (5) is estimated using 2004 data, which yields the predicted price necessary for calculation of the *PDEMP* variable. In (7), (8), and (9), we use demonstrated agent specialization information (vis-à-vis 2003 data) to explain future precise pricing ability. For our empirical results to support our theoretical framework, we should see negative and statistically significant coefficients for our independent variables in (7), (8), and (9). A formal reporting of the empirical results and a brief discussion follows.

Results

Empirical Results

The results of the market expected estimation (Equation (5)) are presented in Table 2. The model is appropriate (F=414.66 (p<.0001), R^2=.7866), and five of the six explanatory variables are statistically significant; only *Area3* is insignificant in predicting *lnPrice*. Older properties exhibit lower selling prices, while larger properties (*lnSqFt*) sell at higher prices. When controlled for square footage, properties with more bedrooms sell for less, while properties with more bathrooms exhibit higher selling prices. *Area2* properties exhibit higher selling prices than comparable properties in *Area1*, the control area.

Recall that model (5) serves two purposes. First, (5) represents the market model, the statistical representation of the process used by informed market participants in valuing properties. The explanatory variables included in (5) are reflective of the types of factors that participants generally consider important when evaluating properties within a given market. The second, and more important, outcome of the estimation of (5) is that we can use the predicted selling price from (5) to calculate (6), the *PDEMP*, the independent variable in subsequent estimations.

We next turn our attention to the estimation of models (7), (8), and (9), the results of which are presented in Table 3. We begin with a discussion of model (7). The negative, statistically significant coefficient for *TList* indicates that, for a given listing, employing a listing agent who has historically taken relatively many listings reduces the *PDEMP* for that property. This result lays the foundation of support for our hypothesis that specialization in listings reduces deviation from the expected property value, a result that is preferred by constrained risk-averse sellers. Estimation of model (8) bolsters this foundation. Results of the estimation of model (8) indicate that agents who specialize in listings (in terms of their balance of listings and sales (*%List*)) reduce *PDEMP* and, therefore, increase pricing precision as compared to agents who do not specialize in listings. Finally, model (9) presents the regression of

[9]Jackson and Lindley (1989) illustrates the predicament we face in this instance, demonstrating that the interpretation of main effects in the presence of an interaction term may be problematic. Jackson and Lindley's work is based on Gujarati (1970), which provides the theoretical basis for their empirical test. In light of these issues, we include separate estimations for each of the main effects in (7) and (8) as well as the combined model with interaction (9) to allow the reader the most complete and correct analysis.

Table 2 OLS regression results—market model y=*lnSP*

	Coefficient	Std Error	*t*
Intercept	2.47786	0.36026	6.88[a]
lnAge	−0.12423	0.00997	−12.46[a]
lnSqFt	1.24291	0.05639	22.04[a]
lnBed	−0.17700	0.08399	−2.11[b]
lnBath	0.32688	0.06238	5.24[a]
Area2	0.17019	0.03410	4.99[a]
Area3	0.03882	0.03691	1.05
N	682		
R-Square	0.7866		
F	414.66[a]		

[a] Significant at α=0.01
[b] Significant at α=0.05

PDEMP on the main effects, *TList* and *%List*, as well as the interaction of *TList* and *%List*. The results demonstrate that listing agents who take a larger percentage of listings (relative to sales) and who also take a larger number of listings significantly reduce *PDEMP* (increase pricing precision).[10]

Discussion

As a proxy for the seller's expected price determination, (5) performs quite well. Its explanatory power is reasonably high, and it contains the majority of the individual choice variables that differentiate one property from another in our sample area. It is common for employed listing agents to provide sellers with this type of information for small samples of properties comparable to their own. As such, the calculation of *PDEMP* is also reliable as a proxy for the precision of actual selling price as compared to the expected selling price. To this point, our framework holds.

Our framework also predicts that agents who specialize in listings will be associated with smaller deviations from P_i^M (as estimated by $\widehat{P}_i$) and will, therefore, deliver a final selling price (P_i) that should be closer to the seller's expected price than a less specialized agent could deliver. Our empirical results fully support this conclusion as well. In all of our measures of listing specialization, agents with greater listing specialization reduce deviation from our proxy for expected selling price. Accordingly, these results give us an identifiable agent characteristic that may assist relatively risk-averse sellers in choosing an agent that better meets his or her needs.

Our results also support the conclusions of Zumpano and Elder (1994) and can coexist with the results from Turnbull and Dombrow (2007). Specifically, Zumpano and Elder posit agent specialization as an economically viable strategy from a firm's

[10] Again, we recognize that the signs and statistical significance of our main effects, *TList* and *%List*, changed in the presence of the interaction term. This is not unusual, as the interaction term "steals" some of its statistical significance from the main effects. In model (9), we cannot interpret the main effects.

Table 3 OLS regression results y=*PDEMP*

	Model (7)	Model (8)	Model (9)
Intercept	0.01970[a] (0.00109)	0.02130[a] (0.00212)	0.01849[a] (0.00223)
TList	−0.00011[a] (0.00003)		0.00118[a] (0.00035)
%List		−0.00885[b] (0.00399)	0.00176 (0.00451)
TList× *%List*			−0.00223[a] (0.00061)
N	682	682	682
R-Square	0.0197	0.0072	0.0397
F	13.69[a]	4.92[b]	9.34[a]

Numbers in parentheses are standard errors
[a] Significant at α=0.01
[b] Significant at α=0.05

perspective, and our model presents one explanation as to the value of specialization at the transaction level. Additionally, since our model is based on pricing precision, our results do not necessarily contradict Turnbull and Dombrow. In particular, our model allows specialized listing agents to affect higher prices than their counterparts, who may be deviating from the market predicted value at a greater magnitude, but at a lower price.

Conclusion

We present a model of brokerage intermediation that has as its focus listing specialization and the impact of such specialization on the pricing precision of residential properties. We include a specific measure of pricing precision, a previously uninvestigated dependent metric in the brokerage intermediation literature. Our theoretical framework predicts that financially constrained, risk-averse sellers should choose listing specialists in order to reduce uncertainty in final selling price and limit associated liquidity losses. The source of this risk aversion with respect to price may be any number of situations: financial distress, voluntary or involuntary relocation, upsizing, or downsizing. Regardless, a financially constrained seller with an informed and pressing reservation price should seek the services of a listing specialist, since our empirical tests indicate that listing specialists significantly reduce uncertainty in the final transaction price when compared to a standardized expected pricing heuristic.

The manner in which listing specialists affect this outcome is undetermined by our model. We conjecture that listing specialists are better at processing market information and, therefore, properly pricing properties so that their clients will obtain a final selling price that is close to their requisite price. However, in reality (i.e., removed from our model's constraints) it could be that listing specialists are no better than their counterparts at information processing but significantly better at counseling and/or persuading their clients to follow their advice. Without sensitive information regarding agent-client communication, we cannot determine which explanation is more appropriate.

It has been suggested that some agents may utilize some marketing or advertising techniques that may systematically influence transaction prices upward. We believe that in residential real estate markets, two issues preclude such behavior from resulting in consistent, sustained above-market prices by certain agents. The first issue is that reputation is public information. In a competitive market, agents identified as consistently winning positive economic rent for their sellers will face more rigorous resistance from prospective buyers during negotiations. As this reputation is disseminated, the advantage to employing these agents will be reduced. Second, we view human capital in these markets as dynamic and, once an agent utilizes a particular technique, other agents will mimic that technique. As more agents mimic the technique, its effectiveness declines until it is ineffective in garnering economic rents. Because of these and other economic arguments, competition in the market for residential real estate brokerage services will eliminate the long-term ability of agents to use such strategies and techniques to influence market outcomes. Further pursuit of this line of thought is beyond the scope of this study.

Irrespective of the mechanism used by the identified specialists to achieve greater pricing precision, we can say that there exists some readily identifiable agent characteristic that identifies those agents who are better at affecting pricing precision than others are. Also, it seems clear that our study provides further support for the conjecture of Colwell and Marshall (1986) that the important capital contributing to better performance in the brokerage industry (in our model, human capital) belongs to the agent and not to the firm. Finally, what effect our identification has on the matching of consumer needs, agent services, and the fees for those services remains a topic for future consideration.

Acknowledgements We wish to thank C.F. Sirmans (Editor), an anonymous referee of the journal, Tom Springer, Bill Hardin, Tom Lindley, Frank Mixon, and session participants at the 2007 Southern Finance Association Meeting in Charleston, South Carolina, for their comments, suggestions, and assistance. Remaining errors are our own.

References

Anglin, P. M., Rutherford, R. C., & Springer, T. M. (2003). The trade-off between the selling price of residential properties and time on the market: the impact of price setting. *Real Estate Economics*, *26* (1), 95–111. doi:10.1023/A:1021526332732.

Ball, C. A., Torous, W. N., & Tschoegl, A. E. (1985). The degree of price resolution: the case of the cold market. *Journal of Futures Markets*, *5*, 29–43. doi:10.1002/fut.3990050105.

Belkin, J., Hempel, D. J., & McLeavey, D. W. (1976). An empirical study of time on market using a multidimensional segmentation of housing markets. *AREUEA Journal*, *4*(1), 57–75.

Colwell, P. F., & Marshall, D. W. (1986). Market share in the real estate brokerage industry. *AREUEA Journal*, *14*(4), 583–599.

Gardiner, J., Heisler, J., Kallberg, J. G., & Liu, C. H. (2007). The impact of dual agency. *Journal of Real Estate Finance and Economics*, *35*(1), 39–55. doi:10.1007/s11146-007-9028-8.

Geltner, D., Kluger, B. D., & Miller, N. G. (1991). Optimal price and selling effort from the perspectives of the broker and the seller. *AREUEA Journal*, *19*(1), 1–24.

Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *American Economic Review*, *70*, 393–408.

Gujarati, D. (1970). Use of dummy variables in testing for equality between sets of coefficients in linear regression: a generalization. *American Statistician*, *24*(5), 18–22. doi:10.2307/2682446.

Huang, J., & Rutherford, R. C. (2007). Who you going to call? Performance of realtors and non-realtors in a MLS setting. *Journal of Real Estate Finance and Economics*, *35*(1), 77–93. doi:10.1007/s11146-007-9029-7.

Jackson, J. D., & Lindley, J. T. (1989). Measuring the extent of wage discrimination: a statistical test and a caveat. *Applied Economics*, *21*(4), 515–540. doi:10.1080/758519717.

Jud, G. D. (1983). Real estate brokers and the market for residential housing. *AREUEA Journal*, *11*(1), 69–82.

Jud, G. D., & Frew, J. (1986). Real estate brokers, housing prices, and the demand for housing. *Urban Studies*, *23*, 21–31. doi:10.1080/00420988620080031.

Jud, G. D., Seaks, T. G., & Winkler, D. T. (1996). Time on market: the impact of residential brokerage. *Journal of Real Estate Research*, *12*(3), 447–458.

Levitt, S., & Syverson, C. (2005). Market distortions when agents are better informed: the value of information in real estate transactions. National Bureau of Economic Research, NBER Working Paper 11053.

Miller, N. G. (1978). Time on the market and selling price. *AREUEA Journal*, *6*(2), 164–174.

Munneke, H. J., & Yavas, A. (2001). Incentives and performance in real estate brokerage. *Journal of Real Estate Finance and Economics*, *22*(1), 5–21. doi:10.1023/A:1007879109026.

Palmon, O., Smith, B. A., & Sopranzetti, B. J. (2004). Clustering in real estate prices: determinants and consequences. *Journal of Real Estate Research*, *26*, 115–136.

Rutherford, R. C., Springer, T. M., & Yavas, A. (2005). Conflicts between principals and agents: evidence from residential brokerage. *Journal of Financial Economics*, *76*, 627–665. doi:10.1016/j.jfineco.2004.06.006.

Rutherford, R. C., Springer, T. M., & Yavas, A. (2007). Evidence of information asymmetries in the market for residential condominiums. *Journal of Real Estate Finance and Economics*, *35*(1), 23–38. doi:10.1007/s11146-007-9027-9.

Salant, S. W. (1991). For sale by owner: when to use a broker and how to price the house. *Journal of Real Estate Finance and Economics*, *4*(2), 157–174. doi:10.1007/BF00173122.

Sirmans, G. S., Macpherson, D. A., & Zietz, E. N. (2005). The composition of hedonic pricing models. *Journal of Real Estate Literature*, *13*(1), 1–44.

Turnbull, G. K., & Dombrow, J. (2007). Individual agents, firms, and the real estate brokerage process. *Journal of Real Estate Finance and Economics*, *35*(1), 57–76. doi:10.1007/s11146-007-9025-y.

Yavas, A. (1992). A simple search and bargaining model of real estate markets. *AREUEA Journal*, *20*(4), 533–548.

Yavas, A., & Colwell, P. F. (1995). A comparison of real estate marketing systems: theory and evidence. *Journal of Real Estate Research*, *10*(5), 583–599.

Yinger, J. (1981). A search model of real estate broker behavior. *American Economic Review*, *71*(4), 591–605.

Zumpano, L. V., & Elder, H. W. (1994). Economies of scope and density in the market for real estate brokerage services. *AREUEA Journal*, *22*(3), 497–513.