ESSAYS IN REAL ESTATE MARKET ISSUES

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A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in the
Department of Economics, Finance and
Legal Studies in the Graduate School
of the University of Alabama

TUSCALOOSA, ALABAMA

2012

ABSTRACT

This dissertation consists of three separate essays in the area of real estate. The first essay examines the continuing evolution of the Internet and the resulting effects on the efficiency of buyer search. The second essay evaluates the menu of alternatives for sellers of commercial real estate who encounter detrimental conditions. Finally, the third essay examines how publicly listed banks perform as sellers of commercial real estate as compared to non-bank sellers.

The first essay includes market conditions indicative of both a buyer's market and a seller's market. The results indicate that as Internet usage increased search duration increased, whether a buyer's or seller's market. This research finds that the Internet increased buyer search intensity only when market conditions are more favorable to buyers.

The second essay considers short sales, REO sales, and auction sales. Properties sold by each method are found to be significantly discounted relative to properties that are sold under normal conditions. REOs have the greatest discounts, followed by short sales, while properties sold at auction experience the smallest discount. Property characteristics, geographic contagion, market timing, and statutory rights of redemption are each found to have an impact on the relative pricing of properties sold under detrimental conditions, depending on the procedure.

The third essay examines how publicly listed banks perform when compared to non-bank sellers. The non-bank sellers include non-institutional sellers (individuals and developers), corporate sellers, REITs, and financial institutions (equity funds, insurance companies, investment managers, and pension funds). The results indicate that bank sellers do tend to sell

properties at a discount. Abnormal returns around the transaction date are estimated using a generated benchmark Bank companion Index and are found to be positive and significant. Determinants of these cumulative abnormal returns, assets, return on assets, Tobin's Q, coverage ratio, debt reduction, preferred dividends, and invested capital are considered. The return on assets and debt reduction are found to positively affect abnormal returns, whereas-invested capital is negatively related to invested capital.

DEDICATION

This dissertation is dedicated to my parents, Charles Barry and Rhonda Fran Richardson.

ACKNOWLEDGMENTS

I am thankful to have this opportunity to express my appreciation for all of the individuals who helped me with this dissertation. I would like to thank Dr. Leonard Zumpano, the chairman of this dissertation, for all of his help, knowledge, and guidance during the dissertation process. It is truly an honor to have him as an advisor.

I would also like to thank my other dissertation committee members, Dr. Billy Helms, Dr. Robert McLeod, Dr. James Cover, and Dr. Jon Wiley for their valuable comments and support. I am especially appreciative of the expertise and guidance Dr. Jon Wiley has provided me throughout the dissertation process. I am also grateful to Dr. Billy Helms for everything he has done for me throughout my college career. I owe a special thanks to Dr. Charles Leathers for always encouraging me to keep pursuing my goals and being a listening ear when needed.

I would like to thank my parents, Barry and Fran Richardson for their love and encouragement. I would not be where I am today if not for them. I would also like to thank my sister, Nicole Richardson for being a great friend as well as a sister. Finally, I would like to thank my fiancé, Jason Bono for always believing in me and for being my support system through the stresses of life. I love each of you more than you know.

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1. INTRODUCTION

This dissertation consists of three separate essays in the area of real estate. The first essay examines the continuing evolution of the Internet and the resulting effects on the efficiency of buyer search. The second essay evaluates the menu of alternatives for sellers of commercial real estate who encounter detrimental conditions. Finally, the third essay examines how publicly listed banks perform as sellers of commercial real estate as compared to non-bank sellers.

In the first essay, the question addressed is whether the continuing evolution of the Internet since the late 1990's has improved the efficiency of the residential real estate market. The expectation is that the evolution of the Internet as a search tool in the real estate sector has had efficiency effects for buyers of homes. The goal of this research is to further assess the efficiency effects of increased Internet usage and online innovations on the home buying process. Specifically, the objective is to determine if Internet usage in the home search process has reduced or increased the search time and intensity. In addition, this research explores whether the effectiveness of the Internet as a search tool is dependent upon economic conditions that prevail during the search period.

The purpose of the second essay is to evaluate different approaches to divesting of commercial real estate under detrimental conditions. Many empirical studies have focused on estimating price discount effects of liquidating real estate in the residential area. Relatively little analytical attention has been given to the price discount effects of liquidating commercial real estate and comparing alternative procedures. The price discounts for properties sold under

detrimental conditions such as short sales, REO sales, and auction sales relative to comparable properties sold under normal conditions are estimated. The impacts of property characteristics, geographic contagion, market timing, and statutory rights of redemption on the discount of properties sold with detrimental sales conditions are also considered.

Finally, in the third essay, the performance of publicly listed banks as sellers of commercial real estate is evaluated. Non-bank sellers typically purchase and sell commercial assets in similar quantities. By comparison, banks sell nearly nine times the quantity of properties they purchase. This suggests that many of the assets sold by banks were inherited through commercial loan delinquency proceedings. A bank seller has a potentially lower basis for assets acquired through borrower default. Yet traditional finance theory argues that this should be considered a sunk cost and only the opportunity cost – that is, the market value of the asset – is relevant for optimal investment/divestiture policy. In order to examine the research question, transaction prices for office properties sold by publicly listed banks are estimated and compared to similar properties sold by non-bank sellers. The categories of comparables are based on property age, size, class, and submarket. The sale prices and discounts for asset sales are estimated. A generated benchmark Bank companion index is then used to estimate abnormal returns over an intermediate horizon of one to sixty days after the transaction date. Abnormal returns over the intermediate-horizon are then estimated as a function of the following: assets, change in the return on assets from the quarter of the sale to the quarter following the sale, Tobin's Q, the coverage ratio, the change in debt reduction, the change in preferred dividends, the change in common dividends, and the change in invested capital.

2. Further Assessment of the Efficiency Effects of Internet Use in Home Search

2.1 Introduction

Over the past several decades, markets for residential properties have been impacted by developments in real estate marketing and finance that include policies of financial deregulation, innovations in information technologies, and financial innovations in the form of financial derivatives and mortgage contracts. Financial deregulation rests on the presumption that market competition will provide efficiency and market discipline will provide a form of natural regulation that assures a high degree of systemic stability but requires that buyers and sellers of properties, and lenders, borrowers, and investors are equally able to make informed decisions. Recent experience has amply demonstrated that financial innovations in products, mortgages and derivative instruments, and insufficiently regulated processes (the originate-to-distribute model of mortgages) have the potential to destabilize housing markets when information is either asymmetric or lacking. In contrast, any innovation that increases availability of information equally to all participants can be expected to lead to real improvements in efficiency. Unlike the other innovations that have impacted the housing market, the Internet as a search tool should increase efficiency in housing markets by providing information for both buyers and sellers without increasing financial instability.

The Internet has become a fundamental and indispensible tool in the home purchasing process. New products and innovations have increased Internet accessibility making it easier for individuals to quickly acquire information from anywhere and at any time. Real estate professionals and their firms now regularly incorporate Internet use into their daily operations,

creating websites with access to property listings, virtual tours, and other sales information such as neighborhood characteristics. The Internet also allows individuals not only to find information about houses for sale, but equally important, to find financial information about the availability and types of mortgage loans, and even initiate the process of applying for loans online. In 1999, only 37 percent of buyers searched online for a home.[1] According to the 2009, National Association of Realtors (NAR) Profile of Home Buyers and Sellers, 90 percent of home buyers used the Internet to search for homes, an increase of 30 percent over the last six years.

2.1.1 Statement of Purpose

As an economic concept, efficiency has multiple dimensions, with the time involved in searching and the costs incurred in the process being particularly important for potential buyers of residential properties.[2] In fact, as optimal search theory indicates, the search process occurs over two dimensions. One aspect of search is temporal, the time necessary to complete the search process. The other dimension of search is the intensity with which a search is conducted at any point in time. With optimal search, the buyer must reconcile the cost of sampling within a given period with the temporal costs associated with the extension of search to several periods. Across-period search costs result from the duration of search. Examples would include the out of pocket costs of conducting the search and the lost utility by postponing the consumption of the searched for product. Within-period search costs are the marginal costs of search, which include the expense of information collection and the costs of evaluating properties.

[1] See the 1999 article "Realtors See a Decade of Dramatic Development" at the NAR at their official website, realtor.com, which attracts 12 million visits every month.

[2] For search to be optimal the searcher needs to optimize over the two dimensions, searching sequentially over a number of time periods (across-period search) and to choose an optimal number of observations in each period. See Morgan and Manning (1985) for a detailed discussion of search theory.

Empirical evidence of efficiency gains from the use of the Internet as a search tool in home purchasing was first established by Zumpano, Johnson, and Anderson (2003). Based on 1999 survey data, they found that while the Internet as a search tool had not contributed to any reduction in buyer search time, there had been reductions in search costs, even when broker intermediation was involved in finalizing the sale. Additionally, this reduction in within period search costs encouraged greater search intensity. The question addressed in this research is whether the continuing evolution of the Internet since the late 90's has improved the efficiency of the residential real estate market. The expectation is that the evolution of the Internet as a search tool in the real estate sector has had efficiency effects for buyers of homes. Have Internet resources changed buyer's search, and if so, in what way? Has the greater availability and increased usage of the Internet actually shortened the home search process in addition to reducing search costs allowing homes to be on the market for a shorter period of time? Alternatively, has the abundance of information overwhelmed buyers with too many choices, extending the amount of time buyers spend looking for a home? Stated differently, has the Internet actually decreased market efficiency by increasing search costs?

The goal of this research is to further assess the efficiency effects of increased Internet usage and on-line innovations on the home buying process. Specifically, the objective is to determine if Internet usage in the home search process has reduced or increased the search time, and intensity of the search. In addition, this research explores whether the effectiveness of the Internet as a search tool is dependent upon economic conditions that prevail during the search period. Since the housing market boom and subsequent implosion occurred after the Zumpano et al. (2003) study, this research uses more current data to provide insights into whether the Internet as a search tool is more effective during a seller's or buyer's market.

Section 2.2 provides an update on Internet use in the housing market, followed by a brief literature review. Description of the data source and discussion of the methodology can be found in section 2.4 of the paper. The empirical findings from the research and discussion of the results are reported in section 2.5. In section 2.6, conclusions are presented.

2.2 Developments in Internet Use in the Housing Markets

The Internet has dramatically changed how real estate companies conduct their daily business and how consumers purchase and benefit from products and services. Information regarding the real estate sector provided on the Internet has transformed the industry and has proven to be a major tool for home buyers and sellers. Real estate professionals, who at first feared the Internet as competition, are now increasingly incorporating information technology into their businesses using websites that allow anyone with a home computer or cell phone the ability to access real estate sales information. Buyers, sellers, borrowers, and lenders are no longer as dependent on real estate service providers when they are able to acquire market information, sometimes cost free, online (Ts and Webb 2002). Gee (2010) suggests that the reduction and possible elimination of some professional real estate broker services is due to the Internet, devaluing the services that were once only obtainable through real estate brokers and sales associates.[3] Although the scope of their services may have narrowed, brokers can still offer valuable services to buyers and sellers by answering technical questions about houses, assisting with buyer financing, offering third party negotiations, and staging properties.

[3] Before the Internet, buyers searched for homes in classified listings in newspapers and/or contacted brokers for assistance in the search process. Buyers relied on references from family members, friends, co-workers, attorneys, mortgage lenders, and advertisements by brokerage offices when deciding on an agent to use. The agent then assessed the buyer's affordable price range, type of home desired and favored neighborhood locations. The agent would then research property listings on a proprietary MLS database, create a list of suitable properties, and take potential buyers on a tour of listed homes. To finance the home purchase, the buyer would apply for a mortgage loan by contacting a bank, typically requiring other services such as title insurance, property insurance, home inspection, and appraisal. The providers of these services were typically found by recommendations.

2.2.1 Internet Search Engines

Many of the activities related to the home buying process have been made easier and more direct with the arrival of the Internet. Home buyers can explore various websites to find a home anywhere in the world. Buyers can also use the Internet to shop around for the best type of mortgage loan with the most favorable interest rate, obtain loan preapproval, and ultimately receive mortgage financing. In addition to mortgage financing, buyers can also access other real estate services and products such as home inspectors, property appraisers, attorneys or escrow agents, and title insurance online. Innovative search engines with customizable searches have allowed prospective buyers to obtain more information about the housing market and to specify price range, location, architectural style or type, and number of bedrooms and bathrooms. These search engines provide pictures of the listed properties, virtual tours, mortgage calculators, neighborhood maps, local schools information, comparative sales data of homes similar to the listed property that were sold recently, property taxes, and possibly the previous sales price paid by the current home owner along with links to home inspectors, title insurance, mortgages, appraisals, and movers. Some websites offer property listings nationally; others only provide information for regional or local areas. Several sites offer free access require free registration while other sites, offering searchable public records databases, are managed by city and local county governments (Gee 2010).

Many sites function only as a real estate portal, typically easy to navigate with category headings and menu buttons leading to property listings, advice, and other useful tools. Home market valuations may also be offered. MLS websites have listings posted by brokers and agents who are members of the organization that maintain the MLS. These listings have a specific MLS identification number, and the websites frequently require free registration. Sellers attempting to

market their properties without broker assistance can advertise their listings on for-sale-by-owner websites (FSBOs). There are also websites that offer sellers the option to list their homes with limited service brokers, also known as fee-for-service, which allows them to choose the amount and type of services they want an agent to do on their behalf on a fee for service basis (Gee, 2010). Table 2.1 provides a list of real estate search engines and websites along with a brief description of each site.

2.3 Review of the Literature

There is a relatively small body of literature on the use of the Internet in the residential real estate market. Some of this research (Benjamin et al., 2005; Tse and Webb, 2002) examines the Internet as a marketing and communications tool and its impact on the revenues, net income, and net profit margin of residential real estate brokerage firms.[4] Since our principal concern is the impact of the Internet on the efficiency of search, the review is limited to these studies.

Ford et al. (2005) use 48,280 MLS listings of residential properties in Collin, Dallas, Denton, and Tarrant Counties during the January 1,1999 to December 31, 1999 period to study the marketing time and price of properties that are listed on both the Internet and multiple listing services. The authors use a two-stage Heckman procedure with a first stage probit equation estimating the whether the property is listed on the Internet and a second stage least squares

[4] Benjamin et al. using a database from the National Association of Realtors (NAR) 2001 survey and factor loadings find that the use of the Internet is positively related to the financial performance of residential brokerage firms, franchise affiliation, and affiliation with a referral/relocation network and firm size, but it is negatively associated with firm age. Tse and Webb (2002) investigate the effect of monthly web page views on the number of transactions for a large brokerage firm in Hong Kong between January 1996 and April 1999, holding constant advertising expenses and the number of firm branches. Their results imply that the firm's total revenues are impacted by a firm's decisions about Internet use. Specifically, they find a 1 percent increase in the number of page views leads to about a 0.2 percent increase in the number of transactions per staff member and a 1 percent increase in page views increases the agent's commission by about 0.4 percent. Bristow et al. focuses on the relationship between a broker's internet savvy and performance.

estimation of marketing time and selling price in a simultaneous framework. They find that properties listed on the Internet take slightly longer to sell, that is an 6 extra days for marketing time, and also sell for slightly higher prices with a premium of approximately $2,900 over the average house price.

In a 1995 study Baryla and Zumpano find that the use of real estate brokers reduced search duration, exactly what effective market intermediaries should do. Subsequent research by Elder, Zumpano, and Baryla (1999) reveals that brokers, by reducing the costs of within-period search, increased buyer search intensity, which, consequently reduced search duration.

Zumpano, Johnson and Anderson (2003) examine the factors that influence the use of the Internet by buyers as part of the home buying process. They use 1999 data from the National Association of Realtors 2000 Home Buying and Selling Survey, a nationwide survey of recent home buyers and sellers. A Heckman two stage procedure is employed to model the decision to use the Internet as a buyer search tool and to assess the resulting impact on search duration and intensity. In the first stage, a probit equation is employed to model Internet use as a function of various buyer characteristics (income, age, ask price, distance of relocation, corporate movers, first-time homebuyers, broker usage, first learned about the property from a broker, and city). In the next stage, ordinary least squares (OLS) was used to estimate the two aspects of buyer search – search duration and search intensity.

The results from the first stage probit equation of the study are consistent with the expectations of search theory. Out-of-town buyers facing higher information costs are found to be more likely to use the Internet to help in the search process than local home buyers. Younger buyers, typically more familiar with computers, are also found to be more likely to use the Internet as part of their search process than were older consumers. The higher the seller's asking

price, the more likely the buyers are to rely on the Internet in their home search. The expectation that as income (a proxy for the opportunity cost of search) increases, the probability of Internet use increases, however, did not hold for every income level. Use of the Internet appears to be a complement rather than a substitute for employing the services of a real estate broker. First-time home buyers, who could be assumed to be less experienced and less knowledgeable about the home buying process, appear to be more likely to use the Internet as part of the search process than more experienced home buyers.[5] Employer mandated relocation did not impact the use of the Internet. Middle-aged buyers also searched longer than younger buyers.

The key finding of the Zumpano et al. (2003) study is that use of the Internet as a search tool did not lower search time, but Internet use did encourage buyers to search more intensively.

Li and Motiwalla (2009) examine the influence of the Internet on housing prices and its effect on the real estate brokerage industry by analyzing the price difference between houses sold with a broker and those sold by the owner using the Internet. A house is defined as being sold and bought online if the buyer finds sale information directly from the seller's listing posted on the Internet, with the sale and purchase transaction made without broker involvement. A hedonic pricing model is used to investigate the hypothesis that the price of a house sold online should be lower than that of a comparable house sold through a broker because information and transaction costs are lower without the use of a broker. Using a sample set of 188 house records from three towns in Massachusetts, collected from property records maintained in three town halls, they find that the price of a home sold online is, on average lower, than a comparable home sold with a broker; however, this finding was not statistically significant.[6] The authors note that the

[5] First-time home buyers typically searched longer and less intensively than experienced home buyers.

[6] Zumpano, Elder, and Baryla (1996) found that after correcting for selection bias there was no difference in the selling price of comparable homes whether the transaction was broker-assisted or a sale by owner (FSBO).

common practice in real estate of the buyer's agent and the seller's agent to split the commission implies that the transaction cost for buying and selling the property is about the same in this situation. In contrast, they find an asymmetric distribution of benefits, with sellers receiving a bigger portion of the cost savings derived from homes sold online.

Littlefield, Bao, and Cook (2000) design a survey that examines consumers' Internet when searching for a home. The authors use OLS multiple regression to analyze the data and test various hypotheses regarding the home buyers' use of the Internet for real estate related services. Awareness of Internet real estate information, access to Internet, and perceived effectiveness of Internet in home purchase are found to be important factors in determining consumers' use of Internet during home search. As was the case in other studies, older buyers are less likely to use the Internet. The same is true for buyers who indicated satisfaction with broker services. The effect of Internet use on the duration of the home search, however, is not studied.

2.4 Data and Methodology

Data for the study comes from large nationwide surveys of recent homebuyers and sellers conducted by the National Association of Realtors in 2006, very much a seller's market, and 2009, when the housing market was in decline. In August 2006, the questionnaire was mailed to 129,500 consumers who purchased a home between July 2005 and June 2006. The NAR received 7,548 completed surveys for 2006. The 2009 survey was mailed in July 2009 to 120,038 consumers who purchased a home between July 2008 and June 2009. The NAR received 9,138 completed surveys. Elimination of incomplete, and/or contradictory survey responses left a total of 5,267 completed 2006 questionnaires and 7,104 completed 2009 questionnaires.

The 2006 NAR survey consisted of 101 separate questions, and the 2009 NAR survey consisted of 116 separate questions. Many of these questions are not relevant to the research question at hand. The variables included in this study are based on the Zumpano et al. (2003) analysis which uses search theory and the findings of earlier studies to identify potential determinants of buyer search.

2.4.1 Internet Use

The appropriate method for modeling the decision to use the Internet as a buyer search tool and the resulting impact on search duration is the Heckman two-stage procedure. In the first stage, probit estimation is used to model Internet use as a function of various buyer characteristics. Buyer income is used to measure the opportunity cost of search. Earlier research[7] shows that higher income sellers are more likely to list their properties with real estate brokers in the hope of reducing selling time and, hence search costs. Will higher income buyers react in the same way to Internet intermediation, as with real estate professionals to reduce search costs? The data limited the ability to account for buyer income using a continuous variable; therefore, (IncBtw3585K) and (IncOver85K) correspond to the middle and upper income buyers are incorporated into the model with lower income buyers (IncUnder35K) as the base case. As earlier research suggests, younger buyers are more familiar with obtaining and using information provided by the Internet, whereas this has not been the case with older buyers. (Btw3550) and (Over50) correspond to buyers between the ages of 35 and 49 and buyers over 50 years of age, respectively. Under35, denotes buyers below age 35; it is used as the base case and is therefore omitted.

[7] See Zumpano, Elder, and Baryla (1996).

Internet usage could also be affected by the price (AskPrice) of the home because search theory implies that buyer search increases (both duration and intensity) when faced with higher prices. The Internet can be used to identify lower priced homes without a significant increase in search costs. Out-of-towners have high across period search costs and much less familiarly with local market conditions; hence we suspect that as the distance between new and previously occupied property increases so will Internet use. The (Btw16100) variable represents buyers who purchase a new home that is between 16 and 100 miles from their previous home; the (Btw101500) variable represents buyers who purchase a new home that is between 101 and 500 miles from their previous home; and, the (Over500) variable represents buyers with new home purchases over 500 miles from their previous home. The base case, Less15, represents buyers who purchased a new home less than 15 miles from their previous home; it is excluded from the model. In addition to the distance of the move, buyers that have to move due to job related circumstances (EM) may be less sensitive to search costs and home prices if their employers are paying for the move and subsidizing the purchase. Alternatively, if these search costs are not subsidized and if employees are moving to more expensive markets, use of online search tools may increase. Homebuyers who are purchasing a home for the first time (Firsthome) may be more likely to use the Internet to obtain information because they do not have prior home ownership and home purchase experience.

Categorical variables, indicating whether the buyer used a broker to purchase a home (Broker), and (Flbroker), designating if a buyer first learned of their purchase from a broker, are employed to investigate how real estate broker assistance affects the probability that buyers will use the Internet to search for a home.

Buyer location (City) could also affect whether or not the Internet is used in the search process. More available Internet listings are likely for properties in more urban areas than properties in more rural settings. Occupation, sex, and marital status may also influence Internet usage but this data was not available to include in the analysis.

Explicitly, the Netused probit model is defined as:

$$(1)\quad \text{Netused} = \beta_0 + \beta_1\text{LnAskPrice} + \beta_2\text{Btw3550} + \beta_3\text{Over50} + \beta_4\text{IncBtw3585K} + \beta_5\text{IncOver85K} + \beta_6\text{Btw16100} + \beta_7\text{Btw101500} + \beta_8\text{Over500} + \beta_9\text{Firsthome} + \beta_{10}\text{Em} + \beta_{11}\text{Broker} + \beta_{12}\text{Flbroker} + \beta_{13}\text{City} + \varepsilon$$

2.4.2 Duration and Intensity

The buyer's search process is likely to be influenced by many of the same variables that impact Internet use. Including the Inverse-Mills ratio (IMR) from the first stage probit equation helps to test for the presence of sample selection bias and, if present, control for its effects.

One would anticipate that the further away the new home is from the home buyer's previous home, the greater the across-period search cost due to ignorance of local market conditions and the additional costs of the search such as hotels or lost pay from taking time off from work. Therefore, search duration should decline the greater the distance from the buyer's home. A household relocating to a distant location has to travel a longer distance to search for a new home, would face higher costs to search over extended periods. This suggests that search intensity should rise as duration costs increase because of the additional costs that would be incurred by having to make more than one and possibly prolonged trips to the new location.[8]

[8] Ihlanfeldt and Mayock (2010) find that the bargaining power of buyers from outside the local market compared to that of local buyers is weak due to greater search costs and not knowing as much about the local market. Since price expectations are connected to prices previously paid by the buyers, buyers coming from higher priced markets tend to pay more for their new home.

If true, the distance variables (Btw16100, Btw101500, and (Over500) should have a negative sign in the duration estimation and a positive sign in the intensity estimation.

The Internet (Netused) could, at least in part, be a substitute for actual physical search, serving as a pre-screening device to narrow down search time. If the Internet lowers within period costs, it should sign positive and significant for search intensity, which could then reduce duration. On the other hand, it is possible that the Internet could also reduce search intensity as search can be conducted less costly and in a more leisurely manner online, which could extend duration.

Employer-mandated moves (EM) are expected to be inversely related to search duration because the opportunity costs of relocating workers are usually paid for by the employer; doing so by searching more intensively. Buyers should search longer when confronted with higher asking prices (LnAskPrice) because the home buyer would experience greater savings by searching for a lower priced home. If a buyer first learned about the home purchased through broker intermediation (Flbroker), it could reduce the length of search. The sign of Firsthome will depend on whether less knowledgeable first-time homebuyers search longer than more experienced and savvy home buyers. It is also uncertain whether first-time home buyers will search more intensively than previous owners. If they are not as familiar with the search process, they could actually search less efficiently and, hence, less intensively.

The buyer's income is used as a proxy for opportunity cost of the search and should be negatively related to search duration. One would also suspect that more affluent buyers will search more intensively as the means of reducing search time. The coefficients for the distance variables and the employer mandated variable should be positively related to search intensity when buyers are faced with higher across higher across-period costs. The same set of variables

is not used in the first and second stage estimations. Methodologically, at least one predictor in the Internet use equation should not appear in the second stage equation, and this variable should be statistically significant in the first stage, but insignificant in stage two. Therefore, the broker variable has been excluded from the duration and intensity equations because it was statistically significant in the first stage, but insignificant in stage two. The search duration and intensity equations are defined as:

$$\text{(2,3)}\quad \text{Duration/Intensity} = \beta_0 + \beta_1 \text{LnAskPrice} + \beta_2 \text{Btw3550} + \beta_3 \text{Over50} + \beta_3 \text{Btw3585K} + \beta_4 \text{Over85K} + \beta_5 \text{Btw16100} + \beta_6 \text{Btw101500} + \beta_7 \text{Over500} + \beta_8 \text{Firsthome} + \beta_9 \text{Em} + \beta_{10} \text{Flbroker} + \beta_{11} \text{Netused} + \beta_{12} \text{City} + \beta_{13} \text{IMR} + \varepsilon$$

Tables 2.2 and 2.3 provide variable definitions and summary statistics for the samples.

2.5 Empirical Results

The summary statistics in Table 2.3 indicate that buyers searched longer and more intensively in 2009 compared to 2006, which is generally considered be a seller's market. These results may reflect, at least in part, differences in both prevailing market conditions and consumer expectations. In 2006, home prices were rising so rapidly that buyers may have reduced their search time and intensity in order to buy a home before it became prohibitively expensive. In contrast, search intensity and duration increased when facing lower prices in the 2009 buyer's market. There were a lot more homes on the market at the end of the decade so the probability of finding a less expensive house was higher than during the seller's market in 2006. Where buyers had to act quickly in 2006 to avoid accelerating home prices, in a buyer's market there are many more houses on the market and search can be more leisurely since prices are

falling. While search behaviors may be influenced by market conditions it doesn't mean search is less efficient.

2.5.1 Internet Use

The estimates from the Netused probit equation are found in Table 2.4. Interestingly, the results are similar for both the seller's market (2006 data) and the buyer's market (2009 data). Older buyers were less likely to use the Internet when searching for a home than were younger house hunters. As theorized, out-of-town buyers having higher information and search costs were more likely to use the Internet in their search process. Moreover, the higher the asking price the more probable the Internet would be employed to search for lower priced homes. The Internet was also more likely to be used in the search the greater the distance between the new and old home.

As anticipated, as income increases the likelihood of Internet use increased. Employer-mandated moves as well as broker assistance increased the possibility that the Internet will be used to find a home. Not surprisingly, however, buyers who first learned of their home purchase from a broker were less likely to use the Internet as a search tool. Despite differing market conditions the factors influencing Internet use remained virtually unchanged. One difference is that in the 2009 buyers market first-time buyers were more likely to use the Internet as a search tool than was the case in the 2006 seller's market (the first-time buyer variable was insignificant). These results may reflect the fact that in 2006 buyers had to act quickly to avoid accelerating home prices, working directly with brokers rather than search on their own in order

to expedite the purchase. In the 2009 buyer's market, there were many more houses on the market and search can be undertaken more leisurely whether using a broker or not, since prices were falling and the opportunity costs of search were lower than in 2006.[9]

2.5.2 Search Intensity/Duration

The results from the second stage OLS are found in Tables 2.5 and 2.6. The Inverse-Mills ratio was statistically insignificant indicating that there was no sample selection bias problem in either the duration or intensity equations, and these equations were re-estimated without the IMR variable.[10]

The duration results were the same in 2006 and 2009 despite differing market conditions. Confronted with higher prices, all buyers searched longer whether a buyer's or seller's market, with first-time home buyers (FirstHome) searching longer than experienced home buyers. Older home buyers, who were less likely to use online search tools, also tended to search longer than younger buyers as measured in weeks. The higher the home buyer's income the shorter the time spent searching for a home, but these variables (IncBtw3585K and IncOver85K) proved to be statistically insignificant. Since income was not a continuous variable, these results may be due to the way these variables were defined.

Homes further than 100 miles away (Btw101500 and Over500) and with employer mandated moves tended to decrease the search duration. Buyers who first learned of their home purchase via a broker (Flbroker) spent less time searching for a home, and buyers who used the Internet as a search tool (Netused) tended to extend the length or duration of search. These

[9] We estimated a bivariate probability model of net use where the dependant variables were Netused and Broker. No important differences were noted from the original model estimated in this paper.

[10] We also estimated the duration using the Weibull distribution. In the absence of selection bias the use of the Weibull allows for different assumption regarding the probability of finding a home over time. The results were the same as in the OLS model.

results seem intuitive given that for brokers time is money and the quicker they can expedite a sale the greater their income. Online search is far less costly for the buyer even if it extends search duration.

First-time home buyers searched less intensively in 2006 whereas the number of home visits per week increased in 2009; the latter result, however, was statistically insignificant. Buyers who used the Internet decreased their search intensity in the 2006 seller's market, but the same type of buyers searched no more intensively in the 2009 buyer's market than other buyers, indicating that market conditions do impact on some aspects of buyer search behavior. In 2006 Internet search would have revealed high and rising prices. Rising prices may have actually discouraged these buyers from visiting more properties per week. It is also true that Internet use also increased duration at a time when the longer the search the greater the cost incurred by buyers as prices rose rapidly.

In both years, search intensity decreased as the age of the buyer increased which is consistent with the longer search duration of older home buyers. Buyer search intensity increased with buyer income, no matter the market conditions, but this variable proved to be statistically insignificant in both 2006 and 2009.

Additionally, homes further than 100 miles away and employer mandated moves caused search intensity to increase. The greater the distance from their previous home, the more intense the search whether a buyer's or seller's market as these buyers are seeking to avoid high across period search costs. Buyers who first learned of their purchase from a real estate broker were also more likely to look at more homes per week than those who did not use the services of a broker.

2.5.3 Comparison with Earlier Findings

The estimations from the second stage estimations of the earlier Zumpano et al. (2003) paper are found in Table 2.7. Comparison of the effects of the variables on search duration and intensity from the 1999, 2006, and 2009 data are presented in Table 2.8. It should be noted that in order to correctly estimate the search duration and intensity equations for the 2006 and 2009 data, the broker use variable was omitted in the second stage whereas in the 1999 data the city variable was omitted from the second stage estimations. [11]

In addition, due to data limitations and slight differences in the form of the answers to the questionnaire, the 2006 and 2009 variable names are somewhat inconsistent with that of the 1999 variable set. The Btw4070K and Over70K variables, listed with the 1999 data, represent buyers with incomes between 40,000 and 70,000 and over 70,000 respectively. The 1999 data also allowed distance to be defined as a continuous rather than categorical which was not possible with the 2006 and 2009 data.

Table 2.8 reveals no major differences in the relationships between the independent variables and search duration in any of the periods. The Netused variable had no insignificant impact on search time in 1999, but it was positive and statistically significant in 2006 and 2009. Whereas web assisted search was limited in 1999, the growing use of the Internet as a home search tool actually increased the length of time consumers spent searching for a home as we moved into the 21 century.

Across the different time periods, there were also changes in the relationships between some of the regressor variables and search intensity. The asking price positively affected search intensity in 1999 and 2009, but negatively affected search intensity in 2006. This suggests that

[11] We ran separate estimations of duration and intensity for 2006 and 2009 which included the broker use variable and omitted one of the income dummies. The results were basically unchanged.

individuals searched more intensively when market conditions were more favorable for buyers, that is, when prices were lower and supply availability was greater. Additionally, there were differences in the Netused variable. The use of the Internet increased search intensity in 1999 and 2009. Search intensity decreased in 2006, indicating that online buyers search less intensively in a seller's market.[12]

2.6 Conclusion

This study empirically examines whether the evolution of the Internet since the late 1990's has improved the efficiency of the real estate market. The summary statistics indicated, as expected, that search duration is longer in a buyer's market compared to seller's market. Buyers can afford to search longer during periods of falling prices, but reduce search time in the face of rising prices.

The findings from the Netused probit model were consistent with earlier research. The same factors that influenced net use in 1999 still have the same effect today. The results show that older buyers and buyers who first learned of their home purchase from a broker were less likely to use the Internet in their search process, no matter the state of the market. However, as anticipated the Internet was more likely to be used by buyers facing higher prices, employer mandated moves, and by buyers searching over greater distances. These results were not affected by differing market conditions.

In the second stage estimations, the Netused variable was positive and statistically significant in both the 2006 and 2009 duration equations. Importantly, this variable was

[12] To investigate whether the differences in the Internet use were impacted when buyers also employed the services of a broker each data sample (the 2006 and 2009 samples) was split to reflect transactions that were broker-assisted and where no broker was used by the buyer. Results (unreported) from these estimations were virtually the same as for the full sample estimations.

statistically insignificant in the 1999 study, when Internet use was not as widespread. Home buyers using the web searched longer whether a buyer's or seller's market.

Buyers using the web as a search tool looked at fewer homes per week in 2006, but searched more intensively when conditions were more favorable to buyers. Netused in the intensity equations was positive and significant in both 1999 and 2009. Given the idiosyncratic nature of the housing bubble, the inverse relationship between intensity and Netused in 2006 may not hold in more typical, less extreme seller's markets. In 2009, the Internet enabled buyers to search more intensively while greater availability and more affordable choices encouraged buyers using the Internet to search longer.

It is interesting to speculate whether that the efficiency implications of search duration have been changed by the growing use of the Internet. Earlier research has shown the broker intermediation increased buyer search intensity which resulted in a reduction in search duration. That search duration is longer with web use is not necessarily a measure of market inefficiency to the extent it reduces within-period search costs (information collection and the costs of visiting properties); by increasing search intensity it would act to lower total search costs. This would be efficiency enhancing so long as the reduction of within period search outweighs the increase in across-period search costs. However, it is possible that consumers do not correctly assess within-period search costs when using the web, given that such search can be conducted leisurely from the comfort of their homes. Failing to adequately account for the time online could prolong search. It may also be true that for some buyers surfing the web for a home is a source of entertainment, which could work to lengthen search time. This might even be efficient if the satisfaction derived from online search outweighs the opportunity cost of the lost utility

associated with delaying consumption of the product for which they are searching. Online search would also be efficiency enhancing if it enabled buyers to negotiate lower prices than other search methods.

One last possibility is that there is now so much housing information available on the web that buyers may actually be facing rising information and data collection costs. If not sensitive to such an information overload such search could reduce search efficiency if the only thing web search does is prolong search. For example, many buyers use the web as a pre-screening device and then contact a broker to physically inspect the most promising properties. If the time spent online by a buyer did not reduce search time or result in the buyer finding a lower priced home, this would be inefficient as the buyer undertook work for which she was not compensated, a concept sometimes referred to as "shadow work.[13] If the Internet does prolong search time without a commensurate increase in benefits it may also be inhibiting the market clearing process, certainly increasing holding costs for sellers. The next research question that needs to be addressed before anything more definitive can be said about the impact of the Internet on the efficiency of search is whether buyers who used the web were more satisfied with their purchase than those who used other forms of intermediation such as real estate brokers, auctions, or, alternatively, dealt directly with sellers.

[13] The expression "shadow work" was first coined by Ivan Illich in his book of the same name in 1981. In a real estate context, if buyers do some of the work that a real estate broker would otherwise have undertaken this is shadow work. Open Forum Series from Morgan Boyars Publishers, Ltd., 2000.

Table 2.1 Real Estate Search Engines

Website	Description
U.S. Property Listings	
Domania.com	Regional & local realtor listings; buyer submits contact information & agent contacts the buyer
Foreclosure.com	Lists properties in pre-foreclosure, foreclosure, and bankruptcy
HomeGain.com	Listings on resale homes, new construction, & foreclosures; offers free home value estimate & assistance with finding a local real estate agent
HomePages.com	Provides tips on home selling, home buying, & mortgage loans; searches through independent broker & MLS websites; generates revenues from agents with customer referrals from its site
Homes.com	Listings of existing homes, new construction properties, & foreclosures along with information on how to buy a home & find a mortgage
HomeSalez.com	Listings of FSBO & agents in the US, Canada, Australia, New Zealand, and the United Kingdom
Homescape.com	Regional MLS listings & a pathway to local real estate classifieds from websites of newspapers
HomeSeekers.com	Allows searches in Spanish & French as well as English; provides resources on demographics, family statistics, crime, educational attainment, economic data, climate, & health-related figures
Move.com	Listings for new construction homes & rentals; articles about getting a mortgage, home equity loans, & refinancing; & many financial calculators
NeighborhoodScout.com	No property listings; provides interactive maps to find the best school districts, lowest crime areas, & highest rated home-appreciating neighborhoods anywhere in the US
RealEstate.com	MLS property listings are plotted on an interactive map; offers instant home valuation estimate on a single property without contact from an agent
Realsites.com	Serves as a listing service for properties, real estate services, & classified ads around the world
RealtyTrac.com	Specializes in foreclosure listings in all 50 states; FSBOs can post listings as well
Rebuz.com	Directory for consumers to find various real estate associations, architects, appraisers, commercial & residential financing, & additional ancillary services & products
ResidentialNYC.com	Carries listings for condominiums, cooperatives, & houses in New York City
Trulia.com	Listings for resale, new construction, & foreclosures across the country; contains real estate guides for all cities in all states; provides current & historical average sales prices of properties
Zillow.com	Listings for new homes, resales, & foreclosures across US with historical sale price & date of last sale records
MLS Websites	
AtlMLS.com	MLS listings for properties in Atlanta, GA & surrounding areas
MLSLI.com	MLS listings on Long-Island, NY with neighborhood & school information & searches in many languages
MLSListings.com	MLS listings in the Silicon Valley & surrounding neighborhoods
Realtor.com	NAR website; listings for sales & rentals in all 50 states plus Puerto Rico, Guam, & Canada; supplies consumer tips
Realtor.ca	MLS listings across Canada
National Chain Franchises	
Century21.com	Listings in US, Asia, Africa, Middle East, Europe, & South America with advice on buying, selling & closing
ColdwellBanker.com	Listings in US, Europe, Australia, Asia, South America, & the Caribbean; offers buying & selling advice in many professionally produced videos
ERA.com	Listings in US, Asia, Middle East, Europe, & the Caribbean searchable in English or Spanish; offers services for mature markets customers & relocation for military clients
ReMax.com	Listings in US, Canada, Mexico, Australia, Europe, Asia, Africa, South America, Central America, Caribbean, & Middle East; searchable in many languages
For-Sale-By-Owner (FSBO)	
Allthelistings.com	Designed for direct sellers; buyers can browse listings in the US & Canada
Realestate.Yahoo.com	Listings posted by real estate agents & FSBOs; listings for resale, new construction & foreclosure properties in US; provides many resources for consumers; listing fee is charged
Craigslist.org	Sale & rental classified ads posted by agents, FSBOs, landlords, & property management companies viewable for 7 days; no-fee to list a property
ForSaleByOwner.com	Fee-based site for FSBOs; listings in US & Canada; provides articles on market conditions, buying, & selling
ForSaleByOwnerCenter.com	No-fee FSBO site with only US properties; also contains 26 financial calculators
FSBO.com	Fee-based site; sellers can advertise properties for up to 9 months; optional flat fee for listing on MLS; listings in US, Canada, & Mexico
FSBOfreedom.com	No-fee for listing; provides resale & foreclosure listings in the 50 states posted by FSBOs
Owners.com	No-fee for listing; flat fee for listing on MLS; open forum for direct sellers to ask questions & share advice
Limited Service and Discount Brokers	
Assist2Sell.com	Discount broker offering low flat fees for full services to sellers; listings in 44 states & Canada; optional MLS
HouseRebate.com	Full service discount broker based in San Diego, CA; commission rates start at 4.5% to home sellers; buyers can get up to 1% rebate of the purchase price
Redfin.com	No upfront services; agents are direct employees; requires buyers to browse properties on its site, once a buyer finds homes of interest, agent will take buyer on tours, conduct negotiations, & assist with closing; 2/3 of commission paid to buyer's agent is refunded with a rebate to the buyer upon closing; sellers charged $4000 for MLS listing for marketing, professional photos, conducting a market analysis, & negotiations
ZipRealty.com	No upfront discounts; sellers can save up to 25% of commission through rebates & buyers can get back about 20%; provides comparables over the past 3 months, date of sale, home age, square footage, & number of bedrooms & bathrooms

*Information from H. Gee

Table 2.2 Variable legend

Variable	Definition
TTB	Buyer search time in weeks
Visits	Number of properties physically visited by buyer prior to final purchase
Intensity	Visits/TTB, i.e. the average number of properties visited per week
AskPrice	Asking price of purchased property
Under35	One if the buyer's age is less than 35 years, zero otherwise
Btw3550	One if the buyer's age is between 35 and 50 years, zero otherwise
Over50	One if the buyer's age is over 50 years, zero otherwise
IncUnder35K	Buyers whose annual income is less than $35,000
IncBtw3585K	Buyers whose annual income falls between $35,000 and $84,999
IncOver85K	Buyers whose annual income is $85,000 or more
Less15	One if distance in miles between new and previously occupied property is less than 15, zero otherwise
Btw16100	One if distance in miles between new and previously occupied property is between 16 and 100, zero otherwise
Btw101500	One if distance in miles between new and previously occupied property is between 101 and 500, zero otherwise
Over500	One if distance in miles between new and previously occupied property is over 500, zero otherwise
Firsthome	One if property purchased is buyers' first, zero otherwise
Em	One if buyers' move was job related, zero otherwise
Broker	One if buyers purchased property with the aid of a broker, zero otherwise
Flbroker	One if the buyers first learned of their purchase via a broker, zero otherwise
Netused	One if the buyers employed the Internet to aid their search, zero otherwise
IMR	Inverse-Mills ratio from first stage probit
City	One if buyers purchased property in a city neighborhood, zero otherwise

Table 2.3 Summary Statistics

	Entire 2006 Sample			*Entire 2009 Sample*			*Difference in Means*	
Variable	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**	**t-stat**	**p-value**
TTB	13.51073	8	16.94572	18.4800	12	20.4725	14.35	<0.0001
Visits	3.96188	4	1.70204	19.47255	15	18.38416	61.04	<0.0001
Intensity	0.77502	0.5000	0.94518	2.304467	1.25	3.754871	28.86	<0.0001
AskPrice	284057.5	217500	269227.8	257474.67	200000	215932.6	-6.09	<0.0001
Under35	0.38789	0	0.48731	0.4459459	0	0.4971046	6.48	<0.0001
Btw3550	0.34251	0	0.47459	0.3240428	0	0.468049	-2.16	0.0310
Over50	0.26998	0	0.44399	0.2300113	0	0.4208691	-5.10	<0.0001
IncUnder35K	0.11145	0	0.31472	0.0958615	0	0.2944219	-2.83	0.0047
IncBtw3585K	0.49687	0	0.50004	0.4866273	0	0.4998563	-1.13	0.2600
IncOver85K	0.39168	0	0.48817	0.4175113	0	0.4931834	2.89	0.0038
Less15	0.55572	1	0.49693	0.613598	1	0.4869588	6.48	<0.0001
Btw16100	0.22954	0	0.42058	0.2149493	0	0.4108161	-1.93	0.0532
Btw101500	0.07708	0	0.26675	0.0608108	0	0.2389998	-3.56	0.0004
Over500	0.13765	0	0.34456	0.1106419	0	0.3137102	-4.54	<0.0001
Firsthome	0.39567	0	0.48904	0.4984516	0	0.5000328	11.41	<0.0001
Em	0.13670	0	0.34356	0.0981137	0	0.2974893	-6.67	<0.0001
Broker	0.65578	0	0.47516	0.6037444	1	0.4891531	-5.92	<0.0001
Flbroker	0.41485	0	0.49274	0.3814752	0	0.485783	-3.76	0.0002
Netused	0.86444	1	0.34235	0.9310248	1	0.2534298	12.43	<0.0001
City	0.18018	0	0.38437	0.185107	0	0.3884117	0.70	0.4834
IMR	0.34216		0.04598	0.315042		0.0382057		
N	5267			7104				

Table 2.4 First stage probit

2006 Sample				
Predictor	**Coeff.**	**Std. Err.**	**Z**	**P**
Constant	0.236245	0.5116178	0.46	0.644
LnAskPrice	0.0750262	0.0426206	1.76	0.078
Btw3550	-0.3548398	0.0633049	-5.61	0.000
Over50	-0.9625638	0.0661514	-14.55	0.000
IncBtw3585K	0.3314726	0.0698783	4.74	0.000
IncOver85K	0.4756859	0.0843038	5.64	0.000
Btw16100	0.1272944	0.574858	2.21	0.027
Btw101500	0.2538924	0.1032972	2.46	0.014
Over500	0.3353907	0.085849	3.91	0.000
Firsthome	-0.079729	0.0589173	-1.35	0.176
Em	0.3114555	0.0982686	3.17	0.002
Broker	.1827139	0.0476191	3.84	0.000
Flbroker	-0.3470622	0.0467292	-7.43	0.000
City	0.0927452	0.061423	1.51	0.131
N	5267			
Log Likelihood	-1854.4736			
Obs with Dep = 1	4553			
Obs with Dep = 0	714			
2009 Sample				
Constant	-0.6069629	0.55743	-1.09	0.276
LnAskPrice	0.19007	0.0470865	4.04	0.000
Btw3550	-0.4487993	0.075018	-5.98	0.000
Over50	-1.158632	0.0770615	-15.04	0.000
IncBtw3585K	0.317694	0.0740531	4.29	0.000
IncOver85K	0.5517129	0.0901922	6.12	0.000
Btw16100	0.0565125	0.06435	0.88	0.380
Btw101500	0.1873284	0.1167632	1.60	0.109
Over500	0.4433946	0.0992183	4.47	0.000
Firsthome	0.1196499	0.0657478	1.82	0.069
Em	0.2117482	0.1244409	1.70	0.089
Broker	0.1866296	0.0515926	3.62	0.000
Flbroker	-0.5156304	0.051615	-9.99	0.000
City	0.024225	0.0677155	0.36	0.721
N	7104			
Log Likelihood	-1440.8688			
Obs with Dep = 1	6614			
Obs with Dep = 0	490			

Table 2.5 Second stage OLS/Duration

2006 Sample				
Predictor	**Coeff.**	**SE**	**T**	**P**
Constant	0.470309	0.3309425	1.42	0.155
LnAskPrice	0.1081252	0.0274286	3.94	0.000
Btw3550	0.1786055	0.0366445	4.87	0.000
Over50	0.1079922	0.0423778	2.55	0.011
IncBtw3585K	-0.0645268	0.0495913	-1.30	0.193
IncOver85K	-0.0378136	0.0573119	-0.66	0.509
Btw16100	0.0615188	0.0360515	1.71	0.088
Btw101500	-0.2428584	0.0630824	-3.85	0.000
Over500	-0.3514388	0.0526042	-6.68	0.000
Firsthome	0.1387936	0.0363102	3.82	0.000
Em	-0.2187182	0.0547125	-4.00	0.000
Flbroker	-0.1729778	0.029831	-5.80	0.000
Netused	0.3202346	0.0442907	7.23	0.000
City	0.0545685	0.0381417	1.43	0.153
N	5267			
R^2	0.0590			
F-Stat	25.35			
2009 Sample				
Constant	-0.0521897	0.29076	-0.18	0.858
LnAskPrice	0.1822559	0.0242833	7.51	0.000
Btw3550	0.1000313	0.0320906	3.12	0.002
Over50	0.1442366	0.0394712	3.65	0.000
IncBtw3585K	-0.0723272	0.0459763	-1.57	0.116
IncOver85K	-0.0765547	0.0520453	-1.47	0.141
Btw16100	0.0370369	0.0317199	1.17	0.243
Btw101500	-0.184071	0.0599293	-3.07	0.002
Over500	-0.4152612	0.0489628	-8.48	0.000
Firsthome	0.1299183	0.0322549	4.03	0.000
Em	-0.3173747	0.533002	-5.95	0.000
Flbroker	-0.1623303	.0261948	-6.20	0.000
Netused	0.3053973	0.052348	5.83	0.000
City	-0.0316584	0.0327676	-0.97	0.334
N	7104			
R^2	0.0545			
F-Stat	31.42			

Table 2.6 Second stage OLS/Intensity

2006 Sample				
Predictor	**Coeff.**	**SE**	**T**	**P**
Constant	-0.28509	0.304615	-0.94	0.349
LnAskPrice	-0.04088	0.0252466	-1.62	0.105
Btw3550	-0.1468093	0.0337293	-4.35	0.000
Over50	-0.1589169	0.0390065	-4.07	0.000
IncBtw3585K	0.0707605	0.0456461	1.55	0.121
IncOver85K	0.1023615	0.0527525	1.94	0.052
Btw16100	-0.0498827	0.0331835	-1.50	0.133
Btw101500	0.3131853	0.058064	5.39	0.000
Over500	0.4231043	0.0484194	8.74	0.000
Firsthome	-0.1452844	0.0334216	-4.35	0.000
Em	0.3095163	0.0503599	6.15	0.000
Flbroker	0.251324	0.0274578	9.15	0.000
Netused	-0.1233924	0.0407672	-3.03	0.002
City	-0.0136227	0.0351074	-0.39	0.698
N	5267			
R^2	0.0885			
F-Stat	39.26			
2009 Sample				
Constant	-0.8610172	0.295088	-2.92	0.004
LnAskPrice	0.0541625	0.0246447	2.20	0.028
Btw3550	-0.0873295	0.0325682	-2.68	0.007
Over50	-0.1867528	0.0400587	-4.66	0.000
IncBtw3585K	0.0229993	0.04666606	0.49	0.622
IncOver85K	0.0698094	0.05282	1.32	0.186
Btw16100	0.0595313	0.032192	1.85	0.064
Btw101500	0.3255024	0.0608214	5.35	0.000
Over500	0.5829028	0.0496916	11.73	0.000
Firsthome	0.0188416	0.032735	0.58	0.565
Em	0.5011035	0.0540936	9.26	0.000
Flbroker	0.3351894	0.0265847	12.61	0.000
Netused	0.1430055	0.0531272	2.69	0.007
City	0.0753977	0.0332553	2.27	0.023
N	7104			
R^2	0.0976			
F-Stat	58.96			

Table 2.7 Results from 1999 Data

Dependent Variable: LnTTB				
Predictor	**Coeff.**	**SE**	**T**	**P**
Constant	0.8992	0.7595	1.180	0.2370
LnAskPrice	0.1257	0.0615	2.050	0.0410
Btw3550	0.1518	0.0747	2.030	0.0420
Over50	0.1012	0.0964	1.050	0.2940
Btw4070K	0.0222	0.1029	0.220	0.8300
Over70K	-0.0556	0.0814	-0.680	0.4950
LnDist	-0.0702	0.0194	-3.620	0.0000
Firsthome	0.1331	0.0765	1.740	0.0820
Em	-0.4335	0.1210	-3.580	0.0000
Broker	-0.2448	0.0895	-2.740	0.0060
Flbroker	-0.0413	0.0682	-0.610	0.5450
Netused	0.0524	0.0672	0.780	0.4360
N	1145			
R^2	7.6			
F-Stat	8.41			
Dependent Variariable: LnIntensity				
Constant	-1.5370	0.7427	-2.070	0.0390
LnAskPrice	0.0947	0.0601	1.580	0.1150
Btw3550	-0.0193	0.0730	-0.260	0.7920
Over50	-0.0817	0.0942	-0.870	0.3860
Btw4070K	-0.0391	0.1006	-0.390	0.6980
Over70K	0.0732	0.0796	0.920	0.3580
LnDist	0.0990	0.0190	5.220	0.0000
Firsthome	-0.1226	0.0748	-1.640	0.1010
Em	0.6036	0.1183	5.100	0.0000
Broker	0.2288	0.0875	2.610	0.0090
Flbroker	0.2580	0.0667	3.870	0.0000
Netused	0.1924	0.0657	2.930	0.0030
N	1145			
R^2	17.8			
F-Stat	22.26			

*Zumpano et al. 2003

Table 2.8 Variable effects on search duration and intensity

Search Duration			
Predictor	**1999**	**2006**	**2009**
LnAskPrice	Positive*	Positive*	Positive*
Btw3550	Positive*	Positive*	Positive*
Over50	Positve	Positive*	Positive*
Btw4070K	Positive		
Over70K	Negative		
InBtw3585K		Negative	Negative
IncOver85K		Negative	Negative
LnDist	Negative*		
Btw16100		Positive*	Positive
Btw101500		Negative*	Negative*
Over500		Negative*	Negative*
Firsthome	Positive*	Positive*	Positive*
Em	Negative*	Negative*	Negative*
Broker	Negative*		
City		Positive	Negative
Flbroker	Negative	Negative*	Negative*
Netused	Positive	Positive*	Positive*
Intensity			
LnAskPrice	Positive	Negative*	Positive*
Btw3550	Negative	Negative	Negative*
Over50	Negative	Negative*	Negative*
Btw4070K	Negative		
Over70K	Positive		
InBtw3585K		Positive	Positive
IncOver85K		Positive*	Positive
LnDist	Positive*		
Btw16100		Negative	Positive*
Btw101500		Positive*	Positive*
Over500		Positive*	Positive*
Firsthome	Negative	Negative*	Positive
Em	Positive*	Positive*	Positive*
Broker	Positive*		
City		Negative	Positive*
Flbroker	Positive*	Positive*	Positive*
Netused	Positive*	Negative*	Positive*

*Statistically significant at 10% level

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3. COSTLY DIVESTITURE IN COMMERCIAL REAL ESTATE UNDER DETRIMENTAL CONDITIONS

3.1 Introduction

In a properly functioning market, the selling price of real property is an approximation for the true market value. The buyer's objective is to pay the lowest total price for a property with attributes that satisfy the search criteria. The total price for the buyer equals the transaction price plus associated search costs. In contrast, the objective for the seller depends on the procedure. Absent detrimental conditions, the seller aims to achieve the highest possible price, netting out search and transaction costs. Certain conditions influence the seller's objective. For instance, the short sale creates an agency problem wherein the seller benefits very little by seeking the maximum price. In a number of identifiable cases, the seller is financially constrained and may be willing to offer significant discounts on the transaction price in order to minimize marketing duration (Derbes and Derbes 2001).[14]

There are several explanations for why less-than-normal prices may result from liquidation sales. Assuming that potential buyers are sufficiently informed about the seller's need to divest of the property in a short time-frame, the bargaining power for potential buyers is potentially enhanced by these asymmetric (one-sided) time constraints.

[14] Examples of these conditions are court-order liquidation, foreclosure on a mortgage, partition sale, resolution on controversy, dissolution of a partnership or marriage, non-foreclosure liquidation to resolve indebtedness, financial institution real estate owned (REO), liquidation to pay taxes, liquidation in anticipation of death, alternate use of proceeds, relief of carrying a cost burden, year-end corporate accounting results, and corporate or other institution decisions.

In addition, limited exposure to the market during a constrained marketing period reduces the likelihood that the seller will be able to identify the marginal buyer, who has the highest reservation price for the asset.

The rational objective of the seller under such pressure then becomes to minimize losses due to sudden divestiture. The lender has a menu of options for possible solutions to recover their losses when a borrower has defaulted on a mortgage. A driving force behind the lender's choice of resolution is the borrower's motivation for default. If the borrower is no longer able to make the monthly payments but wants to retain the property, the lender has options other than selling the property**,** such as reducing the monthly payment, for instance, by adjusting the interest rate to current market rates – or allowing the borrower to omit several future and past payments (forbearance). Conversely, if the borrower does not aspire to keep the property, the lender has several options for settling the default. These options include permitting pre-foreclosure short sale by the borrower, beginning the foreclosure procedure under a notice of default with the property sold in the course of the process by the borrower, or foreclosing on the property, acquiring title, and selling the property in the market as real estate owned (REO). Under a short sale, the indebted owner sells the mortgaged property with the requirement that the proceeds generated from the sale be passed on to the lender, when the amount is less than the outstanding loan balance. From a lender's standpoint, a short sale is advantageous because additional carrying and transactions costs and legal expenses associated with foreclosure and REO sales are avoided. Agency costs are more severe for the short sales procedures. The borrower, who may face no retribution as long as a sale is made, typically has little incentive to maximize the net selling price (Clauretie and Daneshvary 2011).

Auction sales are another way to recuperate losses when a borrower defaults on a property, and these types of sales are more beneficial to sellers who desire a quicker sale. Real estate auctions in the US are usually in response to a borrower who is under duress from mortgage foreclosure, tax foreclosure, divorce settlement or estate settlement. Because of the desire to sell the property quickly, the properties are often sold at a significant discount to market value (Dotzour et al. 1998).

While many empirical studies have focused on estimating price discount effects of liquidating real estate in the residential area, relatively little analytical attention has been given to the price discount effects of liquidating commercial real estate and comparing alternative procedures. The purpose of the present study is to evaluate different approaches to divesting of commercial real estate under detrimental conditions, including the short sale, auction sale, and REO sale by estimating the price discounts for properties sold under detrimental conditions relative to a control group (of highly comparable properties) sold under normal conditions. The data source is CoStar and includes 18,751 transactions of commercial office buildings in 73 U.S. metropolitan markets during a period spanning from 2006 to 2010.

Section 3.2 presents a review of the literature on empirical analyses of price discounts on sales of real properties. That is followed in section 3.3 by a description of the data and empirical specification. A critical discussion of the findings of the empirical analysis is presented in section 3.4. Some tentative conclusions drawn from the results of this study are offered in section 3.5.

3.2 Review of Literature

Several papers have critically examined the discount from normal market prices of sold properties under various scenarios. Forgey et al. (1994) test the hypothesis that to reduce

holding cost, sellers of foreclosed residential properties are willing to accept a lower price to lessen the time on the market. They estimate the discount on single-family foreclosed properties using a sample of 2,482 listings taken from the Arlington, Texas multiple listing service (MLS) during the period of 1991 to 1993. Using a linear and log-linear hedonic pricing or multiple regression model to estimate the value of a house as a function of both its quantitative and qualitative attributes along with a dummy variable indicating the foreclosure status of the property, the authors test the null hypothesis that foreclosure status houses do not sell at a discount when compared to non-foreclosure residential sales versus the alternative hypothesis that foreclosure status houses do sell at a discount. Based on the 280 foreclosure sales that were included in that sample, Forgey et al. (1994) find a foreclosure discount of 23 percent from the normal selling prices of the other properties.

Clauretie and Daneshvary (2011) develop simultaneous estimates of the price and time on the market (TOM) of a sample of 24,546 single family properties with four types of property sales: (1) normal market in which there is no default from normal price, (2) short sales, (3) those in process of foreclosure, and (4) REO. Their data set includes all detached single-family houses in the MLS supported by the Greater Las Vegas Association of Realtors (GLVAR) between December 2007 and 2008. To assess the effects of short sales, of a sale in the process of foreclosure, and of an REO sale on price and marketing time, they apply the existing hedonic pricing framework with some extensions. This model estimates the sale price as a function of house and neighborhood characteristics, marketing duration (TOM), as well as proxy indicators for the three options. The majority of houses during the period were sold as repossessed properties. After controlling for the property condition by using a variable indicating whether the property is assessed as poor, fair, or good by the listing agent, their estimation shows

discounts of 5.6 percent for short sale, 10.3 percent for properties under foreclosure, and 13.5 percent for REO properties, all compared to no-default sales. The authors also examine the least-costly option to the lender as depending on the size of four different effects: the price discount effect, the TOM effect on selling price, carrying costs from delinquency to the time of listing on the MLS, and carrying costs from listing on MLS to sale. For an average priced no-default house, the results show that short sales generated the smallest price discount of $17,848, yet the house stays on the market for an additional 18 days. Additionally, they find that REO generates the largest price discount of $42,713, and the house is sold about 36 days faster. After the authors account for the price discount, marketing time, and carrying costs associated with elapsed time between delinquency and sale, houses sold while in the process of foreclosure experience the smallest net loss of $30,791, houses sold as short sales are next with a net loss estimated at $33,153, and houses sold as REO sales experience the largest discount estimated at $40,871.

Hardin and Wolverton (1996) conjectured that the literature which provides evidence of significant discounts for foreclosed residential property could be extended to consider income-producing properties. The discount on foreclosed apartment complexes sold by institutional owners is estimated from data based on the Phoenix, Arizona area in 1993 and 1994. Foreclosure sales during this time period total 9 out of 90 transactions. The authors test the null hypothesis that foreclosure-status apartments are not discounted when compared to non-foreclosure apartment sales. They use a log-linear ordinary least squares regression model with variables that correspond to the income potential of the property, including rent, vacancy, and parking ratio, along with a dummy variable which indicates foreclosure status. Their results reveal that foreclosure status apartments sell at a discount of 22.2 percent when compared to

non-foreclosure apartment sales. This finding is credited to heterogeneous seller motivations, such as the need to fulfill regulatory capital requirements, to alleviate negative stock price effects, or to shield credit ratings.

Shilling et al. (1990) focus their study on the appraisal of distressed real estate properties. They estimate the price discount using a sample of 62 residential condominium units sold in 1985 in Baton Rouge, Louisiana. These properties were acquired by a lender through foreclosure and subsequently sold by the same lender. A multiple regression equation is employed with the dependent variable representing the natural logarithm of the selling price for each condominium unit regressed on the various principal components of selling price, including living area, number of bedrooms, location dummy variables, amenities, and a dummy variable indicating whether the property was acquired by a lender through foreclosure and disposed of soon after. They estimate that the price discount on these units is 24 percent. They acknowledge that these distressed properties may have not been properly maintained, and notice that many of the condominiums were foreclosed on shortly after construction. In other cases, the lenders made significant value-added expenditures on poor condition properties. The 24 percent discount is credited to the incentive of the seller to liquidate the properties promptly in order to minimize carrying costs. The results of Shilling et al. (1990) suggest that foreclosure status is associated with a price discount because it decreases marketing duration. The results also suggest that buyers may demand a discount to compensate for carrying costs during the property lease up period.

Pennington-Cross (2006) examine the deviation between the expected price appreciation of typical property and the price appreciation of foreclosed property for 12,280 REO single-family properties that were acquired by foreclosure and sold nationwide for mortgages originated

from 1995 through 1999. Using ordinary least squares, the author empirically tests the foreclosure discount as a function of the discount associated with foreclosures, the discount associated with bargaining power during the marketing of the property, and other factors that could impact the value of the property. The findings indicate that in the same metropolitan area, foreclosed properties sold by either the owner or lender appreciated 22 percent less than non-foreclosed properties. The analysis suggests that foreclosed properties may possess physical, neighborhood, or location characteristics which could lead to slower price appreciation when compared to properties in similar cities.

Clauretie and Daneshvary (2009) use a sample consisting of 1,302 foreclosed and 8,498 non-foreclosed single family homes that sold in Las Vegas, Nevada between November 2004 and November 2007. To provide a baseline for comparison and to investigate omitted variables, endogeneity and spatial autocorrelation issues, the log of house price is estimated first using ordinary least squares with physical and neighborhood characteristics. The authors expand the model specifications to account for endogeneity of time-on-market and property conditions using a two-stage approach. Lastly, the model specification is corrected for two forms of spatial autocorrelations after estimating spatially lagged autoregressive models with autoregressive disturbance terms using generalized spatial two-stage least squares. The foreclosure price discount model is estimated with and without controlling for property conditions (i.e., excellent, fair, good, or poor condition as assessed by the listing agent/broker at the time of listing). A price discount of 10.4 percent is estimated without controlling for the property condition, and 7.8 percent when controlling for the property condition.

Carroll et al. (1997) utilize a sample made up of 1,974 single-family properties containing 385 observations sold by the Department of Housing and Urban Development (HUD)

and 19 observations sold by private financial institutions after the foreclosure in Las Vegas, Nevada between 1990 and 1993. An attempt is made to replicate the findings of Forgery et al. (1994) by using similar linear and log-linear models modified to account for bank-and HUD-foreclosed properties located in their own neighborhood. The authors create dummy variables for each neighborhood grouping to isolate foreclosure effects from location effects. The authors estimate a foreclosure discount between 12 and 14 percent when neighborhood effects are ignored. After controlling for location, the estimate for foreclosure discount drops to between 8.5 and 9.7 percent. Adding further controls for non-foreclosed properties in close proximity to the foreclosed properties makes the foreclosure discount statistically insignificant. These results suggest that foreclosure status serves as a proxy for neighborhood characteristics, rather than property specific attributes.

Allen and Swisher (2000) consider the process of a HUD home auction. Often through foreclosure, HUD attains ownership of properties that were used as collateral for FHA-insured loans. With these loans, borrowers must obtain insurance that safeguards the lender if he or she fails to repay the debt. If default occurs, the lender then takes title of the property through foreclosure proceedings and looks to the FHA for damages and concurrently transfers the title to HUD who attempts to sell the property with a HUD-affiliated real estate broker to regain as much of the losses as possible. HUD organizes an auction with an independent auctioneer when there are enough unsold properties within a given area. To stir interest in the auction, the auctioneer advertises to the public through direct mail, newspapers, and the Internet. Prior to the auction date, a list of properties to be auctioned is supplied to the public, and potential bidders are asked to visit and inspect the properties and to attend a buyer's awareness seminar where the auctioneer educates bidders about the facts concerning HUD auctions. When the auction is held,

the properties are sold to the highest bidders who meet the HUD guidelines. The authors analyze auction prices and compare them with predicted market values of single-family homes owned by HUD in Fort Lauderdale, Florida on July 10 and 11, 1998. On the first day of auction, 71 properties located in Broward and Palm Beach Counties were sold. On the second day, 99 properties located in Miami-Dade County and various counties along the southwestern coast of Florida were sold. The data covers the auction price, property location, property age, number of bedrooms and bathrooms, flood zone status, and eligibility for FHA-insured financing. The authors examine whether auction prices are systematically higher or lower than fundamental values. The predicted market value is calculated by dividing the assessed value for each property by the mean assessment ratio for the property class. The descriptive statistics indicate that auction prices are consistently below predicted market value. The order in which the properties are sold at auction is associated with the premium or discount relative to the predicted market value. Properties sold later in the mass auction are more likely to sell at higher prices relative to market value than those sold early.

Dotzour, Moorhead, and Winkler (1998) evaluate the outcome from auctions to that of private-treaty sales of residential real estate in Christchurch, New Zealand by using a hedonic pricing model. Specifically, they test whether higher priced and unique residential properties sold by auction sell for the same price as it would have by private treaty. In their study, they point out that an auction of real property in Australia and New Zealand is believed to be an attractive substitute for using a real estate broker since the auction process is thought to achieve the fair market value. They use a data set that contains all properties sold by auction and private-treaty during the period September 1991 through December 1992 in the Northwest Hill, St. Alabans, and Shirley areas. The results indicate that auctions are more successful for unique,

desirable houses in the higher price range. In addition, no significant discount is found for properties sold by auction in areas with below average sales prices.

While these residential studies are suggestive, they do not address the pricing of liquidated commercial real estate. A discussion of the data and model specifications for this analysis is presented in the next section.

3.3 Specification

3.3.1 Data

The empirical analysis tests for differences in price based on the sales conditions of commercial properties. The price of commercial office property with no detrimental sales conditions is compared to that of commercial office properties with special sales conditions identified, including short sales, REO sales, and auction sales. The dataset includes detailed transactions of office property collected from the CoStar Comps database from 28 states and Washington, D.C., from 2000 to 2010. Transactions with detrimental sale conditions considered in this study occur regularly beginning in 2006, in 73 of the metropolitan markets, and primarily for Class B and Class C property.[15] Thus, the empirical analysis only considers transactions during the period from 2006 thru 2010, only for those 73 markets where detrimental conditions are observed, and only for Class B and Class C properties. In addition, a few transactions with

[15] The 73 office markets are Albany/Schenectady/Troy, Atlanta, Bakersfield, Baltimore, Boise City/Nampa, Boston, Charleston/N Charleston, Charlotte, Chattanooga, Chicago, Cincinnati/Dayton, Cleveland, Colorado Springs, Columbia, Columbus, Dallas/Ft Worth, Denver, Detroit, East Bay/Oakland, Fayetteville/Springdale/Rogers, Fresno, Green Bay, Greensboro/Winston-Salem, Greenville/Spartanburg, Hampton Roads, Harford, Houston, Indianapolis, Inland Empire (California), Jacksonville (Florida), Kansas City, Knoxville, Las Vegas, Lincoln, Little Rock/N Little Rock, Long Island (New York), Los Angeles, Louisville, Memphis, Milwaukee/Madison, Minneapolis/St Paul, Mobile, Nashville, New York City, Northern New Jersey, Orange (California), Orlando, Philadelphia, Phoenix, Pittsburgh, Portland, Providence, Raleigh/Durham, Sacramento, Salinas, Salt Lake City, San Diego, San Francisco, San Luis Obispo/Paso Robles, Seattle/Puget Sound, South Bay/San Jose, South Florida, Southwest Florida, St Louis, Stockton/Modesto, Tallahassee, Tampa/St Petersburg, Toledo, Tucson, Washington DC, West Michigan, Westchester/So Connecticut, and Youngstown/Warren/Boardman.

sale price less than $5,000 are eliminated. The set considered in this study includes characteristics for 18,751 office property transactions.

An extension to the primary objective is to examine whether the price discount is influenced by property attributes and market conditions. Property attributes include property age, size, and class. To consider pricing outcomes resulting from geographic market conditions, two variables are considered. The first is the volume of sales in each geographic market. The second considers the volume of detrimental sale conditions that occur each quarter, across all markets. The *Short sales per Market* variable is calculated as the total number of short sales in a given market divided by the total number of sales in that market during the entire sample period. The *REOs per Market* and *Auctions per Market* variables are calculated in a similar manner using REO and auction sales, respectively. The *Short sales per Quarter* variable is calculated as the total number of short sales in a calendar quarter divided by the total number of sales in that quarter. The *REOs per Quarter* and *Auctions per Quarter* variables are also calculated in a similar manner using REO and auction sales, respectively.

Descriptive statistics are reported in Table 3.1, and all variables are defined in the notes to Table 3.1. In total, there are 140 short sales, 714 REO sales, and 237 auction sales in the sample. The average property sold for $1.4 million, was constructed 38.7 years ago and includes 18,055 square feet of rentable building area. The sample consists of 52.6% Class B, and the remainder are transactions of Class C property. The empirical models that will be employed are discussed in the next section.

3.3.2 Methodology

The first step of the empirical analysis considers whether different property characteristics and the presence of a sales condition contribute to the pricing of commercial office property. The linear specification used to estimate this price is:

$$\begin{aligned}(1)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Right of Redemption} \\ & + \Sigma\beta_i \cdot \textit{Mkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

Sale price is the transaction price for the property. *Property age* is the age of the property in years. *Property size* is rentable building area in square feet. The variables *Sale price*, *Property age* and *Property size* are logged for all empirical estimations. *Class B* is an indicator variable which equals one if the property is listed as Class B, and zero otherwise. *Short sale* is an indicator variable which equals one if the property is sold as a short sale, and zero otherwise. *REO* and *Auction* are also indicator variables which equal one if the property is sold as a REO and an auction sale, respectively, and zero otherwise. $\textit{Mkt}_i$ includes 72 indicator variables for the metropolitan market in which the property is located. There are 73 markets, and the indicator for one market is suppressed; ε is the disturbance term. $\textit{Quarter}_t$ includes 15 indicator variables for the quarter in which the property was sold. There are 16 quarters during the period from 2006 to 2010, and the indicator for one quarter is suppressed.

Many of the states included in the study have enacted statutory rights of redemption. This statute allows a former property owner who lost a property through a foreclosure sale to regain ownership by buying the property back within a statutory period of time. The most common redemption period is one year from the auction sale date, although a few states have shorter or longer redemptions periods. There has been some anecdotal evidence that suggests that auction prices are lower in states with the right of redemption since the auction buyer cannot acquire

clear title until the redemption period expires or the former owner conveys his redemption right via a quitclaim deed. To account for the possible depressing effect, *Right of Redemption* is a categorical variable which equals one if the property was sold in a state that has statutory rights of redemption, and zero otherwise.[16]

A second step to the approach is to explore whether property characteristics influence the pricing of the property and to determine if the discount for condition of sale is linked to the property characteristics, with interactions explored in three separate models. The first interaction based on property-level attributes is the relationship between property age and the sales condition of the property. The only adjustment to equation (1) is the addition of the interaction variables *Short sale**ln(*Property age*), *REO**ln(*Property age*), and *Auction**ln(*Property age*), written as:

$$\begin{aligned}(2)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Short Sale}^* \ln(\textit{Property age}) \\ & + \beta_8 \cdot \textit{REO}^* \ln(\textit{Property age}) + \beta_9 \cdot \textit{Auction}^* \ln(\textit{Property age}) \\ & + \beta_{10} \cdot \textit{Right of Redemption} + \Sigma\beta_i \cdot \textit{Mkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

The second interaction is for property size and the adjustment to equation (1) includes the interaction variables *Short sale**ln(*Property size*), *REO**ln(*Property size*), and *Auction**ln(*Property size*), written as:

$$\begin{aligned}(3)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Short Sale}^* \ln(\textit{Property size}) \\ & + \beta_8 \cdot \textit{REO}^* \ln(\textit{Property size}) + \beta_9 \cdot \textit{Auction}^* \ln(\textit{Property size}) \\ & + \beta_{10} \cdot \textit{Right of Redemption} + \Sigma\beta_i \cdot \textit{Mkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

[16] The statutory right of redemption should not have an impact on the price of short sales as will not apply in these situations. It could, however, impact the prices of properties sold at auction and REOs.

The final interaction based on property level measures is between property class and the sales condition. The adjustment to equation (1) is to add interaction variables *Short sale*Class B*, *REO*Class B*, and *Auction*Class B*, specified in equation (4) below.

$$\begin{aligned}(4)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Short Sale*Class B} \\ & + \beta_8 \cdot \textit{REO*Class B} + \beta_9 \cdot \textit{Auction*Class B} + \beta_{10} \cdot \textit{Right of Redemption} \\ & + \Sigma\beta_i \cdot \textit{Mkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

Beyond potential influence from property factors, market level variables are considered. The market variables are the volume of short sales, REO sales, and auction sales in each market as well as for each quarter. Their impact is considered by adding *Short sales per Market*, *REOs per Market*, *Auctions per Market*, *Short sales per Quarter*, *REOs per Quarter*, and *Auctions per Quarter*, and their interactions to individual models, and removing market or quarter indicator variables. The interaction between the market volume variables and the sales condition is considered in equation (5).

$$\begin{aligned}(5)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Short sales per Market} \\ & + \beta_8 \cdot \textit{REOs per Market} + \beta_9 \cdot \textit{Auctions per Market} \\ & + \beta_{10} \cdot \textit{Short sale*Short sales per Market} + \beta_{11} \cdot \textit{REO*REOs per Market} \\ & + \beta_{12} \cdot \textit{Auction*Auctions per Market} + \beta_{13} \cdot \textit{Right of Redemption} \\ & + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

The interaction between the volume per quarter and the sales condition is the focus in equation (6).

$$\begin{aligned}(6)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_7 \cdot \textit{Short sales per Quarter} \\ & + \beta_8 \cdot \textit{REOs per Quarter} + \beta_9 \cdot \textit{Auctions per Quarter} \\ & + \beta_{10} \cdot \textit{Short sale*Short sales per Quarter} + \beta_{11} \cdot \textit{REO*REOs per Quarter} \\ & + \beta_{12} \cdot \textit{Auction*Auctions per Quarter} + \beta_{13} \cdot \textit{Right of Redemption} \\ & + \Sigma\beta_i \cdot \textit{Mkt}_i + \varepsilon\end{aligned}$$

In addition to the property factors and market level variables, the statutory right of redemption is also considered. States with statutory rights of redemption allow a party whose property has been foreclosed to reclaim that property within a specified period of time. The interaction between the right of redemption and the sales condition is the focus in equation (7).

$$\begin{aligned}(7)\quad \ln(\textit{Sale price}) = {} & \beta_0 + \beta_1 \cdot \ln(\textit{Property age}) + \beta_2 \cdot \ln(\textit{Property size}) + \beta_3 \cdot \textit{Class B} \\ & + \beta_4 \cdot \textit{Short Sale} + \beta_5 \cdot \textit{REO} + \beta_6 \cdot \textit{Auction} + \beta_6 \cdot \textit{Right of Redemption} \\ & + \beta_7 \cdot \textit{Short Sale*Right of Redemption} + \beta_8 \cdot \textit{REO*Right of Redemption} \\ & + \beta_9 \cdot \textit{Auction*Right of Redemption} + \Sigma\beta_i \cdot \textit{Mkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon\end{aligned}$$

Empirical results for the estimations for equations (1) thru (7) are detailed in the next section.

3.4 Results

Empirical results for the linear specification in equation (1) are reported in Table 3.2. The coefficients for *Property age*, *Property size* and *Class B* are positive and significant. Office properties sell at a higher price when they are older, larger or the building class is Class B. The positive and significant coefficient for Property age variable is possibly because older properties have the central location that is no longer available and new construction moves further out from

the central business district (CBD). The premium for Class B relative to Class C is estimated at 9.97 percent[17] in Table 3.2. The statutory right of redemption is not statistically significant.

The primary coefficients of interest are for the *Short sale*, *REO*, and *Auction* indicator variables. The estimated discount for properties sold as REO is 33.8 percent subtracted from the fundamental value. Short sales are discounted an estimated 23.6 percent, and properties sold at auction occur at a discount of 13.8 percent relative to the fundamental value. Based on this evidence, auctions appear to be the most effective way to sell a distressed asset in the office market with minimum discounting relative to the other methods. However, auctions may not be suitable for all properties and the remainder of the empirical analysis is focused on exploring whether the estimated discounts for detrimental sale conditions are influenced by property characteristics, market timing or geography.

Table 3.3 reports the empirical results from the estimation of equations (2) thru (4), which evaluate whether the price for an office property with a special sales condition is influenced by property characteristics such as age, size, and property class. In equation (2), the interaction between *REO* and *Property age*, as well as between *Auction* and *Property age* is negative and significant, while the interaction between *Short sale* and *Property age* is not significant. This result suggests that older properties experience greater discounts when they are sold as REO and at auction, while short sales are unaffected by the property age. The coefficients for *REO*Property age* and *Auction*Property age* are similar, both estimated at -0.10. Compare the case of a 20-year old property to that for a 30-year old property. The REO discount for the 20-year old asset can be calculated as 34.5 percent while the REO discount for a

[17] The premium is calculated as exp(0.095)-1 = 0.0997 where 0.095 is the coefficient on the Class B variable estimated from equation (1). All discounts and premiums throughout this paper are estimated in this way.

30-year old asset is 37.1 percent.[18] Similarly, the auction discount is 11.0 percent for the 20-year old and 14.5 percent for a property that is ten years older.[19] Newer properties are associated with higher demand, as evidence by the premiums achieved by younger properties. The increased demand for these assets generates higher attention at auctions and for REOs with a significant impact on the outcome. The breakeven age where the discount on the auction sale equals the discount for the short sale is 92 years.[20] This suggests that while property age does appear to have an impact on the discount for auction sales, the discount remains well below the estimated discounts for REOs and short sales in most circumstances.

The estimation of equation (3) is presented in Table 3.3, where it is found that the coefficient for the *Auction*Property size* interaction variable is estimated to be positive and significant. These findings imply that larger properties tend to fare better at auction, while discounts for REO sales and short sales are independent of the property size.

The analysis for the interaction of property characteristics also considers building class, with its potential effect isolated in the specification of equation (4). Equation (4) is estimated using least squares and the results are presented in Table 3.3. The coefficient for the *REO*Class B* interaction variable is estimated to be a positive and significant 0.144, while the coefficient for *REO* is estimated at -0.494. This suggests that REO sales are relatively less discounted when they are for Class B property. The REO discount is 38.9 percent for Class C, but only 29.5

[18] For the 20-year old, the discount is 34.5% = exp(-0.423 = -0.124 – 0.10*ln(20))-1, where -0.124 is the estimated coefficient for *REO*, -0.10 is the estimated coefficient for *REO*Property age*, and 20 is the property age. For the 30-year old, the discount is 37.1% = exp(-0.464 = -0.124 – 0.10*ln(30))-1.

[19] For the 20-year old, the discount is-11.0% = exp(-0.116 = 0.183 – 0.10*ln(20))-1, where 0.183 is the estimated coefficient for *Auction*, -0.10 is the estimated coefficient for *Auction*Property age*, and 20 is the property age. For the 30-year old, the discount is14.5% = exp(-0.157 = 0.183 – 0.10*ln(30))-1.

[20] The discount for a short sale is estimated in equation (1) as 23.6% and in equation (2) found to be independent of the property age. A property that is 92 years old and sold at auction is also discounted an estimated 23.6% = exp(-0.269 = 0.183 – 0.10*ln(92))-1.

percent for Class B.[21] For property sold at auction the discount is 34.5 percent for Class C, yet the auction discount is virtually nonexistent for Class B. Thus, Class B property should be sold at auction. Class C property should be sold as a short sale, since this method has the lowest discount for Class C, estimated at 32.4 percent.

The next section of the empirical analysis considers whether the discounts for detrimental sale conditions are related to market timing, or segmented markets. The specification in equation (5) attempts to isolate the impact on the relative pricing of assets sold under detrimental conditions that can be attributed to the local volume of properties being sold through the same procedure. For instance, if the market is oversupplied with short sales, is the discount for office property sold as a short sale even lower? Empirical results from the estimation of equation (5) are provided in Table 3.4. The only interaction found to matter is for the *REO*REOs per Market* variable which is negative and significant, estimated at -4.63. San Diego is an extreme for high REO activity with REO sales making up 9.9 percent of the market during the sample period, compared to St. Louis where the share of REOs is 3.8 percent of the transactions in the office market and similar to the average for other markets. Based on the results from this estimation, the average REO sale in San Diego is estimated to be discounted by 44.8 percent compared to a discount of 26.7 percent in St. Louis.[22] This evidence suggests that REOs will be more highly discounted where REO activity is high and properties are in competition for buyers of distressed assets. This finding is the commercial real estate analog to the existing literature on residential mortgage default contagion. No similar geographic effects obtain for the short sale or auction.

[21] The REO discount for Class B office property is calculated as 29.5% = exp(-0.350 = -0.494 + 0.144)-1, where -0.494 is the estimated coefficient for *REO* and 0.144 is the estimated coefficient for *REO*Class B*.

[22] For San Diego, the discount is 44.8% = exp(-0.594 = -0.135 – 4.63*(0.099)) -1, where -0.136 is the estimated coefficient for REO, -4.62 is the estimated coefficient for REO*REOs per Market, and 0.099 is the volume of REOs in San Diego. For St. Louis, the volume of REOs is 0.038 and the estimated discount is 26.7% = exp(-0.311 = -0.135 – 4.63*(0.038))-1.

The next empirical test is for the pricing of assets sold under detrimental conditions in the office market and whether the price is impacted by macroeconomic adjustments in the volume of distressed asset sales over time. The empirical test is specified in equation (6) and the results are reported in Table 3.5. The *Auction*Auctions per Quarter* interaction variable is found to be positive and significant, with the implication that auction sales are actually discounted less during periods when the national office market experiences a large number of properties sold at auction. Auction activity peaks during the first quarter of 2007 at 3.8 percent of the national office market, and then gradually declines to around 1.3 percent of the market during 2009 and 2010.

The final empirical analysis considers whether the discounts for detrimental sale conditions are related to whether or not the property was sold in a state that offers statutory rights of redemption. The empirical test is specified in equation (7) and the results are reported in Table 3.6. The *REO*Right of Redemption* interaction variable is found to be negative and significant, estimated at -0.185. This result implies that REO sales are discounted more when the properties are sold in states that have statutory rights of redemption. This result makes sense since banks acquiring foreclosed properties would be unwilling to pay market price as it may take up to a year to clear title to these properties.

3.5 Conclusion

A considerable amount of research has been published on the distressed liquidation of residential real estate properties. In contrast, very little has been done to examine the liquidation of commercial properties. This paper examines the price discount effects of liquidation of commercial office buildings with special sales conditions. The main empirical results indicate that there is an ordinal ranking for the discounts received when commercial office properties are

sold under detrimental conditions. The ranking is that REO sales experience the greatest discounts, estimated at 33.8 percent followed by short sales, which are discounted by an estimated 23.6 percent followed by auction sales, which are only discounted 13.8 percent relative to properties sold with no sales conditions. That is, these properties are sold at a discount from the normal market price as a reflection of the property's true value.

Property characteristics also play an important role in the price discount of properties sold with sales conditions. Older properties exhibit increasing discounts when they are sold as REOs or at auction, and properties sold as short sales are not affected by age. The results also suggest that the auction discount is decreasing in property size as larger properties are able to attract sufficient attention. Lastly, Class C properties perform worse as REO sales and at auction, when compared to Class B. Even though these property characteristics are found to influence the discounts, the auction method for divesting of distressed assets often experiences the lowest discount.

Beyond the property characteristics, it is clear that market conditions also play an important role in the price discounts of properties with sales conditions. Geography impacts the success of an REO, and REOs tend to perform worse when a given market is overwhelmed with properties being sold as REOs. Auctions actually perform better during periods there are many properties being sold at auction. Curiously, the discount for short sales in the office market appears to be independent of property characteristics, geography and market timing.

Finally, REO sales are discounted more when they are sold in states with statutory rights of redemption. Interestingly auction sales are unaffected by statutory rights of redemption. Short sale prices would be unaffected as the seller is voluntarily conveying title and the statutory right do not apply.

Table 3.1 Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Sale price	$1,390,178	$4,977,153	$5,000	$275,000,000
Property age	38.7	33.6	1	310
Property size	18,055	38,282	300	1,205,584
Class B	0.526	0.499	0	1
Class C	0.474	0.499	0	1
Short sale	0.007	0	0	1
REO	0.038	0	0	1
Auction	0.013	0	0	1
Right of Redemption	0.603	0.489	0	1
Short sales per Market	0.007	0.009	0	0.044
REOs per Market	0.038	0.030	0	0.099
Auctions per Market	0.013	0.014	0	0.080
Short sales per Quarter	0.007	0.006	0	0.018
REOs per Quarter	0.038	0.031	0	0.113
Auctions per Quarter	0.013	0.004	0	0.038

Notes: This table reports summary statistics for the data and variables used in this study, including 18,751 transactions for office property collected from the CoStar COMPs database. The first column lists the variable, the second and third columns provide the sample mean and standard deviation for the properties, while the fourth and fifth columns report the minimum and maximum values. *Sale price* is the transaction price paid for the office property. *Property age* is in years. *Property size* is the rentable building area, measured in square feet. *Class B* and *Class C* are indicator variables for the property class, which equal one to identify the respective class and zero otherwise. *Short sale*, *REO*, and *Auction* are indicator variables which identify the respective sale condition with a value of one, and zero otherwise. *Right of Redemption* is an indicator variable which equals 1 if the sale occurred in a state with the right of redemption and zero otherwise. *Short sales per Market*, *REOs per Market*, and *Auctions per Market* are variables which measure the percentage of transactions in each market during the sample period that are identified by the respective sale condition. *Short sales per Quarter*, *REOs per Quarter*, and *Auctions per Quarter* are variables which measure the percentage of transactions in each quarter for all markets that are identified by the respective sale condition.

Table 3.2 Relative Prices with Detrimental Conditions

Variable	Coefficient	(*t*-stat)
Intercept	9.25***	(122.6)
Property age	0.014*	(1.9)
Property size	0.455***	(65.7)
Class B	0.095***	(5.5)
Short Sale	-0.269***	(-3.3)
REO	-0.412***	(10.8)
Auction	-0.148**	(-2.3)
Right of Redemption	0.016	(0.3)
Quarterly indicator variables:	Included [15 quarters]	
Market indicator variables:	Included [72 markets]	
Observations:	18,751	
R^2:	34.6%	

Notes: This table reports the results from the least squares estimation of Equation (1), which provides the initial estimates for the relative pricing of properties that are sold under detrimental sale conditions. The dependent variable is *Sale price*, logged. All variables are defined in the notes to Table 1. In the first column is the variable name, the second column provides the estimated coefficient, and the corresponding *t*-statistic is in the final column, in parentheses. The estimation is for a fixed effects model with control variables for time at the quarterly frequency for 15 of the 16 quarters during the period 2006 to 2010. In addition, indicator variables are included for 72 of the 73 metropolitan markets considered, with one suppressed. *Property age* and *Property size* are logged. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively, based on the corresponding *t*-statistic.

Table 3.3 Property Characteristics and Detrimental Conditions

	Equation (2)		Equation (3)		Equation (4)	
Variable	Coefficient	(*t*-stat)	Coefficient	(*t*-stat)	Coefficient	(*t*-stat)
Intercept	9.23***	(122.2)	9.30***	(121.3)	9.26***	(122.7)
Property age	0.020**	(2.6)	0.013*	(1.8)	0.014*	(1.9)
Property size	0.455***	(65.7)	0.449***	(63.5)	0.454***	(65.7)
Class B	0.094***	(5.5)	0.094***	(5.4)	0.082***	(4.6)
Short sale	-0.022	(-0.1)	0.867	(1.3)	-0.391***	(-3.0)
REO	-0.124	(-1.2)	-0.631**	(-2.0)	-0.494***	(-8.6)
Auction	0.183	(0.9)	3.10***	(6.9)	-0.423***	(-4.6)
Right of Redemption	0.016	(0.3)	0.012	(0.2)	0.017	(0.3)
*Short sale*Property age*	-0.083	(-1.1)				
*REO*Property age*	-0.100***	(-3.1)				
*Auction*Property age*	-0.100*	(-1.7)				
*Short sale*Property size*			-0.128	(-1.6)		
*REO*Property size*			0.024	(0.7)		
*Auction*Property size*			0.322***	(6.6)		
*Short sale*Class B*					0.206	(1.2)
*REO*Class B*					0.144*	(1.9)
*Auction*Class B*					0.522***	(4.1)
Quarterly indicator variables:	Included [15 quarters]		Included [15 quarters]		Included [15 quarters]	
Market indicator variables:	Included [72 markets]		Included [72 markets]		Included [72 markets]	
Observations:	18,751		18,751		18,751	
R^2:	34.7%		34.7%		34.7%	

Notes: This table reports the least squares estimations of Equations (2), (3) and (4), which examine the interactions between physical property attributes and the pricing of properties sold under detrimental conditions. The dependent variable in each model is *Sales price*, logged. All variables are defined in the notes to Table 1. In the first column is the variable name; in the second and third columns are the estimated coefficients and corresponding *t*-statistics from Equation (2), which considers the interactions with *Property age*. In the fourth and fifth columns are the estimated coefficients and corresponding *t*-statistics from Equation (3), which considers the interactions with *Property size*. In the sixth and final columns are the estimated coefficients and corresponding *t*-statistics from Equation (4), which considers the interactions with *Class B*. Each estimation is for a fixed effects model with control variables for time at the quarterly frequency for 15 of the 16 quarters, as well as indicator variables for 72 of the 73 markets. *Property age* and *Property size* are logged. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively, based on the corresponding *t*-statistic.

Table 3.4 Geographic Contagion and Detrimental Sale Conditions

	Equation (5)	
Variable	Coefficient	(*t*-stat)
Intercept	8.99***	(122.9)
Property age	0.034***	(4.6)
Property size	0.480***	(69.0)
Class B	0.112***	(6.2)
Short sales per Market	2.021***	(5.1)
REOs per Market	1.712***	(5.7)
Auctions per Market	-5.084***	(-9.4)
Short sale	-0.414**	(-2.4)
REO	-0.135	(-1.4)
Auction	-0.041	(-0.4)
Right of Redemption	-0.006	(-0.4)
*Short sale*Short sales per Market*	7.48	(0.9)
*REO*REOs per Market*	-4.63***	(-3.1)
*Auction*Auctions per Market*	-4.10	(-1.3)
Quarterly indicator variables:	Included [15 quarters]	
Observations:	18,751	
R^2:	26.7%	

Notes: This table reports the least squares estimation of Equation (5) which considers the interactions between the volume of detrimental sale conditions within each metropolitan market and the pricing of properties sold under detrimental conditions. The dependent variable in each model is *Sales price*, logged. All variables are defined in the notes to Table 1. In the first column is the variable name; in the second and third columns are the estimated coefficients and corresponding *t*-statistics. The estimation includes indicator variables for 15 of the 16 quarters to control for time fixed effects. *Property age* and *Property size* are logged. *** and ** indicate significance at the 1% and 5% levels respectively, based on the corresponding *t*-statistic.

Table 3.5 Market Timing for Detrimental Sale Conditions

	Equation (6)	
Variable	Coefficient	(*t*-stat)
Intercept	9.28***	(120.2)
Property age	0.015*	(2.0)
Property size	0.455***	(65.7)
Class B	0.097***	(5.6)
Short sales per Quarter	-14.41***	(-4.4)
REOs per Quarter	0.247	(0.4)
Auctions per Quarter	-15.31***	(-8.4)
Short sale	0.035	(0.1)
REO	-0.446***	(-4.1)
Auction	-0.654***	(-3.0)
Right of Redemption	0.015	(0.3)
*Short sale*Short sales per Quarter*	-25.45	(-1.1)
*REO*REOs per Quarter*	0.553	(0.3)
*Auction*Auctions per Quarter*	36.28**	(2.4)
Market indicator variables:	Included [72 markets]	
Observations:	18,751	
R^2:	34.3%	

Notes: This table reports the least squares estimation of Equation (6) which considers the interactions between the volume of detrimental sale conditions per quarter including all markets and the pricing of properties sold under detrimental conditions. The dependent variable in each model is *Sales price*, logged. All variables are defined in the notes to Table 1. In the first column is the variable name; in the second and third columns are the estimated coefficients and corresponding *t*-statistics. The estimation includes indicator variables for 72 of the 73 markets to control for fixed effects attributable to the geographic markets. *Property age* and *Property size* are logged. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively, based on the corresponding *t*-statistic.

Table 3.6 Statutory Right of Redemption and Detrimental Sale Conditions

	Equation (7)	
Variable	Coefficient	(*t*-stat)
Intercept	9.24***	(122.3)
Property age	0.014*	(1.9)
Property size	0.455***	(65.7)
Class B	0.095***	(5.5)
Short sale	-0.379**	(-2.5)
REO	-0.294***	(-4.7)
Auction	-0.056	(-0.5)
*Short sale*Right of Redemption*	0.156	(0.9)
*REO*Right of Redemption*	-0.185**	(-2.4)
*Auction*Right of Redemption*	-0.144	(-1.1)
Quarterly indicator variables:	Included [15 quarters]	
Market indicator variables:	Included [72 markets]	
Observations:	18,751	
R^2:	34.7%	

Notes: This table reports the least squares estimation of Equation (7) which considers the interactions of *Rights of Redemption*. The dependent variable in each model is *Sales price*, logged. All variables are defined in the notes to Table 1. In the first column is the variable name; in the second and third columns are the estimated coefficients and corresponding *t*-statistics. The estimation is for a fixed effects model with control variables for time at the quarterly frequency for 15 of the 16 quarters, as well as indicator variables for 72 of the 73 markets.. *Property age* and *Property size* are logged. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively, based on the corresponding *t*-statistic.

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4. Banks as Sellers of Commercial Property

4.1 Introduction

Bank lending and bank profits have been strongly linked to asset price changes, occasionally resulting in banking crises. Accordingly, commercial real estate is of importance for four reasons. First, commercial property loans are a significant portion of a bank's assets. At the end of 2007, commercial real estate loans made up about 23 percent of total interest-earning assets for all banks in the United States, and the ratio for small and median –size banks was as much as 46 percent. Second, commercial property has been widely used as collateral for other types of loans increasing banks' exposure to the commercial real estate market. Third, commercial real estate loans are typically the most unstable part of a bank's portfolio. The delinquency rates for commercial real estate have reached levels as high as 12 percent in 1991 and as low as 1.03 percent in early 2006, whereas delinquency rates for other loans have been more stable at levels between 1.4 percent and 3.3 percent for residential real estate loans and between 2.7 percent and 4.2 percent for consumer loans. The final reason for the importance of commercial real estate for banks is that given the significance of bank lending to commercial real estate markets, there is possibility for bank lending to increase asset prices in the market, particularly if lending criteria is relaxed (Davis and Zhu 2009).

Since 2008, there have been 442 bank failures in the United States, in large part driven by commercial real estate loans (FDIC Failed Bank List). As an example, for ten of the eleven banks that failed in early 2011, Trepp LLC's Foresight Analytics division reported that

commercial real estate loans contributed to more than half of the banks' nonperforming loans. For the eleven banks as a group, commercial real estate loans made up $600 million (82 percent) of the total $732 million in non-performing loans. Construction loans made up more than half ($391 million) of these non-performing loans, while commercial mortgages accounted for $209 million (Bay 2011).

With borrowers struggling to meet debt obligations as property prices declined by 34.5 percent from the 2007 peaks, banks have had to decide whether to modify a loan or to foreclose on the properties (Mulholland 2012). It is expected that banks will have more real-estate-owned (REO) assets on their balance sheets as they become more assertive in their management of troubled commercial real estate loans. With-secondary markets now becoming more liquid, banks have already begun to sell more commercial real estate than in years past, are having success in raising capital, and are starting to see some positive earnings (Dotzour 2012). Bank of America, as a prime example of the very active sellers of commercial real estate, reduced its commercial real estate loans in the core portfolio by 28 percent in 2010 (Kucera 2012).

Non-bank sellers typically purchase and sell commercial assets in similar quantities.[23] By comparison, banks sell nearly nine times the quantity of properties they purchase. This suggests that many of the assets sold by banks were inherited through commercial loan delinquency proceedings. A bank seller has a potentially lower basis for assets acquired through borrower default. Yet traditional finance theory argues that this should be considered a sunk cost, and that only the opportunity cost – that is, the market value of the asset- is relevant for optimal investment/divestiture policy.

[23] For instance, REITs sold 333 office buildings during 2010 and purchased 384. The ratio of properties sold to properties purchased is 0.88 for REITs. For 2010, a similar ration for corporations is 1.2 for equity funds is 0.96. This is based on CoStar Comps buyers and sellers data during the study period.

This essay examines how publicly listed banks perform as sellers of commercial real estate. In order to examine the research question, transaction prices for office properties sold by publicly listed banks are estimated and compared to similar properties sold by non-bank sellers. These non-bank sellers include non-institutional sellers (individuals and developers), corporate sellers, REITs, and financial institutions (includes equity funds, insurance companies, investment managers, and pension funds). The categories of comparables are based on property age, size, class, and submarket. The sale prices for bank asset sales are estimated, and are then used to identify whether the assets were divested at a price above or below the values of similar properties sold by non-bank entities. A generated benchmark Bank companion index is then used to estimate abnormal returns over an intermediate horizon of one to sixty days after the transaction date. Abnormal returns over the intermediate-horizon are then estimated as a function of the following: assets, change in the return on assets from the quarter of the sale to the quarter following the sale, Tobin's Q, the coverage ratio, the change in debt reduction, the change in preferred dividends, the change in common dividends, and the change in invested capital.

The remainder of this paper is organized as follows. Section 4.2 provides a background on asset sales. Section 4.3 details the estimation of the sale price and discounts of properties sold by banks and the data used in the estimation. Section 4.4 covers the development of the benchmark index and reports the abnormal returns following office sales over intermediate-horizons. Section 4.5 explores the determinants of abnormal returns over the intermediate horizon, associated methodology, and results. The final section offers concluding remarks.

4.2 Background/Literature Review

4.2.1 Asset Sales for Corporations

Managers of asset-holding firms have to make decisions not only about assets to be acquired but also which assets to sell and the lowest possible price they are willing to accept. The possible explanations for asset sales by corporations include performance enhancement, increasing funds, creating opportunities for firms to direct capital in profitable ways, and to provide funds to firms who have high demand for cash right away. Lang, Paulsen, Stultz (1995) state that selling assets when they can offer the cheapest funds enables firms to pursue objectives beyond just operating efficiency. For firms with high leverage and/or poor performance, an effective asset sale can be an enhancement of value as funds from the asset sale are discounted by the stock market and retained by the firm. The average firm that performed poorly before the sale tends to experience a positive stock price reaction when the funds received from the sale are distributed to shareholders.

Hite, Owers, and Rogers (1987) examine the valuation of partial and complete sell-offs of a firm's assets. Buyers and sellers experience significant abnormal returns for effective partial sell-offs and unsuccessful sales experience gains at bid announcement but are lost at offer expiration. Complete liquidation lead to higher average abnormal returns, which indicates that asset sales are associated with the transfer of resources to higher-valued uses instead of an indicator of market mispricing before the divestiture announcements. Bates (2005) examines the distribution of funds after 400 subsidiary sales and finds positive shareholder wealth occurring only when the funds are distributed to shareholders or spent on positive NPV projects. Warusawitharana (2008) uses a model that connecting purchases and sales of assets to the

marginal value of capital inside the firm. The results suggest that return on assets and size increase the probability of an asset sale or purchase, and transaction size fluctuates with the value of the capital utilized by the firm.

Shliefer and Vishny (1992) examine factors that influence liquidation values of assets focusing specifically on the potential buyers of assets. They note that if firms in financial distress need to sell assets, the most likely buyer of these assets are other companies within the same industry. However, those cohorts are probably also experiencing financial problems which causes assets to be sold at prices below value in best use. Ofek and John (1995) find that asset sales led to an improvement in the operating performance of the seller's remaining assets in each of the three years following the asset sale for firms that increase their focus which is positively related to the seller's stock return at divestiture announcement. Evidence suggested that some of the seller's gains came from the assets being better suited to the buyer. Dittmar and Shivdasani (2003) look at a sample of firms that divest an entire business segment and are related to decreases in diversification discounts. A discount appears for firms that continue to be diversified after the sale and those operating as single-segment firms after the divestiture. The four outcomes are as follows. First, changes in the organizational structure have a significant impact on investment policies of retained segments. Second, changes in divisional investments are associated with changes in the diversification discount. Third, the results support the view that corporate focus leads to more efficient investment policies. Fourth, the results show improvement occurs in the operation of the remaining assets after the sales.

Schlingemann, Stultz, and Walkling (2002) explain that the liquidity of the market for corporate assets is a major factor in the firm's decisions to divest a business segment, which segment to divest, and if it should divest a core segment or unrelated segment. Industries with

more liquid markets for corporate assets, poorly performing segments, and small segments are the most likely to be divested. They find that firms with assets in markets that are more liquid are more likely to divest than those with less liquid markets.

4.2.2 Fire Sales by Banks

Bank asset sales have been investigated in literature regarding fire sales. Chang (2011) develops a model of market illiquidity which considers buyers' entry decisions and sellers' trading strategies in a decentralized trading environment with search frictions and adverse selection. The model includes two important aspects of market illiquidity. Those are, first, market thinness, defined as the buyer/seller ratio in the market which determines how quickly a buyer can be located, and second, price undervaluation, defined as a price discount resulting from a seller's need to liquidate the asset quickly (i.e. a fire sale). The author finds that in equilibrium, market thickness works as a screening device dependent upon the matching how long a seller wishes to wait to sell the asset and how much the buyer is willing to pay for the asset. Market thickness of the submarkets with better quality assets is distorted downward so that there is a clear distinction between sellers with low-quality assets and sellers with high-quality assets. If the market does not observe the seller's private value of the asset, ~~those~~ sellers who are willing to wait longer are not actually those with better quality assets. In this case, a full screening does not occur and a set of semi-pooling equilibra develops with the fire sale being of most interest. Here buyers offering reasonably higher prices are secondary and sellers with critical needs for funds sell their assets immediately at undervalued prices since they end up pooling with the low-quality assets.

Crockett (1990) examine 'workouts' (incremental investment for completion, rehabilitation, or marketing), 'deep pockets' (ability to absorb losses related to expenses for

maintaining asset productivity, and avoiding untimely sale or reorganization), and 'fire sales' (considerations of liquidity and usually leads to a transfer of assets to investors with advantages in handling distressed properties). The author finds that decisions of the optimal workout plan will be easier if the distress is limited to a specific property where forecasts of future market conditions are more accurate. Deep pocket owners are likely to make more attractive financing arrangements for cleaning, maintenance, and security than owners without the funds. Crockett also finds many asset sales can reduce the costs associated with distress rather than leading to further destabilization implied by fire sales.

Diamond and Rajan (2011) discuss the costs and benefits of cleaning up the banking system by closing some banks and compelling others to sell assets if there is an increased risk of a crisis. They find that banks may be forced to sell illiquid assets even though they may have private incentives to hold on to those assets. Banks can sell the asset today to strengthen its current financial status, but the bank would also lose any returns that the asset might generate from value recovery. Liquid buyers expecting fire sales are less likely to lend due to expected higher returns. Privately optimal decisions can result in worse fire sales and a more significant decrease in lending.

Acharya, Shin, and Yorulmazer (2011) consider the bank portfolio choice between liquid (safe) and illiquid (risky) assets. The authors find evidence that when banks have relative expertise in employing risky assets, the market for these assets clears only at fire-sale prices following a large number of bank failures and the gains from acquiring assets at fire-sale prices make it attractive for banks to maintain liquid assets. The choice of bank liquidity is found to be inefficiently low during economic booms but remarkably high during crises. Liquidity support to failed banks or unconditional support to surviving banks provides no motivation for banks to

have liquidity. The opposite is true when support to surviving banks is dependent on their liquid asset holdings.

4.2.3 Commercial Real Estate

Commercial property asset sales have been examined in much of the real estate literature. Much of the decision regarding the divestiture of real estate properties are related to the tradeoff between selling price and the time it takes to sell the property. Tripp (1977) empirically examines the relationship between selling price and the length of time the property spends on the market using investment properties from the Residential Income Property Multiple Listing Service. He uses a canonical regression as a function of the ratio of asked down payment to price, age of the property, number of rental units, quality of appearance and location, and the sale date. The results indicate a positive relationship between the discount rate and the selling time of the property. In addition, increase in asked down payment, number of rental units, and age increase the time to sale for a given capitalization rate. Moreover, increases in quality of appearance and location and date of sale over the period reduce the time to sale for any given price. Tripp points out that this information is useful when deciding on a reasonable asking price.

Johnson, Wiley, and Wu (2007) employ hedonic pricing and duration models to analyze the relationship between the price of national CoStar commercial properties and the time it takes to sell these properties. The two are found to be negatively related suggesting that lengthy marketing times can lead to lower transaction prices. In addition, properties with higher prices will sell more quickly than properties with lower prices.

Orr, Dunse, and Martin (2003) also examine the relationships between commercial real estate prices and time on market for the property by using rents rather than selling price. They

fail to find evidence of a direct relationship between time on market and transacted rents, time on the market and asking rents, and asking rents with transacted prices. To expand their analysis, the authors examine the physical, location and market conditions that influence the expected time of on the market for a property and find that the state of the property market has a significant impact on the amount of time it takes to lease a property which is also consistent with earlier studies on housing. However, non-price incentives, motivation, tenants' characteristics, and search costs are found to better explain the link between rents and the amount of time it takes to lease the property.

Brown and Sing (2004) estimate the time on the market for commercial real estate sector within the United Kingdom, but take a different approach than more traditional time on the market studies. The authors use a simple present value model to estimate the time that it takes for prices to reach their open market equilibrium, discounted at a risk adjusted rate of return. The authors find that it would take 8.4 months for expected prices to converge to their open market appraisals in order for a sale to occur.

Dobson and Goddard (1992) begin their analysis with a theoretical model of the determination of price and rents of commercial real estate which considers the motivations of different types of commercial property users, owner-occupiers and tenants, and those of different types of commercial property owners, owner-occupiers and landlords. Prices and rents adjust to equate the numbers of commercial property buyers and sellers, and the number of new landlords to tenants. This leads to equations where price and rent are determined simultaneously in response to changes in demand and supply side variables, since decisions to buy, sell, rent, and lease are impacted by prices and rent. The authors then empirically test these equations using data consisting of industrial properties, shops, and offices. The results show that an employment

change is a determinant of price and rent for industrial properties, interest rates have a negative relationship with prices for industrial properties and offices and a positive relationship with rent for all types of properties, and house price change has a positive relationship with prices for industrial properties and offices and rents on all types of properties.

4.2.4 Commercial Real Estate and Banks

There is also recent literature that discusses the association between commercial real estate and banks. Davis and Zhu (2009) consider the relationship between commercial property price movements and the lending decisions, risk and profitability of 904 individual banks. They find that commercial property prices have strong relationships with many bank performance variables. Specifically, commercial real estate prices tend to be positively related to bank lending and profitability, and negatively related to banks' net interest margin and bad loan ratios and the strength of this relationship is dependent upon bank size.

In a different study, Davis and Zhu (2011) explore determinants commercial property prices and their association to credit using a model where lending is closely related to property prices and cycles can arise in property markets. Macroeconomic shocks (GDP, interest rates) cause changes in property prices and bank lending with the overall influence dependent upon the attributes of property markets. A positive effect of credit on commercial property prices in the short run but a negative effect in the long run is found. GDP is also found to have a positive effect on property prices whereas interest rates have a negative impact.

Data and model specifications for the analysis are discussed in the next sections.

4.3 Property Price and Discount Estimations

4.3.1 Data

The empirical analysis tests for differences in price based on the seller of commercial office properties. The price of commercial properties sold by publicly listed banks is compared to that of commercial office properties sold by non-bank sellers, including non-institutional sellers (including individuals and developers), corporate sellers, REITs, and financial institutions (includes equity funds, insurance companies, investment managers, and pension funds). The dataset includes detailed transactions of office properties collected from the CoStar Comps database in December 2010. Transactions considered in this study occurred in 53 markets[24] with 171 submarkets from the third quarter of 2008 to the fourth quarter of 2010 and are for Class B and Class C properties. The set considered in this study includes characteristics for 1239 office property transactions.

Descriptive statistics are reported in Table 4.1, and all variables are defined in the notes to Table 4.1. The average property sold by a bank has 19,707 square feet of rentable building area, is 29.9 years old, and sold for a price of $1,685,623. 59.8% of the properties are considered Class B space and 40.2% are considered Class C space. There are 261 bank sales in the sample. The average property sold by a non-bank seller is 26,522 square feet of rentable building area, is 28.1 years old, and sold for a price of $2,595,669. 68.8% are considered Class B space, and the

[24] The 53 office markets are Asheville, Atlanta, Bakersfield, Birmingham, Boise City/Nampa, Boston, Charlotte, Chicago, Cincinnati/Dayton, Cleveland, Colorado Springs, Columbus, Denver, Detroit, East Bay/Oakland, Fresno, Greensboro/Winston-Salem, Greenville/Spartanburg, Indianapolis, Inland Empire (California), Jacksonville (Florida), Las Vegas, Little Rock/N. Little Rock, Long Island (New York), Los Angeles, Memphis, Milwaukee/Madison, Minneapolis/St. Paul, Nashville, New York City, Northern New Jersey, Oklahoma City, Orange (California), Orlando, Pensacola, Philadelphia, Phoenix, Pittsburgh, Portland, Providence, Sacramento, San Diego, San Francisco, Seattle/Puget Sound, South Florida, Southwest Florida, St. Louis, Stockton/Modesto, Tallahassee, Tampa/St. Petersburg, Tucson, Tulsa, Washington, D.C., West Michigan, and Westchester/So. Connecticut.

remainder is transactions of Class C properties. There are 978 non-bank sales in the sample. Comparing sample means, the only significant difference is for Class B and Class C with non-bank sales consisting of Class B properties and bank sales consisting of Class C properties.

4.3.2 Discount Estimation

The first step of the empirical analysis considers whether banks as a seller of properties contribute to the pricing of office properties. The linear specification used to estimate this price is

$$(1)\ \ln(\textit{Sale price}) = \beta_0 + \beta_1 \cdot \ln(\textit{age}) + \beta_2 \cdot \ln(\textit{size}) + \beta_3 \cdot \textit{Class C} + \beta_4 \cdot \textit{Bank} + \Sigma\beta_i \cdot \text{Submkt}_i + \Sigma\beta_t \cdot \textit{Quarter}_t + \varepsilon$$

Sale price is the transaction price for the property. *Age* is the age of the property in years. *Size* is the rentable building area in square feet. The variables *Sale Price*, *Age*, and *Size* are all logged for the empirical estimation. *Class C* is an indicator variable which equals one if the property is listed as Class C, and zero otherwise. *Bank* is an indicator variable which equals one if the property is sold by a bank, and zero otherwise. $Submkt_i$ are dummy variables for each submarket within a market, with one indicator suppressed. $Quarter_t$ includes indicator variables for the quarter in which the property was sold with one indicator suppressed.

Empirical results for the linear specification in equation (1) are reported in Table 4.2. There are 171 submarkets with one submarket suppressed. There are 10 indicators for the quarter in which the property was sold with one quarter suppressed. The coefficient on size is positive and significant. Office properties sell at a higher price when they have larger rentable building area (in square feet). Larger properties sell at a premium of 77.5 percent.[25] The

[25] All estimated discounts and premiums are estimated in the following way. The estimated coefficient is 0.574 for the size variable. The premium is then estimated as exp(0.574)-1 = 77.5%.

primary coefficient of interest is for the Bank indicator variable. The estimated discount for properties sold by banks is 18.3 percent.

4.4 Abnormal Stock Returns

Further analysis examines abnormal stock returns around the transaction dates in order to evaluate the effect on shareholder value. There are 261 office sales by publicly listed banks. The empirical method estimates abnormal returns surrounding the transaction date. One index is considered for the estimation of abnormal returns surrounding the transaction dates. The Bank index is a value weighted index for all securities with CRSP data listed under SIC codes 6020, 6021, 6022, and 6029. A companion index technique is implemented whereby stock returns from the subject are excluded in the creation of the Bank index used to evaluate abnormal returns for that firm.

An intermediate horizon is useful to determine whether the proceeds from the asset sale impact the value of the firm. The intermediate horizon ranges from the day after up to two months following the transaction date (+1, +60). It is expected that cumulative abnormal returns are non-linear with respect to asset size. The cumulative abnormal returns (CAR) are lowest when asset sales are most heavily discounted which occurs for the largest assets, but also small cumulative abnormal returns (CAR) when the asset sales are too small. The estimated mean cumulative abnormal return (CAR) over the intermediate horizon is reported in Table 4.3. The cumulative abnormal returns are positive and significant estimated at 3.14 percent relative to the Bank index.

4.5 Determinants of Abnormal Returns

The evidence presented is that abnormal returns over the intermediate horizon are positive and significant for the full sample. To consider whether firm characteristics influence

abnormal returns following the asset sale, cumulative abnormal returns generated over the intermediate horizon measured relative to the Bank index are collected to create the CAR variable. Data for each bank's characteristics are collected from Compustat. Summary statistics for characteristics in the sample of divesting banks are summarized in Table 4.4, and all variables are defined in the notes to Table 4.4.

The first consideration of an explanation for the abnormal returns include the firm's total assets, change in return on assets from the quarter of the sale to the quarter following the sale, interest coverage ratio, and Tobin's Q. The model for the determinants of CAR is

$$CAR = \beta_0 + \beta_1 \cdot Assets + \beta_1 \cdot \Delta ROA + \beta_4 \cdot Q + \beta_5 \cdot Coverage + \varepsilon \quad (2)$$

The variables used in equation (2) are defined in Table 4.4.

The estimation of equation (2) is reported in Panel A of Table 4.5. The total assets are only negative and significant. The change in return on assets from the quarter of the asset sale to the quarter following the asset sale is positive and significant. Coverage is the firm's interest coverage ratio and measures the firm's ability to meet its financial obligations. A firm is better able to fulfill its obligations the higher the coverage ratio. Coverage is positive and significant for the full sample, second quartile, and fourth quartile; therefore, the higher the interest coverage ratio, the more likely the bank is to experience abnormal returns. Q is the ratio between market value and replacement cost and is related to the firm's investment opportunity set. Investment policy indicates that managers should invest in capital when Q is high and divestiture is viable when Q is low. There is no evidence to suggest that abnormal returns are impacted by the value of Q.

For more explanation for the abnormal returns over the intermediate horizon following the asset sale, the next consideration is for the use of funds for the firm. For a firm, spending is

consistently occurring, this includes debt reduction, preferred and common dividends, and investment. The focus is on changes in spending that occur in the quarter following the asset sale. The equation to be estimated for CAR determinants is

$$(3) \quad CAR = \beta_0 + \beta_1 \cdot \Delta\text{Debt Reduction} + \beta_1 \cdot \Delta\text{Preferred dividends} + \beta_4 \cdot \Delta\text{Common dividends} + \beta_5 \cdot \Delta\text{Invested Capital} + \varepsilon$$

Variables in equation (3) are summarized in Table 4.4, and variable definitions are provided in the notes to Table 4.4.

Panel B of Table 4.5 includes the results from the estimation for equation (3). ΔDebt Reduction is positive and significant. Abnormal returns are significantly higher when there is an increase in funds committed to debt reduction. This suggests that some of the benefit from asset sales can be attributed to capital restructuring. Abnormal returns from asset sales are lower when assets are sold below market value and are reinvested in other long-term assets.

4.6 Conclusion

This essay examines the relationship between publicly listed bank office property sales and the decisions to sell commercial real estate office properties. The empirical results indicate that properties sold by banks sell at an 18.3 percent discount from similar properties sold by non-bank sellers. An extension of the analysis looks at abnormal returns around the transaction dates of these bank sold office properties. For the full sample of banks, cumulative abnormal returns were found to be positive and significant at 3.14 percent. Determinants of these cumulative abnormal returns, assets, returns on assets, Tobin's Q, coverage ratio, debt reduction, preferred dividends, common dividends, and invested capital are considered. The change in return on assets from the quarter of the sale to the quarter after the sale and coverage has a positive impact

on cumulative abnormal returns whereas assets are found to have a negative impact. Debt reduction positively affects cumulative abnormal returns and invested capital has a negative influence.

The results indicate that even though these banks are selling these assets at significant discount, they are still generating positive and significant abnormal returns. Getting these properties off of their books is still beneficial to the bank as well as the shareholders. Banks benefit from discounted asset sales as long as funds are used in the previously mentioned ways. For further research, an empirical analysis based on the size of the asset sale will be undertaken.

Table 4.1 Summary Statistics

	Bank Sales				Non-bank Sales				
Variable	**Mean**	**Std Dev**	**Min**	**Max**	**Mean**	**Std Dev**	**Min**	**Max**	**t-test for diff in means**
Sale price	1,685,623	4,007,119	17,500	33,250,000	2,595,669	9,526,044	18,000	146,200,000	1.51
Age	29.858	28.341	2	120	28.088	28.289	1	175	-0.90
Size	19,707	30,032	800	205,278	26,522	68,437	788	1,292,748	1.57
Class B	0.598	0.491	0	1	0.688	0.464	0	1	2.76***
Class C	0.402	0.491	0	1	0.312	0.464	0	1	-2.76***
Bank	1	0	1	1	0	0	0	0	
Number of Observations	261				978				

Notes: This table reports summary statistics for the office property data and variables used in this study collected from the CoStar database. The first column lists the variable name. The second, third, fourth, and fifth columns provide the sample mean, standard deviation, minimum value, and maximum value, respectively, for the bank sales. The sixth, seventh, eighth, and ninth columns report the sample mean, standard deviation, minimum value, and maximum value, respectively, for the non-bank sales. The tenth column presents the t-test for the difference in means. *Sale price* is the transaction price paid for the office property. *Age* is the property age in years. *Size* is the rentable building area, measured in square feet. *Class B* and *Class C* are indicator variables for the property class, which equal one to identify the respective class and zero otherwise. *Bank* is an indicator variable which identifies the seller as a bank seller with a value of one and zero otherwise. Number of observations is the number of observations in each sample. ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively, based on the *t*-statistic.

Table 4.2 Estimation of ln(Sale price), bank discount

Variable	Coefficient	(*t*-stat)
Intercept	9.600***	(16.44)
Age	-0.015	(-0.43)
Size	0.574***	(18.54)
Class C	-0.079	(-0.98)
Bank	-0.202***	(-2.86)
Quarterly indicator variables:	Included [9 quarters]	
Submarket indicator variables:	Included [170 submarkets]	
Observations	1239	
R^2	57.79%	

Notes: This table reports the results from the least squares estimation of Equation (1) for each subsample, which provides the initial estimates for the relative pricing of properties that are sold by bank sellers. The dependent variable is *Sale price*, logged. All variables are defined in the notes to Table 1. The first column presents the variable name, and in each panel, the estimated coefficient and corresponding *t*-statistic, in parentheses. *Age* and *Size* are logged. The estimation is for a fixed effects model with control variables for time at the quarterly frequency for 9 of 10 quarters during the second half of 2008 through 2010. In addition, indicator variables are included for 170 of the 171 submarkets considered, with one suppressed. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively, based on the corresponding *t*-statistic.

Table 4.3 Abnormal stock returns

	From day +1 to +60	
	Mean	Generalized-sign Z Score
Cumulative	3.14%***	(3.157)

Notes: This table reports the mean cumulative abnormal returns (CAR) for the intermediate-horizon relative to the asset sale transaction date for the sample of bank office transactions compared to the benchmark Bank index. The intermediate horizons begin one trading day following the asset sale and lasts for 3 months (+1,+60). The Bank index is a value-weighted index constructed based on all CRSP securities for SIC 6020, 6021, 6022, and 6029. A companion index approach is used whereby the subject is excluded from the set of returns used to generate the index in each iteration. The estimation period includes one year of stock returns and ends 50 trading days before the event window. The generalized-sign Z score is reported in parentheses. ***, **, and * denote statistical significance for the coefficient at the 1%, 5%, and 10% levels, respectively.

Table 4.4 Summary Statistics of Divesting Firms

Variables	Mean	Std dev	Min	Max
Assets	719,642	858,755	438.087	2,363,878
ΔROA	0.0002	0.008	-0.071	0.042
Q	0.998	0.039	0.926	1.174
Coverage	2.192	26.818	-308.901	51.263
ΔDebt Reduction	-0.004	0.104	-0.571	0.259
ΔPreferred dividends	.00001	0.001	-0.002	0.002
ΔCommon dividends	0.001	0.022	-0.111	0.315
ΔInvested Capital	0.018	0.074	-0.078	0.252
Number of firms	35			
Number of transactions	261			

Notes: This table reports the summary statistics for banks in this study selling office properties. The first column lists the variable name. The second, third, fourth, and fifth columns report the mean, standard deviation, minimum value, and maximum value, respectively. Assets is the quarterly reported book value of total assets (ATQ), in millions of USD, in the quarter of the sale. ΔROA (return on assets) equals the difference in the quarterly net income (NIQ) divided by total assets (ATQ) in the quarter of the sale from the quarterly net income (NIQ) divided by total assets (ATQ) in the quarter following the sale. Coverage is the interest coverage ratio, which equals income before extraordinary items (IBQ) divided by the sum of preferred dividends (DVPQ) and interest related expense (XINTQ). Q is Tobin's Q, which equals total book assets (ATQ) plus the market cap (PRCCQ*CSHOQ) minus common equity (CEQQ), all divided by total book assets (ATQ) in the quarter of the sale. ΔDebt reduction equals the difference in debt reduction (DLTRQ) from the previous quarter, divided by total long-term debt (DLTTQ). ΔPreferred dividends equal the difference in preferred dividends paid (DVPQ) from the previous quarter, divided by the market cap (PRCCQ*CSHOQ). ΔInvested capital equal the difference in total invested capital (ICAPTQ) from the previous quarter, divided by total assets (ATQ). Data for all variables are collected from Compustat.

Table 4.5 Determinants of abnormal returns

Panel A.

Variable	Coefficient	(*t*-stat)
Intercept	0.342	0.85
Assets	-0.040**	-2.26
ΔROA	7.098***	3.97
Q	-0.102	-0.26
Coverage	0.002**	2.58
Observations	261	
R^2	8.0%	

Panel B.

Variable	Coefficient	(*t*-stat)
Intercept	0.046***	3.00
ΔDebt Reduction	0.432***	2.98
ΔPreferred dividends	-44.360	-1.60
ΔCommon dividends	0.687	1.00
ΔInvested Capital	-0.517**	-2.57
Observations	261	
R^2	7.6%	

Notes: This table reports the results from the estimation of abnormal returns, considering variables specified in equation (2) as the independent variables. The dependent variable is the cumulative abnormal return (CAR) collected over the intermediate-horizon (+1,+60) using the Bank index as a benchmark for the respective transactions. The estimation method is ordinary least squares. All variables are defined in the notes to Table 4. The asset variable is logged. The first column presents the variable name, and in each panel, the estimated coefficient and corresponding t-statistic, in parentheses. Panel A reports the results from the estimation of abnormal returns considering variables specified in equation (2). Panel B presents the results from the estimation specified in equation (3). ***, **, and * indicate statistical significance for the coefficient at the 1%, 5%, and 10% levels, respectively.

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5. CONCLUSION

This dissertation consists of three separate essays in the area of real estate. The first essay examines the continuing evolution of the Internet and the resulting effects on the efficiency of buyer search. The second essay evaluates the menu of alternatives for sellers of commercial real estate who encounter detrimental conditions. Finally, the third essay examines how publicly listed banks perform as sellers of commercial real estate as compared to non-bank sellers.

In the first essay, the findings from the Netused probit model were consistent with earlier research. The same factors that influenced Internet use in 1999 still have the same effects today. The results show that older buyers and buyers who first learned of their home purchase from a broker were less likely to use the Internet in their search process, regardless of the state of the market. However, as anticipated, the Internet was more likely to be used by buyers who are facing one or several of the following: higher prices, engaged in employer mandated moves, and searching over greater distances. These results were not affected by differing market conditions.

In the second stage estimations, the Netused variable was positive and statistically significant in both the 2006 and 2009 duration equations. Importantly, this variable was statistically insignificant in the 1999 study, when Internet use was not as widespread. Home buyers using the web searched longer whether a buyer's or seller's market.

Buyers using the web as a search tool looked at fewer homes per week in 2006, but searched more intensively when conditions were more favorable to buyers. Net use in the intensity equations was positive and significant in both 1999 and 2009. Given the idiosyncratic nature of the housing bubble, the inverse relationship between intensity and net use in 2006 may

not hold in more typical, less extreme seller's markets. In 2009 the Internet enabled buyers to search more intensively while greater availability and more affordable choices encouraged buyers using the Internet to search longer.

In the second essay, the main empirical results indicate that there is an ordinal ranking for the discounts received when commercial office properties are sold under detrimental conditions. The ranking is that REO sales experience the greatest discounts, estimated at 33.8 percent, followed by short sales, which are discounted by an estimated 23.6 percent, followed by auction sales, which are only discounted 13.8 percent relative to properties sold with no sales conditions. That is, these properties are sold at a discount from the normal market price as a reflection of the property's true value.

Property characteristics also play an important role in the price discount of properties sold with sales conditions. Older properties exhibit increasing discounts when they are sold as REOs or at auction, and properties sold as short sales are not affected by age. The results also suggest that the auction discount is decreasing in property size as larger properties are able to attract sufficient attention. Lastly, Class C properties perform worse as REO sales and at auction, when compared to Class B. Even though these property characteristics are found to influence the discounts, the auction method for divesting of distressed assets often experiences the lowest discount.

Beyond the property characteristics, market conditions also play an important role in the price discounts of properties with sales conditions. Geography impacts the success of an REO, and REOs tend to perform worse when a given market is overwhelmed with properties being sold as REOs. Auctions actually perform better during periods there are many properties being

sold at auction. Curiously, the discount for short sales in the office market appears to be independent of property characteristics, geography and market timing.

Finally, REO sales are discounted more when the properties are sold in states with statutory rights of redemption. Interestingly, auction sales are unaffected by statutory rights of redemption. Short sale prices would be unaffected as the sellers are voluntarily conveying titles and the statutory right do not apply.

In the third essay, the empirical results indicate that properties sold by banks sell at an 18.3 percent discount from similar properties sold by non-bank sellers. An extension of the analysis looks at abnormal returns around the transaction dates of these bank sold office properties. For the full sample of banks, cumulative abnormal returns were found to be positive and significant at 3.14 percent. Determinants of these cumulative abnormal returns, assets, returns on assets, Tobin's Q, and the coverage ratio, debt reduction, preferred dividends, common dividends, and invested capital are considered. The change in return on assets from the quarter of the sale to the quarter after the sale and coverage both have a positive impact on cumulative abnormal returns whereas assets are found to have a negative impact. Debt reduction positively affects cumulative abnormal returns and invested capital has a negative influence.

The results indicate that even though these banks are selling these assets at significant discount, they are still generating positive and significant abnormal returns. Getting these properties off of their books is still beneficial to the bank as well as the shareholders. Banks benefit from discounted asset sales as long as funds are used in the previously mentioned ways. For further research, an empirical analysis based on the size of the asset sale will be undertaken.