Uncovering Rent-Seeking and Social Waste: A Parable from the Real Estate Market

by

Chang-Tai Hsieh, Princeton University
Enrico Moretti, UCLA

CEPS Working Paper No. 78

February 2002

1 Introduction

There is a growing realization that rent-seeking is pervasive in many societies and these activities are important in explaining many economic outcomes. Rent-seeking can take many forms, from lobbying and bribing for protection and exclusive licenses, to competing for jobs in government bureaucracies, to seeking admission to elite schools. Regardless of the form it takes, rent-seeking is widely viewed as socially wasteful, both because of the implicit tax imposed by rent-seekers on the socially productive parts of the economy, and also because resources are wasted in capturing these rents. For example, economists have long sought to understand how inefficient trade policies arise out of lobbying by interest groups.[1] To take another example, some economists have argued that an important reason why many countries remain underdeveloped is because property rights are poorly protected and returns from predatory and rent-seeking behavior are high relative to the profits from undertaking socially productive activities.[2]

Clearly, the very nature of rent-seeking makes makes it very difficult to find direct evidence of such activities, let alone obtain a measure of the social waste due to rent-seeking activities. Instead, one has to look for indirect evidence of such activities, and a number of recent papers use such indirect evidence to measure hard-to-observe activities such as matching-fixing in sports, test cheating, Medicare fraud, political corruption, and asset-stripping.[3] This paper follows this approach by deriving the implications of rent-seeking in a specific institutional context – the U.S. residential real estate market – and subjects these predictions to empirical tests.

The U.S. residential real estate market has a number of distinctive institutional characteristics that provide a unique opportunity to measure the extent of rent-seeking and the social waste due to these activities. When an existing home is sold in the US, the sale is usually handled by two real estate brokers representing the seller and the buyer. The two brokers split a brokerage commission that is almost always stated as a percentage of the selling price of the home. In the

[1] See Bhagwati (1982) and Krueger (1974) for seminal contributions to this literature, and Hillman (1989) and Rodrik (1995) for comprehensive surveys.

[2] See Acemoglu (1995), Baumol (1990), Murphy, Shleifer, and Vishny (1991, 1993), and Olson (1982). See Hoff (2001) for a related story about the lack of political support for the rule of law in former Soviet Union.

[3] See Duggan and Levitt (2000), Jacob and Levitt (2001), Becker, Kessler, and McClellan (2001), Fisman (2000), Bertrand, Mehta, and Mullainathan (2000), and Banerjee, Mookherjee, Munshi, and Ray (2001).

period under consideration in this paper, the commission rate appears remarkably uniform, both across geographical regions and over time. What is particularly surprising about the apparent uniformity of the commission rate is that it implies that a real estate agent's commission from selling a house will differ dramatically depending on the price of the house, although the effort necessary to sell an expensive house may not be much different from that required to sell a cheaper home.

Consider, for example, the transaction cost of selling a typical house in two cities – Boston and Minneapolis – that are similar in most dimensions except in the cost of housing. In 1990, the price of a typical house in Boston was roughly twice that of a typical house in Minneapolis.[4] With a fixed commission rate, the brokerage fee from selling a typical house in Boston was therefore twice that of a similar transaction in Minneapolis. If this is all there is to the story, real-estate agents in Boston would simply earn twice as much as their counterparts in Minneapolis. Real estate commissions would simply be a transfer from home-sellers and home-buyers to real-estate agents, and the deadweight loss from the fixed commission in Boston would probably be small, especially if the demand for real estate transactions is relatively price inelastic.

However, because there is relatively free entry into the real-estate business, an average real-estate agent in Boston does not earn twice as much as an agent in Minneapolis. Because the commission from selling a typical house is twice as high in Boston than in Minneapolis, there are more real estate agents in Boston seeking these high commissions, although the total number of homes sold each year is actually larger in Minneapolis. Consequently, the average real estate agent in Minneapolis is much more productive than a typical agent in Boston, selling 6.6 houses each year in Minneapolis as compared to an average 3.3 houses a year in Boston.

One could still argue that there is something fundamentally different between Boston and Minneapolis, that the effort necessary to sell a house in Boston is simply twice the effort necessary in Minneapolis. Perhaps the dense urban structure or the older age of dwellings in Boston makes it harder for brokers to sell houses, or perhaps descendants of Irish Catholics are more finicky

[4] According to the 1990 Census, the average price of residential housing was $216,231 in Boston and $100,504 in Minneapolis.

about their housing than descendants of Germans and Scandinavians. However, it has not always taken twice as many real-estate agents to sell a house in Boston than in Minneapolis. Although the productivity of real-estate agents in Minneapolis was twice that in Boston in 1990, the difference was much smaller in 1980. In 1980, a typical real-estate agent in Boston sold 6 houses while her counterpart in Minneapolis sold 7 homes. What accounts for this change? From 1980 to 1990, housing prices doubled in Boston, while the average price of housing in Minneapolis remained unchanged. Since the commission rate is fixed, the rents from selling a house in Boston increased from 1980 to 1990, and thus attracted many people into the real-estate business in Boston seeking to earn these commissions. By 1990, the number of real-estate agents in Boston had roughly doubled. And since the number of houses sold in Boston in 1990 had roughly remained unchanged, the productivity of an average real-estate agent in Boston in 1990 had fallen to almost half of what it was in 1980.

The tragedy of this outcome is that despite the fact that home sellers in Boston pay twice as much to real-estate agents than in Minneapolis, real-estate agents in Boston are no better off than in Minneapolis, nor are they better off than their counterparts in 1980. The higher commissions in Boston are simply dissipated away, wasted through massive entry of real-estate agents seeking to capture these rents, agents who could otherwise be engaged in socially productive activities rather in rent-seeking behavior.

This paper presents a simple model to show that if real-estate commission rates do not vary across cities and if there are few barriers to entry in the real-estate profession, then we should observe a similar relationship between the amount of rent-seeking activities and the average price of housing in a city. In equilibrium, as long as the earnings of every real-estate agent is equal to her opportunity cost, the higher commissions in high housing-cost cities will be fully dissipated through entry, and brokers in such cities will be no better off than their counterparts in low housing cost cities.

Using the 1980 and 1990 Population Censuses to measure the number of brokers and the productivity of an average broker in 282 metropolitan areas, we find three pieces of evidence consistent with a story in which commission rates are fixed and generate more rent-seeking activities

in cities with high housing costs. First, we find that the fraction of real-estate brokers in a city increases with the average price of housing in the city. Second, we show that the productivity of a typical real-estate agent (defined as sales per hour worked) falls when the price of housing in a city increases. Third, we find no relationship between the price of housing and the average earnings of brokers, after the latter is adjusted for the brokers' city-specific reservation wage to account for differences in the cost of living. There three pieces of evidence hold up both in a cross-section of cities, and when considering changes across cities from 1980 to 1990. The advantage of looking at changes over time is that we abstract from all other permanent characteristics of cities that may be correlated with the price of housing and that could also affect the difficulty of matching home-buyers and home-sellers.

Our most robust estimate indicates that a one percent increase in average housing prices in a city results in a 0.7 percent decline in brokers' productivity. We interpret this evidence as support for our story of how a fixed commission rate generates rent-seeking activities. However, an alternative explanation is that the higher commission in high housing cost cities may reflect the possibility that a broker has to spend more time matching buyers and sellers in such cities. For example, expensive houses may have idiosyncratic features. And even when differences in housing prices are entirely due to the price of land (rather than housing quality), home-buyers in expensive cities may take more time searching and visit more houses before making a decision. Therefore, some of the documented correlation between housing prices and the productivity of realtors may reflect differences in the quality of the service provided by realtors.

We can not completely rule out this interpretation. However, we provide four pieces of evidence that are inconsistent with this view. First, when we condition on measures of changes in the quality of housing such as changes in size, age, and dwelling structure, our results change very little. Second, we use two indices of housing prices that are based on repeated sales of the same property as instruments for changes in the price of housing in a city. These instrumental variable estimates are entirely driven by changes in the price of *land*, and are therefore robust to changes in unobservable characteristics of housing. When we do so, our results do not change. Third, we use data on vacancies to show that increases in housing prices in a city are associated

with *decreases* in the average time houses for sale remain on the market. This suggests that when housing prices increase, realtors find it *easier*, not harder, to match buyers and sellers.[5] Finally, we show that although the average number of houses visited by home buyers rises with housing prices, this correlation is small and statistically insignificant.

We want to make clear that our argument is based on the assumption that commission rates are relatively fixed across cities. While our empirical evidence suggests that this was the case in the years we examine in this paper (1980 and 1990), there is some anecdotal evidence that in recent years, the internet may have made it possible for discount brokers to emerge.[6] In turn, this may be putting downward pressure on commission rates. Clearly, if commission rates are in fact lower in high housing cost cities today, our hypothesis is that we would not observe the correlation between the productivity of real estate brokers and the price of housing in 1980 and 1990 that we document in this paper.

The paper proceeds as follows. Section 2 presents evidence that suggests that commission rates are invariant to the price of housing. Section 3 presents anecdotal evidence on rent-seeking activities by real-estate agents and uses a simple theoretical framework to analyze the extent to which higher housing prices are dissipated through such rent-seeking activities. In Section 4, we present empirical evidence on rent-seeking behavior by real-estate agents. Section 5 concludes.

2 The Real-Estate Brokerage Industry

There are two striking empirical facts about the real-estate brokerage industry. First, an important aspect of the market for real-estate brokers is the absence of significant barriers to entry. The exam to obtain a license is the only barrier, and the requirements to pass the exam are limited.[7] Moreover, at any point in time there is a large number of licensed but inactive brokers who are presumably ready to become active when it is profitable for them to do so. In Table A1, we present the number of active and inactive licensed brokers in each state. About 20%

[5]The extreme example of this phenomenon is the housing market in Silicon Valley in the late 1990s, where houses were sold only hours after they were listed.

[6]The internet was not widely available in 1980 and 1990.

[7]The annual issues of the "Digest of Real Estate License Laws" provide detailed data on the licensing requirements in each state.

of brokers at any moment in time are inactive. In addition, another characteristic of this labor market is a large number of part-timers, who are likely to adjust their number of hours worked according to market conditions.

A second striking empirical fact about real-estate brokerage services in the 1980s is that most commission rates appear to be fixed at 6 or 7 percent, regardless of whether the house sells for half a million dollars or for a hundred thousand dollars, or whether a house is more or less easy to sell. The uniformity of commission rates across markets and over time is well established in the real estate literature.[8] In fact, this lack of variation in commission rates led the Federal Trade Commission (FTC) to investigate the industry for possible antitrust law violations in the early 1980s.

Specifically, the FTC's report provides three pieces of evidence that most home-sellers pay a fixed commission rate. The first piece of evidence is from a survey conducted by the FTC of a nationally representative sample of 934 home-sellers in 1979 and 1980. The data from this survey shows that 85% of the home-sellers reported having paid a commission rate of 6 or 7 percent. The distribution is shown in the top panel of Figure 1.[9] A second piece of evidence comes from data compiled from the actual settlement documents of 5,000 home sales from all fifty states in 1979.[10] This data, shown in the bottom panel of Figure 1, also indicate that the overwhelming majority of home-sellers pay a commission rate of 6 or 7 percent, and only 9 percent of the sample report paying a commission rate of less than 5 percent.[11] Finally, Figure 2 presents the distribution of commission rates from a random sample of listings from the Multiple Listing Services (MLS) in Boston, Los Angeles, Minneapolis, and Seattle in 1978 and 1979, which adds to the evidence that the majority of real estate agents get paid a commission rate of 6 or 7 percent.[12]

[8]Examples of papers dealing with uniform commission rates include, but are by no means limited to, Carney (1981), Crockett (1982), Owen (1977), Miceli (1992), Turnbull (1996), Wachter (1987), Williams (1998), Arnold (1992), Goolsby and Childs (1989). Different conclusions on the uniformity of commission rates are found in Sirmans and Turnbull (1997).

[9]Note that Figure 1 reports the distribution of commission rates *actually paid* by consumers. In a small number of cases, the commission paid differed from the commission originally quoted, as home sellers were given a rebate or were made a gift by the broker. For those cases, the commission reported in the figure is adjusted to reflect the implicit commission rate. Source: FTC (1983), pg. 45.

[10]The settlement documents are known as standardized HUD-1 forms.

[11]Source: FTC (1983), Table III-3.

[12]FTC (1983), Table III-7.

A limitation with the evidence presented so far is that they are all from the late 1970s and early 1980s. It could be the case that as result of the FTC's investigation and numerous consent decrees signed between the US Department of Justice and realtors' organizations, there is now more price competition in real-estate brokerage services. It is therefore possible that commission rates are now more closely aligned with the actual time the realtor spends matching buyers and sellers. As we'll discuss in detail later in the paper, our empirical analysis covers the years 1980 and 1990, and we do not have evidence comparable to that collected by the FTC on whether commission rates were still fixed at 6 percent after 1980. The only systematic evidence we have is from the Consumer Expenditure Survey (CEX) from 1980 to 1998. Among the families surveyed by the CEX over this time period who sold a house, roughly two-thirds report having paid a commission to a realtor. Although the commission rate we obtain from the CEX is noisy, both because of imperfect recall and also because the CEX does not provide a perfect measure of commission fees from home sales, the median commission rate in our sample is 6.1 percent. More importantly, a household-level regression of the commission rate on the price of housing suggests that there is no correlation between the commission rate and the price the house was sold at. Using a linear specification that controls for year effects, the point estimate suggests that a $10,000 increase in the price of housing is associated with only a 0.005 percentage point decrease (with a standard error of 0.017) in the commission rate. The lack of correlation between housing price and commission rate is shown in Figure 3.[13]

What is quite remarkable is that if in fact commission rates are fixed, the commission from selling a house increases one-to-one with the price of the house. Now, one could argue that the broker that sells a million dollar house is a providing a completely difference service than one selling a cheap hundred thousand dollar condo, and that the additional 54 thousand dollars the

[13]House sales includes "own home" (UCC 820101) and "vacation home" (UCC 820102). We measure commission fees as "total selling expenses" (UCC 820301 and 820302), but this clearly includes other expenses other than commission fees. We estimate commission rate by dividing commission fees by the price of housing. Any measurement error will introduce attenuation bias, leading us to understate the true relationship between price and commission rates. To reduce measurement error, we drop observations with implausibly large or small estimated commission rates (less than 1% or more than 10%.) We end up with 406 household who report selling their houses and have non-missing price and commission rate. Since there are too many data points to show in a single Figure, each point in Figure 3 is the average commission rate within intervals $10,000 wide. The superimposed fit is from an household level regression of commission rates on housing prices. As mentioned in the text, the slope coefficient is -0.005 (0.017).

broker that sells the million dollar house gets simply reflects this difference. While this may be true when looking at houses of different prices within a market, it is less clear that there are significant differences in the average quality of housing across cities, despite sizable cross-city variation in the average price of housing. In Section 4 we present evidence that differences in the average price of housing across cities do not appear to be correlated with differences in the quality of housing or in the quality of services provided by realtors.

The apparent uniformity of commission rates presents an enormous puzzle, especially if one believes that the cost and effort necessary to sell a house does not increase one-to-one with the price of housing. Why do commission rates appear to be so insensitive to economic forces? We do not have an answer to this puzzle. One possibility is that it reflects collusion by real-estate brokers, perhaps enforced by the fact that every realtor has to work through the local MLS, which makes price cutting easily detected.[14] In addition, real-estate is unique in that a broker needs the cooperation of another agent to complete a transaction, which makes punishment for deviating particularly effective. [15][16] A second possibility is that the lack of variation in the commission rate (and the large variation in the price of brokerage services) may simply reflect differences in the elasticities of demand for these services. In particular, it is not implausible that the owner of a million dollar house is willing to pay a higher commission than the owner of

[14]Historically, realtor organizations published "recommended" commission rates, which were set at 6 or 7 percent. These recommendations were enforced, in part, by the realtors' control over the local MLS, which typically refused to accept listings from brokers who had accepted a commission rate lower than that recommended in the schedule. However, this practice ended in the 1970s due to antitrust action by the Justice Department and numerous consent decrees signed between the Justice Department and realtor organizations.

[15]There is substantial evidence that discount brokers are frequently punished by others brokers. For example, the FTC (1983) reports that in a survey of discount brokers, more a third of these brokers experience refusals by newspapers to run their advertisements due to pressure by traditional brokers to boycott publications which run ads of discount brokers. In addition, 93 percent of discount brokers reported disparagement of their business to prospective clients by non-discount brokers. Disparagement took the form of statement that the brokers were operating illegally, that they were unethical or unprofessional, or simply that the seller will not succeed in selling their homes through the discount brokers because no other brokers will deal with them. In addition, as any home-buyer will know, most real-estate agents are reluctant to inform the home-buyer of homes that are being directly sold by the owners (known as FSBOs). Since most FSBOs offer to pay the standard 3 percent commission to the buyer's agent, the only sensible explanation for this phenomena is that the buyer's agent fears possible retaliation by other agents.

[16]A related explanation is that the fixed commission rate is a social norm among real-estate brokers, and that there is a cost associated with deviating from this norm. There is a growing literature that social norms are important in explaining outcomes such as education, discrimination, childbearing decisions, and crime. Most similar to the convention of fixed commissions is the prevalence of 50-50 splits among share cropping contracts (Burke and Young, 2001). However, we still don't have a good understanding of why certain norms emerge, and not others, and how these norms are sustained.

a hundred thousand dollar house. The higher commission paid by the owner of the expensive house may therefore reflect her more inelastic demand for a realtor's service. Free-entry therefore results in more entry and higher prices in markets where the demand is more inelastic.[17]

However, none of these explanations are satisfactory. First, if the fixed commission rate is due to collusion by realtors, it's not clear why realtors collude in this manner instead of colluding to prevent new real-estate agents from earning any profits. Alternatively, if the fixed commission rate simply reflect differences in the elasticity of demand for real-estate services, the differences in the demand elasticity would have to be extreme to generate an equilibrium in which commissions increase one-to-one with the price of housing. Nonetheless, while a fruitful question for future research is how the competitive market mechanism can yield large variations in price that are seemingly unrelated to the cost of providing the service, our objective in this paper is not to explain the reasons behind this phenomena, but to examine the *consequences* of the lack of variation in commission rates.[18]

Finally, we want to reiterate that other than the data in the CEX, we do not have evidence on whether commission rates are still fixed at 6 percent today. There is some anecdotal evidence that suggests that in the recent years, the emergence of new technologies may be loosening the control of realtor organizations over information on the inventory of houses for sale. In particular, the increased use of web based home searches is playing a role in making it easier for discount brokers to match demand and supply. In turn, this may be putting downward pressure on commission rates. As previously stated, the empirical work in this paper focuses on 1980 and 1990, when the internet was not available.[19] Nonetheless, as will be clear later in the paper, to the extent

[17] See Mankiw and Whinston (1986).

[18] An additional puzzle about real-estate contracts is not only why commission rates are fixed for prices with vastly different prices, but also why they are stated as a fixed percentage of the total selling price rather than a non-linear schedule of the selling price. For example, suppose the price that a realtor can get for a house is given by $P=P_1+\theta e$, where e is the effort that the realtor has to put into selling the house. To elicit the maximum effort by the realtor, the commission should be stated as a function of $P\text{-}P_1$, rather than simply as a function of P. One explanation for this is that the principals in this principal-agent relationship are weak, perhaps because a typical home-seller only sells a house a few times in her lifetime, and also because many home-sellers leave town after selling a house, which potentially makes reputation less important.

[19] A recent Wall Street Journal article ("Home Rules: Real-estate listings on the Web are loosening the grip Realtors have long had on the Market", 10/29/2001) reports that one new real estate Web sites is eReality.com. *"The site typically charges the seller no more than 4.5% in commissions, which is considerably less than the usual 6% charged by traditional Realtors."* The company gains access to the Multiple Listing Services (MLS) by hiring real estate brokers who join local Realtor associations and thus qualify for access to the MLS. The company then

that our assumption of a fixed commission rate is wrong, and commission rates are in fact lower in high housing cost cities in 1980 and 1990, we will observe little effect of price of housing on brokers' productivity and brokers' labor supply.

3 Rent-Seeking and Rent-Dissipation

3.1 Anecdotal Evidence

If there is little variation in commission rates across cities, this implies that the broker commission from selling an average house is larger in a city where housing prices are high. In turn, our hypothesis is that this will generate more rent-seeking activities by real-estate agents to capture these rents In thinking about what we mean by rent-seeking activities, it's useful to think about what real-estate agents do as having two components. First, real-estate agents have to find a client – either somebody who wants to sell her house, or somebody who wants to buy a home. This is called "prospecting" by real estate agents, and includes activities such as door-to-door canvassing, phoning, mailings, and calling on houses for sale by the owner (known as FSBOs). It also includes activities such as establishing a "farm", which can be a small group of people (such as members of a tennis club) or a small neighborhood where the agent establishes a presence by, for example, handing out free pumpkins during Halloween.[20] Second, after the agent has obtained a client, she has to find a buyer for the property (if the client is a seller) or an appropriate house

gives its customer passwords to search through large sections of the MLS on their own. The strategy faced a legal challenge in 1999 when one Board of Realtors filed lawsuit alleging eReality.com had violated the rules of the local MLS. The lawsuit was recently settled. The unusually tight housing market in the late 1990s may have also play a role in the increased variance in commission rates in more recent years. For example, a broker in Fremont reported to us that the prevailing commission rate in Northern California was lowered from 6% in 2001, possibly as a response to the hot housing market.

[20]This dialogue describes how a new real-estate agent learned about the importance of "farming":

"Kennedy, I know it's tough not getting in on the great floor time here," my manager told me a few weeks after I started real estate, "but you can turn it to your advantage." Nell Shukes was trying to cheer me up. With noting to show for many hard hours except a couple of unpromising FSBO situations, I needed cheer.

"Tell me how, Nell."

"Do what that kid out in Simi Valley is doing."

"What kid?"

"Tommy Hopkins."

That was the first time I'd ever heard the name. "So what's he doing?"

"Breaking records," Nell said. "I've been trying to break his record all year. I came close, but—" Nell leafed through her message and then looked at me. "For Halloween, he rents a truck and loads it up with pumpkin. For Christmas, he throws parties for all the neighborhood kids."

"But how can that pay off? All that expense—"

for the client (if the client is a buyer). While the second activity provides a valuable service to home-sellers and home-buyers, the resources spent in the first activity are of marginal social value. More importantly, the fraction of her time that a realtor spends on "prospecting" and "farming" relative to useful activities – actually selling a house or helping a buyer find an appropriate house – increases as the number of other realtors in the same market rises.

One way to see the importance of prospecting is to look at the contents of any "self-help" book for real-estate agents. For example, the book "How Real Estate Agents Earn Big!" states that "prospecting is the gasoline that fuels the real estate engine. You can't get a career started without prospecting. You can't afford to abandon the habit of prospecting for new business even after your career is zooming right along."[21] One can also count the pages in such self-help books devoted to "prospecting" relative to providing services to buyers and sellers. Consider, for example, the contents of the best-selling book "How to Master the Art of Listing & Selling Real Estate."[22] Of the 396 pages in the book, more than half of the book is devoted to chapters with titles such as "How to acquire listing power," "Winning the Good Fight Against For-Sale-by Owners," and "Real Estate's Royal Road to Riches is Called Prospecting." To take another example from another best-selling book, "How to List and Sell Real-Estate", more than half of the book focuses on topics such as "How to Flip Those Fizzbos Right Into Your Fold," "Sow That Farm and Reap–and Reap–and Reap," and "Danny Kennedy's Full-Year Farming Almanac."[23]

We do not want to claim that "prospecting" and "farming" are entirely wasteful. Our claim is simply that society's gain from having free pumpkins during Halloween and from free note-pads with a realtor's picture is far less than what they cost to the realtor, both in terms of the direct cost of these freebies, but particularly in terms of the opportunity cost of the time the realtor

---

"There are four or five hundred houses in his neighborhood, Danny. It's active—about 20 percent turnover—and he's getting it all."

"Then he's averaging two listings a week!"

"Right, and he sells most of them himself."

"Four transactions a week!"

She nodded. "Plus the referral business he's doing outside his farm. It does add up."

"His farm?" If I'd heard the term before it hadn't sunk it. Pumpkins, Christmas parties, farms. This is the real estate business? My mind was reeling.

Source: Kennedy and Jamison (1999)

[21] Tayler (1997)

[22] Hopkins (1991)

[23] Kennedy and Jamison (1999)

puts into such activities. What's more, our claim is that as long as the commission rate is fixed, the amount of time that realtors devote to such activities increases as the market becomes more competitive – that is, as more realtors are chasing after the same number of customers.

3.2 Theoretical Framework

In thinking about the extent to which higher commissions in cities with expensive housing are dissipated through rent-seeking activities, it's useful to have the following model in mind. We'll assume a continuum of economic agents distributed uniformly from 0 to 1. For now, we'll assume that these agents are identical.[24] An agent can dedicate herself to two types of activities – productive activities or rent-seeking activities. In city j, if a person works in the productive sector, she earns a wage w^j. In turn, the earnings of agents that turn to rent-seeking activities depend on the total amount of the rents, which we denote as R^j, and the number of people seeking these rents. In the case of the real-estate industry, R^j is given by $R^j = c \cdot S \cdot P^j$, where c is the commission rate, S is the number of housing sales in the city, and P^j is the price of housing.[25] The key institutional fact is that the commission rate is fixed at c.

Rent-Dissipation: Base Case We begin with the simplest version of the model in which the number of sales in a city is exogenous, and labor is the only input in the real-estate business. The wage in the productive sector in city j is given by w_j. w_j represents the reservation wage for rent-seekers. Turning to the rent-seeking sector, because every agent is identical, each rent-seeker has an equal probability of getting a sale. The expected earnings of a rent-seeker is thus given by the total size of rents available in the city divided by the number of people seeking these rents, or $\frac{R^j}{b^j}$, where b^j is the number of rent-seekers in city j. The equilibrium number of people engaged in rent-seeking in city j is determined by the condition that the expected wage in the two sectors must be the same: $w_j = \frac{R^j}{b^j}$. From the simple condition that wages have to be the same in the

[24] relax this assumption later.

[25] We assume that houses are homogeneous within a city, although in the empirical part of the paper we allow for differences in size, age, and other characteristics of a house. In the version of the model with heterogeneous agents, we allow for agents with different abilities to capture different shares of the real estate market, but an equivalent story would be that each agent sells the same number of houses, but agents with higher abilities sell the more expensive houses.

two sectors, we can derive the equilibrium number of rent-seekers in city j:

$$b^j = c \cdot S \cdot \frac{P^j}{w_j} \tag{1}$$

The number of rent-seekers in city j is thus directly proportional to the price of housing adjusted for the reservation wage in the city.[26]

The main testable implication of the model is the relationship between the productivity of real estate agents in a city and the size of the rents available to rent-seekers – the price of housing. Taking our equation for the equilibrium number of rent-seekers, we can define the productivity of real-estate agents in city j as the number of houses sold per number of real-estate agents:

$$\text{Productivity}^j = \frac{S}{b^j} = \frac{1}{c} \cdot \frac{1}{(P^j/w_j)} \tag{2}$$

If the commission rate is fixed and if the wage of every real estate agent is equal to her opportunity cost, the productivity of real-estate agents will be inversely proportional to the price of housing (again, adjusted for the reservation wage in the city). This version of the model generates the most rent-dissipation, since the elasticity of the number of real-estate agents with respect to the adjusted price of housing is one: $\frac{db^j}{d(P^j/w^j)} \cdot \frac{(P^j/w^j)}{b^j} = 1$. As a consequence, the elasticity of the productivity of rent seekers with respect to the adjusted price of housing is also one:

$$\frac{d(S/b^j)}{d(P^j/w^j)} \cdot \frac{(P^j/w^j)}{(S/b^j)} = 1$$

The flip-side of this is that the number of people engaged in productive activities in city j (1-b^j) falls when the price of housing rises.

Rent Dissipation with Increasing Costs So far, we've assumed that other than the higher cost due to the presence of other brokers, the cost of working in the rent-seeking sector does not vary across cities. However, it is plausible that selling expensive homes is more costly than selling

[26]By adjusting the price of housing for the reservation wage in the city, we allow the opportunity cost of working outside the rent seeking sector to vary by city. For example, an economic boom that drives up the price of housing in a city will also increase the wage from working in the productive sector of the economy.

cheaper homes. For example, a broker who deals with million dollars mansions may need a more expensive office to see customers than a broker who deals with condos worth a hundred thousand dollars. The former broker may want to take clients to expensive restaurants, while Denny's may be fine with the clients of the latter broker. Local services and labor inputs also tend to be more expensive in cities with higher housing prices. As we pointed out above, prospecting may involve not only extra working hours, but also monetary expenses (buying the freebies, hiring assistants, phone calls, etc.)

To see what happens to the amount of rent dissipation, let $COST(P^j) = k \cdot P^j$ be the cost of working in the rent-seeking sector in a city. The equilibrium condition becomes $w_j = \frac{c \cdot S \cdot P^j}{b^j} - k \cdot P^j$, which implies that the number of rent seekers given by

$$b^j = \frac{c \cdot S \cdot \frac{P^j}{w_j}}{1 + k \cdot \frac{P^j}{w_j}}$$

It is straightforward to see that the elasticity of supply of rent seekers with respect to the adjusted housing price, P^j/w_j, is:

$$\frac{db^j}{d(P^j/w_j)} \cdot \frac{(P^j/w_j)}{b^j} = 1 - \frac{k \cdot (P^j/w_j)}{1 + k \cdot (P^j/w_j)} \leq 1$$

Intuitively, an increase in housing prices has two effects. On one hand, higher prices imply higher commissions and therefore more entry in the market. On the other hand, some of the higher commissions are necessary to cover the higher cost of doing business. The net effect is that rent seeking takes place, but less than in a world in which costs are independent of housing prices.

However, it is also possible that some of the higher cost in high housing cost cities may actually reflect rent-seeking costs, rather than "normal" business costs. For example, prospecting activities could involve paid advertising in the local press, distribution of flyers and free pumpkins, and mass mailings. Since we measure rent-seeking by sales per broker, we are implicitly assuming that rent-seeking only takes the form of time spent by brokers doing things of marginal social value. Clearly, if rent-seeking takes the form of higher cost, this would not be captured by our measure of rent-seeking. Therefore, the elasticity of measured productivity with respect to price

shocks would also be less than one if part of the rent is dissipated away by higher monetary costs of prospecting.

Rent Dissipation in Boom Markets We next relax the assumption that the number of housing sales is invariant to the price of housing. However, it's reasonable to expect that an economic boom that increases the price of housing will also increase the number of people looking to sell and buy housing. In turn, the increased "thickness" of the market may make it easier for a real-estate agent to match buyers and sellers. For example, selling houses was very easy for realtors in Silicon Valley during the high-tech boom years in the late 1990s. Houses were sold hours, sometimes only minutes, after being listed. This effect is likely to lead us to underestimate the amount of rent seeking. As previously stated, our indirect test for rent-seeking is based on the correlation of housing price shocks to the productivity of brokers. To the extent that it is easier for brokers to sell houses in good times, the productivity of brokers should *increase*, everything else constant. Therefore, any negative impact of price shocks on productivity that we may find should be considered a lower bound of the true amount of rent-seeking.

Rent Dissipation with "Star" Agents Finally, we allow agents to differ by ability. This implies that there may significant differences in earnings between agents, and the earnings of some agents may exceed the opportunity cost of their time. For example, in every real-estate market, there are a small number of "star" agents that appear to do extremely well. In this model, an increase in the size of the rents (as represented by an increase in P_j) will still result in the dissipation of the rent by an increase in the number of people seeking these rents. However, because part of the higher price of housing is translated into higher earnings for *some* real-estate agents,there is less rent dissipation than in world in which the wage of *every* rent-seeker is equal to her alternative wage in the productive sector. Put differently, if the earnings of a significant number of rent-seekers exceed their opportunity cost, the elasticity of the number of rent-seekers to the price of housing will be less than one: $\frac{db^j}{dP^j} \cdot \frac{P^j}{b^j} \leq 1$. See Appendix 1 for details of this model.

4 Empirical Evidence

As a reminder to the reader, if commission rates do not vary and barriers to entry are low, there will be more rent-seekers in cities where housing prices are higher (or where housing prices have increased). In this section, we turn to cross-city evidence to estimate the extent to which higher housing prices are dissipated by rent-seeking activities. In our base case model, higher commissions in high housing cost cities are fully dissipated by rent-seeking: the elasticity of number of brokers with respect to price shocks is 1 and the elasticity of productivity with respect to price shocks is -1.

However, in reviewing the empirical evidence, it's important to have the bear in mind that there are a number of reasons why the elasticity may not be equal to 1. First, our story is based on the assumption that commission rates are fixed. However, if commission rates are actually lower in high housing cost cities, then the elasticity of the number of brokers (and productivity) with respect to the price of housing will be less than one. In the limit, if commission rates adjusted fully to price shocks, we should observe no correlation between changes in productivity and price shocks. Furthermore, even if commissions rate are invariant, there are two reasons why higher commission fees in more expensive cities may not be completely dissipated by rent-seeking. First, the costs of doing business may be higher in a city with high housing prices. Second, it may be the case that "superstar" agents in high housing cost cities earn a lot more than similar "supertars" in low housing cost cities, so part of the higher commissions in high cost cities are captured by these "star" agents. In sum, if the elasticity of productivity with respect to the price of housing is less than one, this suggests that in high housing cost cities, 1) commission rates are lower, 2) business costs are higher, or 3) "star" agents have higher earnings.

On the other hand, there are two reasons why our measures potentially understate the extent to which higher commissions are dissipated by rent-seeking. First, rent-seeking may take the form of additional expenditures on things like pumpkins, note-pads, and mailings. Second, it's reasonable to expect that the time and effort required to match buyers and sellers will be lower in "boom" markets. Both factors suggest that the elasticity of our measures of rent-seeking (sales per agent or sales per hour worked) with respect to the price of housing potentially understates

the extent to which higher commissions are dissipated by rent-seeking.

4.1 Data

The data we use are from the 5% sample of the Census of Population and Housing in 1980 and 1990. We define a "market" as a metropolitan area (MSA). Since the definition of metropolitan areas changes from 1980 to 1990, we redefine 1990 SMSAs to be consistent with the 1980 definition.[27] In total, we have a sample of 282 MSA for both years. We use the occupation code in the Census to identify real estate agents.[28] To measure the number of houses sold in a city, we use information on the date in which the household moved to the current house along with information on whether the household owns the house in which it lives.[29] The Census also asks homeowners about the value of their house, which we take as our measure of the price of housing.

Table 1 shows summary statistics for the sample. The average number of respondent in the 282 cities is 7,457 in 1990 and 5,288 in 1980. Such large sample size ensures that we have a non-trivial numbers of real estate agents in most cities. There are 137 realtors in 1990 and 112 in 1980 in the average city. We define productivity in two ways: as the total number of sales in the city divided by the total number of realtors and as the total number of sales in the city divided by the total number of hours worked by realtors. In Table 1, we report average productivity according to the second definition, which equals 0.005 in 1980 and 0.004 in 1990.[30] The average real price of houses is $94,142 in 1990 and $85,826 in 1980. Note that the average price of housing increased

[27] See Moretti (2000) for details on the match.

[28] The occupation code for real estate agents is 254: "Real estate sales occupations" in the "Sales Representatives, Finance and Business Services" category.

[29] Specifically, we define an observation as a sale in 1990 if the respondent reports that she owns the house and moved into the house in 1990 or 1989. The definition for 1980 is analogous. Note that since the Census takes place in April, we are identifying sales that take place during the previous 15-16 months. In Table 1 we report adjusted means that reflect sales over a 12 month period. Since the value of the house is in discrete categories, we use the mid points of each category to transform it into a continuous variable.

[30] The figures for average productivity imply that on average it takes 200 hours to sell an house in 1980. There are three reasons why the average productivity is so low. First, some real estate agents work in the non-residential brokerage services. While the denominators includes hours worked by all brokers, the numerator includes only residential transactions. Second, among those who work in residential sector, part of the hours worked are presumably for leases, not sales. Third, it is possible that some of the workers who assist the broker, but are not directly involved in closing deals, erroneously report being brokers. These three factors will lead us to underestimate the true productivity, but this will have little effect on our findings if these three sources of bias are uncorrelated with housing prices across cities. We show below that our measure of real estate agents based on self-reported occupation from the Census is highly correlated with the official number of licensed realtors.

in the 1980s. Consistent with our story, both the number of realtors and the hours worked by realtors increased, while productivity decreased.

Table 2 (top panel) reports cities with the highest and the lowest cost of housing, as well as the average productivity of brokers in these cities (defined as sales per hours worked) in 1990. As can be seen, the price of housing in the ten most expensive cities is almost six times higher the price of housing in the ten cities with the lowest cost of housing. In turn, the productivity of brokers in the low cost cities is about four and a half times *higher* than the productivity of real-estate agents in the high cost cities. The bottom panel reports cities with the largest and the smallest *change* in cost of housing between 1980 and 1990, as well as the average *change* in productivity of brokers. Cities that experienced large increases in price of houses also experienced large decreases in the productivity of realtors, while the productivity of real-estate brokers *increased* in cities where the price of housing fell. The cities with the largest (smallest) increase in the price of housing between 1980 and 1990 are not the same as those with the highest (lowest) price of housing in 1990 (with the exception of Stamford and Norwalk).

Our measure of real-estate brokers is based on people who identified themselves as such in the Census. As one way to assess how precise our measure of real-esate agents is, we use data from state licensing boards on the number of people with active real-estate licenses (see Appendix Table A1). Data from state licensing boards are not available at the city level, but only at the state level. When we aggregate our Census data to the state level, the correlation between our estimate of the number of brokers by state and the number of active licensed brokers from the state licensing boards is 0.92. This suggests that the number of brokers estimated using self-reported occupation in the Census reflect fairly accurately the actual number of licensed brokers.

In interpreting the results we present below, it's important to bear in mind a limitation of our data. The Census provides an accurate measure of housing sales in a city, but we can not assume that all these transactions are conducted through brokers. Clearly, some home-sellers choose to avoid paying the brokerage fees by selling their homes by themselves. The resulting bias depends on the extent to which the fraction of houses directly sold by the owner is correlated with the

price of house.[31]

4.2 Housing Prices and Rent-Seeking across Cities

We now turn to the three testable implications of our story that a fixed commission generates rent-seeking activities. First, the fraction of realtors in a city (relative to the population) should be increasing in the price of housing (equation 1). Second, the productivity of an average realtor should be lower in a city with higher housing prices (equation 2). Third, in equilibrium, brokers should be indifferent across cities: their wage (adjusted for the cost of living) should be uncorrelated with price of housing. This section tests these predictions, using both the cross-sectional variation and 1980-1990 changes in housing prices across cities.

Relative Number of Real-Estate Agents Figure 4 shows that the fraction of real estate agents in the labor force is higher in cities where the average price of houses is higher. The top panel shows the 1990 cross section, while the bottom panel shows the 1980 cross section. Importantly, when we look at changes between 1980 and 1990 in Figure 5, the picture appears qualitatively similar. Table 3 quantifies the impression one gets from Figure 5 that differences in the price of housing have a significant effect on the supply of real-estate agents. This table reports estimates of equation 1, i.e. the regression of the (log) ratio of number of brokers in the city divided by the total number of workers in the city on the (log) average price of houses in the city normalized by the (log) city-specific reservation wage of brokers. The estimates of the city-specific reservation wage of real estate agents are obtained as a weighted average of the wages of workers in all other occupations in the same city. We assign weights to individuals in the sample who are not brokers based on how similar their observable characteristics are to the observable characteristics of brokers.[32] We have experimented with different definitions of the

[31] Our evidence from the CEX suggests that the fraction of houses directly sold by the owner *falls* with the price of the house. Therefore, the ratio of the total number of houses sold in an expensive city to the number sold in a low housing cost city is higher than the ratio of houses sold *by a broker* in an expensive city to that sold by brokers in a city with cheaper housing.

[32] In particular, we obtain the weights from a probit model where the dependent variable is a dummy equal one for brokers, and the independent variables include the interaction of gender with race, with schooling, with a quadratic in experience; as well as the interaction of race with schooling and with a quadratic in experience.

reservation wage, and have found that our results are not sensitive to these alternatives.[33]

Column 1 in the top panel of Table 3 confirms that the coefficient for the 1990 cross-section is positive and significant. The corresponding estimate for 1980, reported in column 2, is slightly larger. When we control for city population (not shown), the coefficients do not change, suggesting that the relationship between the fraction of real estate agents in the labor force and the average price of houses is not due to differences in city size.

To abstract from some of the factors that can potentially introduce spurious correlation between the share of brokers and the price of housing in the cross-section of cities we now look at changes over time in the supply of real-estate agents and *changes* in the price of housing. The estimated coefficient, shown in column 3, is 0.9, indicating that a 1 percent increase in the average cost of housing in a city results in a 0.9% increase in the number of real estate agents. To help interpreting the magnitude of the estimated effect, consider cities like Seattle, Raleigh-Durham and San Diego which are around the 75th percentile in the distribution of changes in housing prices from 1980 to 1990. In these three cities, the value of houses sold in 1990 was 16-19 percent higher (in real dollars) than that of houses sold in 1980. The point estimate of the coefficient implies that in these cities, the number of real-estate agents increased by 15-18% over ten years (holding population constant). In the median city there was virtually no change in the value of houses sold between 1980 and 1990.[34]

Finally, we re-estimate all the models using an alternative definition of labor supply. To allow for the fact that many real-estate agents work part-time, the dependent variable in the bottom panel of table 3 is the log ratio of hours worked by real estate agents over the total hours worked by all workers in the city. The resulting estimates are virtually identical to those using the number of brokers in a city as the dependent variable.

Productivity of Real-Estate Agents We have shown that the number of hours worked by real-estate agents in a city (relative to the total hours worked in a city) increases when the price

[33]For example, when we use the average wage in the city or average white collar wage in the city, the results are virtually unchanged.

[34]Note that we are looking at the values of houses that are sold in a particular year. This does not need to be equal to the value of the stock of houses in the same year.

of housing increases. This is consistent with the prediction of our theoretical framework that positive price shocks results in an increased supply of brokers (equation 1). Alternatively, it is also consistent with an increase in the demand for brokerage services associated with positive price shocks. From Table 3, it is impossible to tell whether the equilibrium increase in the number of hours worked by realtors reflects increased demand for brokerage services or increased supply of brokers. To tell these two stories apart, we turn to our main piece of empirical evidence: the relationship between productivity and housing prices. If the fixed commissin rate results in rent-seeking behavior, then we should see that an increase in housing prices lowers the productivity of real-estate brokers. On the other hand, if the positive correlation between hours worked and housing prices simply reflect a shift in demand, there should be no effect on productivity.

The ideal dataset to test our model would be a longitudinal dataset where the same house is sold multiple times, both in expansion years and in recession years. If such dataset was available, we could regress the change between expansions and recessions on the amount of time that it takes to brokers to sell the same house on the change in average housing price. By looking at the same house, we would be able to completely abstract from changes in the quality of housing that might affect the amount of time required to brokers to sell the house. We don't have such longitudinal data, but below we provide evidence indicating that our results are robust to observed and unobserved housing characteristics.

As before, we start with a scatter plot of the correlation between price of housing and productivity of realtors. Figure 6 shows that both in 1980 and 1990, the cross sectional evidence is consistent with the negative relationship predicted by the model. The same is true when looking at changes in Figure 7. Importantly, the relationship in all three Figures appears tight and robust, and it does not seem to be driven by outliers. Once again, we quantify the visual impression one gets from the figures by regressing the (log) average productivity of brokers in the city on the (log) average cost of housing normalized by the city-specific (log) reservation wage of brokers (equation 2). Productivity is defined as the ratio of the total number of sales in a city over the total number of hours worked by brokers in the city, although the results are virtually identical if we define productivity as sales per broker. Results in Table 4 indicate that real-estate agents are

significantly less productive in cities with high housing prices. Column 1 in Table 4, which uses the cross-sectional variation in housing prices across cities in 1990, suggests that a percentage point increase in cost of housing in a city is associated with 0.92 percent decrease in the number of houses sold per hours worked. Column 2 reports a similar estimate for the 1980 cross section, which is larger (in absolute value) than that from the 1990 cross-section. The estimated cross-sectional elasticities suggests that higher commissions in higher cost cities are almost completely dissipated by entry.

The last set of OLS regressions in table 3 (columns 3 and 4) uses changes in the price of housing from 1980 to 1990 to measure the extent to which high commissions translate into lower productivity. In the basic bivariate specification without any controls, the estimated elasticity is -0.64 and highly significant. This estimate, which abstract from any city-specific factors that may also affect the difficulty of matching buyers and sellers of houses, suggests that part of the cross-sectional correlation and housing prices is due to permanent unobserved characteristics of cities such as density and unobserved quality of the stock of housing that potentially affect the amount of effort necessary to match matching buyers and sellers. Nonetheless, once we control for such city-specific factors, it is still the case that roughly two-third of the higher commissions due to high housing prices are dissipated through rent-seeking activities.

In column 4 we report the estimates from a specification that controls for the changes in housing characteristics. Specifically, we include the change in average age of housing, average number of bedrooms, percentage of one-family houses, percentage of housing that are condominiums, and percentage of houses with kitchen and plumbing. Introducing these variables as controls makes sense if they capture changes in the quality of housing that may also affect the production function of real-estate services. For example, it is theory possible that selling older and larger houses takes more time from a realtor than selling newer and smaller houses. As we have argued in Section 2, this may be a problem within a city, but it is unlikely to be a major problem when looking at differences across cities. Moreover, it is even less likely to be a major problem when looking at changes over time. The quantitative impact of controlling for observable characteristics of houses is quite limited. The coefficient in column 4 is 0.71, more than the coefficient in column

3, although they are not statistically different.[35]

In summary, our most robust estimates (in columns 3 and 4) suggest that between 64% and 71% of higher commissions are dissipated through rent-seeking activities. As previously discussed, there are potentially three explanations for why the elasticity of productivity with respect to price is less than 1 (in absolute value). A first explanation is that commission rates are actually lower in expensive cities. Second, it is possible that the brokers' costs increases when the price of housing increases. A third explanation is that "star" agents in high housing cost cities earn extraordinary rents. We do not have direct evidence on the first two explanations, but the next section turns to an assessment of the extent brokers earn more in expensive cities.

Housing Prices and Brokers' Earnings To see whether brokers earn more in high housing cost cities, we begin by showing the relationship between the expected revenue of real-estate agents, computed as 6 percent of the total value of homes sold in a city, and the actual total value of brokers' earnings in the city, as reported by brokers in the Census. Under the following assumptions, (1) the commission rate for all transactions is 6%; (2) brokers earnings comes exclusively from sales of residential homes; and (3) that brokers report their total sales revenues, the sum of earnings reported by all brokers in a city should exactly equal 6 percent of the sum of the value of all home sales in the city. Figure 8 plots the log of actual brokers earnings on the y-axis against the log of expected brokers' earnings on the x-axis for 282 cities. The corresponding coefficient in a regression of log of actual earnings on log of expected brokers' earnings with no intercept is 1.02 (0.001).[36]

Having shown evidence suggesting that reported brokers' earnings appear to closely reflect

[35]Since it is possible that the extra controls are endogenous, interpretation of this model requires care. The sign of the coefficient estimates on the added controls is consistent with some of the added variables being endogenous For example, controlling for housing prices, the age of housing has a positive effect on productivity. Since we expect older houses to be more difficult to sell, this estimate makes little sense if age of housing is in fact controlling for changes in the difficulty of selling that are correlated with housing prices. Instead a more reasonable interpretation is that economic booms that increase housing prices also translate into building booms that lower the average age of housing.

[36]One explanation for why the coefficient is not exactly one is that not all brokers report as their earnings the total revenues generated by their sales. The earnings obtained by agents who are employed by brokerage firms need to be necessarily lower than 6% of the selling price, since agents need to split their revenue with their employer. Moreover, although we don't have any firm evidence on this, we speculate that some self-employed brokers may report in the Census their revenues minus their costs, instead of their revenues.

revenues from housing sales, we now assess whether brokers in high cost cities have higher earnings (relative to their opportunity cost) than brokers in low-cost cities. We regress the log difference between average earnings in a city and brokers' reservation wage on the log of average house price in the city. After normalizing for the reservation wage, we expect brokers' earnings to be on average the same in cities with expensive real estate and in cities with affordable housing.

Figure 9 shows that there is little relationship between changes in adjusted wages and changes in house prices. Table 6 confirms that the coefficient in the model based on 1980-1990 changes is not significantly different from zero, although there appear to be a positive cross-sectional correlation between adjusted wages and prices. One possible explanation for the difference between cross-sectional and panel estimates is that more expensive cities attract brokers with higher unobserved ability, and that such ability differential is constant over time.

4.3 Does Quality of Housing Matter?

As we've mentioned, one important limitation of our estimates is that the average quality of housing may differ according to the average price of housing in the city. In this section we report estimates designed to probe the robustness of our estimates to potential heterogeneity in the housing stock. In the next section we address the issue of differences across cities in brokers services.

By looking at changes over time in the same city, we have made a first step to control for characteristics of the housing stock that are correlated with prices and may affect productivity. It is reasonable to presume that many unobserved characteristics of houses that may affect brokers' productivity are fairly permanent, and can be absorbed in specifications that control for city fixed effects. However, the sample of houses in 1990 does not need to be exactly the same as the sample in 1980, since new homes have been built between 1980 and 1990. We have also shown that controlling for some key housing characteristics such as size, age, whether the house is a one family house, whether it is a condo has the effect of increasing–not decreasing–the coefficient on housing price (Table 3). This is a first indication that heterogeneity in the housing stock may not be a large source of bias. However, we are concerned that our controls absorb only some

heterogeneity, and that there may be unobserved characteristics of the housing stock that affect brokers' productivity and are correlated with housing prices.

One can think of changes in housing prices as being the sum of changes in land prices and changes in the quality of housing. The part that is due to changes in housing attributes is potentially problematic, if these attributes affect brokers' productivity directly. On the other hand, the part that is due to changes in price of land is a good source of variation. Changes in land prices do not affect brokers' productivity directly, but if our model is correct, they affect it indirectly through their effect on entry of new brokers. While so far we have looked at the total effect of prices on productivity, we now follow two different strategies to isolate the effect of changes in land prices on productivity in order to abstract from unobserved housing heterogeneity.

First, we use an alternative index of housing prices designed by the Office of Federal Housing Enterprise Oversight (OFHEO) to measures average price changes in repeat sales or re-financing on the same properties. By only using repeat sales or re-financing, the index isolates the component of price changes that is exclusively due to changes in land prices (and depreciation). Changes in the quality of new houses do not affect the index.[37] We use the change in repeated sales price index as an instrumental variable for the change in housing average prices. The two index are highly correlated. They would be perfectly correlated if changes in average housing prices reflected *only* changes in land prices. The instrumental variable estimates isolate the effect of land prices on productivity, and therefore are not contaminated by changes in unobserved quality of housing. Put differently, if we assume away depreciation and renovation of houses between 1980 and 1990, the change in prices that identifies the IV coefficients is driven only by changes in cost of land. The instrumental variable estimate in column 5 of Table 4 is similar to the corresponding

[37]We are assuming that renovation of old houses is not very important. The index is designed to capture changes in the value of single-family homes in the U.S. This information is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975. The HPI is updated each quarter as additional mortgages are purchased or securitized by Fannie Mae and Freddie Mac. The House Price Index is based on transactions involving conforming, conventional mortgages purchased or securitized by Fannie Mae or Freddie Mac. Only mortgage transactions on single family properties are included. The index has several limitations. First, the index is available for the period under consideration only for 119 cities. Second, the definition of several metropolitan areas is not consistent with our definition, and can not be reconciled. Third, the index is limited to sales of existing single-family homes. It misses sales of new homes, and sales of non-single-family homes. Fourth, while the index is useful to identify changes in house prices over time, it can not be used for cross-sectional comparisons. (The index is normalized to 100 in a base year).

OLS estimate in column 4.

A similar approach is to use the Census to estimate the cost of housing, but restricting the sample only to houses existing both in 1980 and 1990. Specifically, we estimate the change in housing prices restricting the 1990 sample to houses that are 10 years or older, so that only houses that existed in 1980 are included in the calculation. Clearly, this is not a true panel, because there is no guarantee that the houses in the 5% sample in 1990 are exactly the same as the one in the 5% sample in 1980. But it is a random sample of the population of houses existing in both years, and as such it is a consistent estimate of the change in price for this population of houses. The price changes in this restricted sample are not driven by changes in the quality of new houses, but mainly reflect changes in the price of land. This index is similar in spirit to the OFHEO price index, but has the advantage to be available for all the 282 cities in the sample. In column 6, we use the change in prices calculated on the sample of houses existing both in 1980 and 1990 as an instrument for the the change in total price of housing. Again, the IV estimate is close to the OLS estimate. Overall, our results indicate that our findings are unlikely to be driven by unobserved characteristics of the housing stock.

Finally, we present additional estimates of different specifications designed to probe the robustness of our results. At the top of Table 5 is the base case, from columns 2, 4, and 6 of Table 4. In the second row in Table 5, we estimate a model where the dependent variable is the number of bedrooms in houses sold in the city divided by the number of hours worked by brokers. While we have already controlled for the size of houses by introducing measures of the number of bedrooms (in columns 4 to 6 of Table 4), the specification in row 3 in Table 5 is alternative way to make sure that our results are not driven by differences in the size of homes across cities. The coefficients in row 6 are very similar to the base case, confirming that variation in the size of houses is not affecting our findings.

In row 3 we control for the percentage of renters in the city. We are concerned that some of the brokers work on leases as well as sales, and that the time spent on leases may be correlated with housing prices. Although imperfect, the model in row 4 help us assess how big the bias may be. The coefficient is smaller for the 1990 cross section, but it is virtually unchanged when

we look at the model in changes. This lends some credibility to the assumption that the bias introduced by ignoring leases is differenced out in the specification based on changes over time.

In row 4, we use median housing prices instead of the mean price of housing. Since the price of housing is top coded in the Census, the mean price is sensitive to how the top coded values are treated, while the median price is not. The coefficients in row 5 are lower than the base case, but not significantly so. Finally, in row 5 we drop New York city. New York city is one of the few markets, and the only one among the large cities, that has no Multiple Listing System. Dropping it from the analysis has virtually no effect on the estimated coefficients.

4.4 Are More Expensive Houses More Difficult to Sell?

In this section, we turn to an assessment of how much of our results can be explained by increased services to customers in cities where housing prices have increased. In our most robust specification (that based on 1980-1990 changes), we find that between two-third and three-quarters of the higher commission in cities with high housing prices is dissipated through lower productivity of real-estate agents. Although we interpret entry as largely rent-seeking and social waste, this interpretation could be erroneous if the production function of brokerage services depends on the price of housing. Specifically, it is possible that the services provided by real-estate agents that are of value to home-buyers and home-sellers increase one-to-one with the price of housing. Although our results are robust to differences in the characteristics of housing across cities, it could be the case that as land prices rise, it takes more time to sell a house. Alternatively, even if the time that it takes to sell a home for sale does not vary according to its price, buyers in cities with high housing prices may visit a larger sample of homes before making a decision. In either case, some or all the documented correlation between higher prices and lower productivity the negative relationship between productivity and prices uncovered in Table 4 could simply reflect the fact that brokers in expensive cities need to spend more time showing houses to prospective buyers than brokers in cheaper cities.

While we can not completely rule out this possibility, we present two pieces of evidence that appear inconsistent with this view. First, a direct measure of the amount of time brokers spend

selling a house is the duration of vacancies. Ideally, we would like to observe the amount of time that brokers spent trying to sell each house. We do not have this data, but for the sample of houses that are vacant and for sale, the Census provides information on the amount of time the house has been on the market.[38] Figure 10 shows that the relationship between time on the market and housing prices in 1990 is negative. Table 7 presents regressions on the average duration of vacancies in a city on the price of housing in the city. Columns 1 and 2 presents the cross-sectional evidence for 1980 and 1990. As can be seen, the coefficient estimates suggest that vacancies are *shorter*, not longer, in cities where real estate is more expensive. In other words, in cities where brokers get larger commissions for every house sold, they actually spend *less* time selling houses than their counterparts in cities with cheaper housing. When we control for city fixed effects in column 3, the coefficient on housing prices remains negative, but now becomes insignificant.

One could argue that the time on the market is endogenous, as a higher effort on the brokers side could lead to a quicker sale. However, the negative sign uncovered in Table 7 is consistent with the observation that selling houses in boom years is easier than selling houses in bad years. The extreme example is the real estate market boom in many US cities in the late 1990s. For example, in cities like San Francisco and San Jose, the demand was so high relative to the supply that virtually every property listed would sell within days. Most of the variation in prices that identifies our estimates comes from variation over the local business cycle. When the local economy booms, vacancies are shorter: real estate agents find it easier to close deals than when the market is in recession. In sum, while we do not have conclusive evidence that houses in more expensive cities are easier to sell, what we can say with reasonable certainty is that it does not take more time to sell a house in an expensive city.

While this evidence suggests that brokers do not spend more time selling a house in a high housing cost city, it is still possible that *buyers* of such houses tend to take more time searching for the appropriate house than buyers of houses in cheaper cities. Therefore, if buyers' agents need

[38]The variable "time on the market" is categorical in the Census. We make it continuous by taking the midpoints of each category.)

to spend more time assisting home-buyers, this could explain some of the correlation between productivity and housing prices. To assess this argument, we turn to the 1997-1999 Annual Survey of Recent Home Buyers which, to our knowledge, is the only data source that provides information on the number of houses visited by home-buyers. The survey is a representative sample of approximately 1,800 home buyers in 20 major cities collected annually by the Chicago Title and Trust Company.[39] Although the number of cities covered by this survey is a fraction of the total number of cities for which we have data in the Census, the 20 markets in the Annual Survey of Recent Home Buyers account for approximately one-third of all home sales in the United States.[40] The average home buyer in 1999 visited 13.3 houses before making a decision.

Figure 11 shows the relationship between log average number of houses visited and log average housing prices. The relationship appears to be tenuous. The corresponding coefficient from a regression of the logarithm of the number of houses visited on the log of the price is 0.135 (0.099) in 1999. The corresponding coefficient for 1998 and 1997 are 0.168 (0.120) and 0.193 (0.120), respectively. The estimates suggest that the number of houses visited by home-buyers increases with housing prices, but the effect is very small. None of the estimates are statistically different from zero. The point estimates suggest that if brokers were not engaging in rent-seeking activities, the commissions of brokers in a city where property prices are ten percent higher should only be 1.3-1.9 percent higher. Instead, commissions are 10 percent higher in such cities. Therefore, even ignoring the fact that the estimates are not significantly different from zero, the increase in the number of houses visited could explain no more than 13-19% of the higher commissions.[41] Nonetheless, we don't want to read too much into this evidence, since the results on the number of visits are based on a sample of only 20 cities, and must thus be interpreted with caution.

[39] http:www.ctt.com

[40] The cities included in the survey are Atlanta; Boston; Chicago; Cleveland; Dallas/Fort Worth; Denver; Detroit; Houston; Los Angeles; Memphis, Tenn.; Miami; Minneapolis/St. Paul; New York City; Orange County, Calif.; Orlando, Fla.; Philadelphia; Phoenix; San Francisco; Seattle/Tacoma and Washington, D.C.

[41] Remember that these results are for a cross-section of cities, and our cross-sectional results in table 4 suggest that productivity of brokers falls by one percent for every percentage increase in price.

5 Conclusions

While there has been a long-standing appreciation of the importance of rent-seeking in explaining many economic outcomes, the very nature of rent-seeking makes such activities extremely difficult to measure. The methodological contribution of this paper is show that although we can not directly observe socially undesirable activities, we can still expose such activities by looking for indirect evidence. Specifically, we can derive implications of rent-seeking behavior and subject these predictions to empirical tests.

The substantive contribution of the paper is to exploit the unique institutional characteristics of the US residential real-estate market to obtain indirect measures of rent-seeking by real-estate agents. We show that if commission rates are fixed, if there is relatively free-entry into the real-estate business, and if it does not take more work to match buyers and sellers in cities where housing is more expensive, then differences in commissions for each housing transaction will be fully dissipated through entry and wasteful prospecting activities. Therefore, our main empirical test is that if realtors engage in rent-seeking activities, then we should expect the productivity of an average realtor in city with high property prices to be lower than in cities where housing is cheaper.

The empirical evidence confirms this prediction. In our most robust estimates that control for fixed differences in the difficulty of matching buyers and sellers across cities, we find that roughly two-third of the higher commissions in a city where the price of land has increased is dissipated by entry and wasteful rent-seeking activities. In turn, we find that an average real-estate broker in a high-priced city is no better off than her counterpart in a city with cheaper housing. The outcome of a fixed commission is thus truly tragic: rent-seekers are no better off in cities where housing prices have increased, yet home-owners and home-sellers are clearly worse off.

The fact that a one percent increase in housing costs translates into a three-quarters of a percent drop in productivity, rather than a one percent decline, may simply reflect higher business costs in these cities. It could also be the case that commission rates may in fact be lower in high housing cities. In addition, we can not completely rule out the argument that the lower number of sales per agent in expensive cities may reflect unmeasured differences in the quality of services

provided by brokers. We provide three pieces of evidence on this point. First we show that our results hold up when controlling for permanent characteristics across cities. Second, we show that by one measure – average time on the market – it is easier, not more difficult, to match buyers and sellers in cities with more expensive housing. Third, we show that there is a weak relationship between the average number of houses visited by a home-buyer and the average price of housing in a city.

Turning to the broader implications of our story, our view is that the US real-estate industry is a parable of why rent-seeking is so costly. We are struck by the parallels between our story about rent-seeking by realtors across US cities, and the stories told by development economists on why rent-seeking might explain why some countries remain desperately poor. In the same way that poor protection of property rights may make rent-seeking more profitable in some countries than in others, there are weak property rights in real-estate transactions in the US, and the value of these weak property rights increases proportionally with the price of housing in a city. And in the same way that these cross-country differences explain why so many people are engaged in predatory rent-seeking activities in some countries, differences in the price of housing explains why there are more realtors in some cities than in others. And finally, in the same way that many countries are poor because so many people choose to extract rents rather than engaged in socially productive activities, the social waste from a fixed-commission is higher in cities with high housing prices.

We don't want to push this analogy too far, mainly because cities in which rent-seeking leads to more social waste are precisely ones that have experienced an economic boom. Therefore, we clearly can't say that cities in which there is more social waste are poorer. We can only say that people in such cities would be better off with an institution in which real-estate brokerage services were priced in a different manner. Ultimately however, our hope is that this paper will prompt others to go out and uncover evidence of other socially wasteful activities.

Bibliography

Acemoglu, Daron (1995). Reward Structures and the Allocation of Talent. European Economic Review 39 (1), pp. 17-33.

Arnold, M A. "The Principal Agent Relationship in Real Estate Brokerage Services" Journal of the American Real Estate and Urban Economics Association vol 20 89-106 (1992)

Banerjee, Abhijit, Mookherjee, Dilip, Munshi, Kaivan, and Ray, Debraj. "Inequality, Control Rights, and Rent Seeking: Sugar Cooperative in Maharashtra," Journal of Political Economy 109 (1), 2001, 138-190.

Baumol, William (1990) Entrepreneurship: Productive, Unproductive, and Destructive, Journal of Political Economy 98: pp. 893-921.

D. Becker, D. Kessler and McClellan "Detecting Medicare Abuse", mimeo, Stanford University (2001)

Bhagwati, Jagdish. Directly unproductive profit-seeking activities: A welfare theoretical synthesis and generalization. Journal of Political Economy 90(5), Oct. 1982, 988-1002.

Bertrand, Marianne, Mehta, Paras, and Sendhil Mullainathan. "Ferreting Out Tunnelling," MIT mimeo, 2000.

Burke, Mary and Peyton Young. "Competition and Custom in Economic Contracts: A Case Study of Illinois Agriculture." American Economic Review 91(3), June 2001, 559-73.

M Carney " Real Estate Brokerage Commission rates: Price Fixing in Home Brokerage" PhD Dissertation, UCLA, 1981

Crockett, J H. "Competition and Efficiency in Transacting: The Case of Residential Real Estate Brokerage" Journal of the American Real Estate and Urban Economics Association vol 10 209-227 (1982)

Duggan, Mark, and Steven Levitt. "Winning isn't Everything: Corruption in Sumo Wrestling" National Bureau of Economic Research, Working Paper 7798 (2000)

Federal Trade Commission. The Residential Real Estate Brokerage Industry. Washington, DC: FTC, 1983.

Fisman, Ray. "Estimating the Value of Political Connections", American Economic Review, forthcoming (2001)

Goolsby, W C and B J Childs "Brokerage Firm Competition in Real Estate Commission Rates" The Journal of Real Estate Research 3 (1989)

Hillman (1989). The Political Economy of Protection. Chur, Switzerland and New York: Harwood Academic Publishers.

Hopkins, Tom. How to Master the Art of Listing & Selling Real Estate. Englewood Cliffs,

NJ: Prentice Hall, 1991.

Hoff, Karla. "The Circle of the Rule of Law," World Bank mimeo, 2001.

Jacob, Brian, and Steven Levitt. "Teacher Cheating", mimeo, University of Chicago, (2001)

Kennedy, Danielle and Warren Jamison. How to List and Sell Real Estate in the 21st Century. Upper Saddle River, NJ: Prentice Hall (1999).

Krueger, Anne. (1974). The political economy of the rent-seeking society. American Economic Review 64(3), Sept. 1974, 523-34.

Mankiw, N. Gregory, and Michael Whinston. "Free Entry and Social Inefficiency," Rand Journal of Economics 17(1), Spring 1986, 45-58.

Moretti, Enrico. "Estimating the Social Return to Education: Evidence from Longitudinal and Cross-Sectional Data" Center for Labor Economics, University of California, Berkeley, Working Paper No. 22 (1999)

Murphy, Kevin, Shleifer, Andrei, and Vishny, Robert (1991). The Allocation of Talent: Implications for Growth. Quarterly Journal of Economics, pp. 504-530.

Murphy, Kevin, Shleifer, Andrei, and Vishny, Robert (1993). Why is Rent-Seeking So Costly to Growth? American Economic Review, pp. 409-414.

Olson, Mancur (1982). The Rise and Decline of Nations. New Haven: Yale University Press.

Owen, B. "Kickbacks, Specialization, Price Fixing and Efficiency in Residential Real Estate Markets" Stanford Law Review 29 931-967 (1977)

Rodrik, Dani (1995). Political Economy of Trade Policy. In Handbook of International Economics, Volume III, Amsterdam: Elsevier-North Holland: pp. 1457-1494.

Sirmans, C F and G Turnbull "Brokerage Pricing under Competition", Journal of Urban Economics 41 102-117 (1997)

Tayler, Joan. How Real Estate Agents Earn Big! San Francisco: Mansion Press, 1997.

Turnbull, G. "Real Estate Brokers, Non price Competition and the Housing Market" Real Estate Economics 24 293-316 (1996)

Williams "Agency and Brokerage of Real Assets in Competitive Equilibrium" The Review of Financial Studies, vol 11 239-280 (1998)

Appendix 1

We'll now allow agents to differ by ability, which is referenced by an index i, which is distributed uniformly from 0 to 1. Now, if person i decides to work in the productive sector of the economy, her wage will be given by $w_i^j = w^j + \theta \cdot i$, where θ is a positive constant; high ability individuals (people with high i's) have higher wages. In turn, if she decides to become a rent-seeker, then her fraction of the "market" is $\frac{i}{2 \cdot i_{\max} \cdot b^j - (b^j)^2}$, where $i_{\max}$ is the ability index of the real-estate agent with the highest ability (and, as before, b^j is the equilibrium number of rent-seekers in city j).[42] This formulation assumes that individuals with high ability (high i's) capture a larger share of the real-estate market, but this share declines with the total number of people in the rent-seeking sector (b^j). The earnings of individual i who decides to be a rent-seeker is thus the product of her share of the rents and total amount of rents available in the city: $\frac{i}{2b^j - (b^j)^2} \cdot (c \cdot S \cdot P_j)$. We'll also assume that $w^j > \frac{c \cdot S \cdot P_j}{(b^j)^2}$ and $\frac{c \cdot S \cdot P_j}{2b^j - (b^j)^2} < w^j + \theta$: individuals at both extremes of the ability distribution (those with ability i=0 and i=1) will find it more profitable to work in the productive sector of the economy than to become a rent-seeker.

The equilibrium number of rent-seekers is still determined by the condition that the wage must be the same in the two sectors, but now only for the *marginal* rent-seeker. This can be represented graphically by the intersection of lines RS and PS in figure A1, which plots the earnings in the two sectors against the ability index i. Schedule PS (for productive sector) plots the wage in the productive sector of the economy as a function of i, or $w_i^j = w^j + \theta \cdot i$. Schedule RS (for rent-seeking sector) plots the wage in the rent-seeking sector as a function of i, or $\frac{i}{2b^j - (b^j)^2} \cdot (c \cdot S \cdot P_j)$. The assumption that $w^j > \frac{c \cdot S \cdot P_j}{(b^j)^2}$ and $\frac{c \cdot S \cdot P_j}{2b^j - (b^j)^2} < w^j + \theta$ assures us that RS will lie below PS at i=0 and below PS at i=1. In equilibrium, all individuals with $i_{\max} - b^j < i < i_{\max}$ will choose to become rent-seekers, and all individuals with $i < i_{\max} - b^j$ and $i > i_{\max}$ will choose to work in the productive sector of the economy. Real-estate therefore attracts people from the "middle-class." The distribution of rents among rent-seekers is highly skewed; agents with high i's get a large share of the real-estate market while those with low i's get a smaller share of the market. In this model, an increase in housing prices is represented by a backward shift in the RS schedule. This will increase less than in a model where all agents are homogeneous.

[42] $2 \cdot i_{\max} \cdot b^j - (b^j)^2$ is the sum of i for all rent-seekers, assuming that all individuals i$\in [i_{\max} - b^j, i_{\max}]$ choose to become rent-seekers.

Figure 1: The Distribution of Brokers Commission Rates in the U.S..

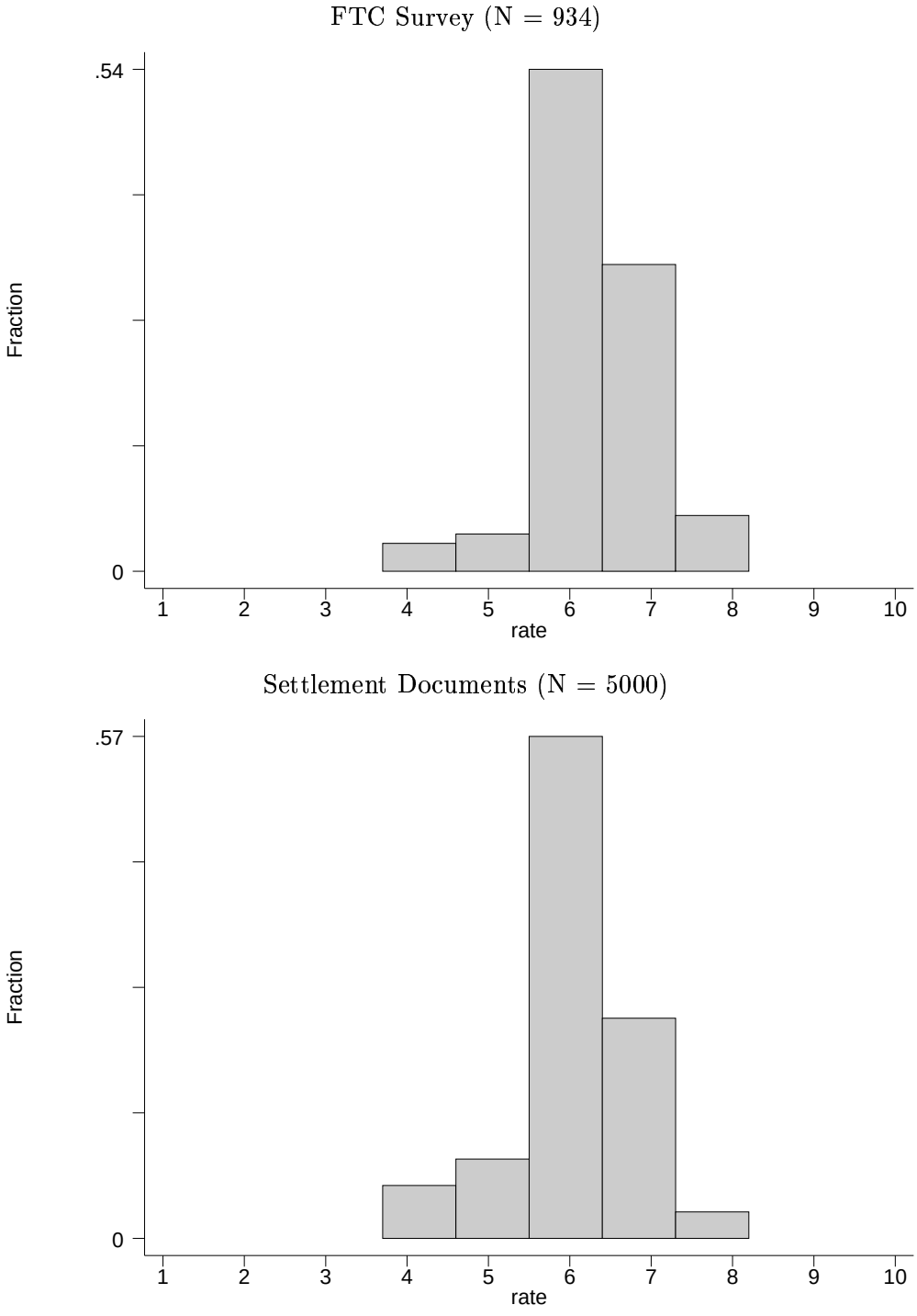
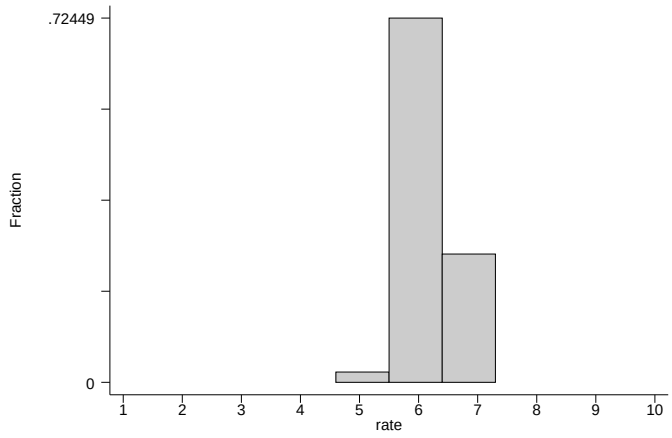
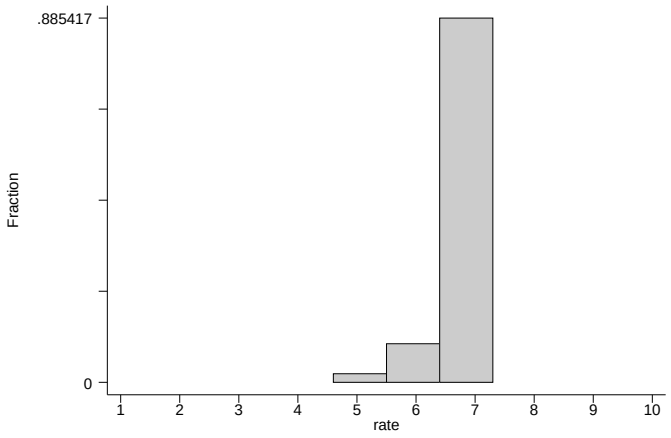


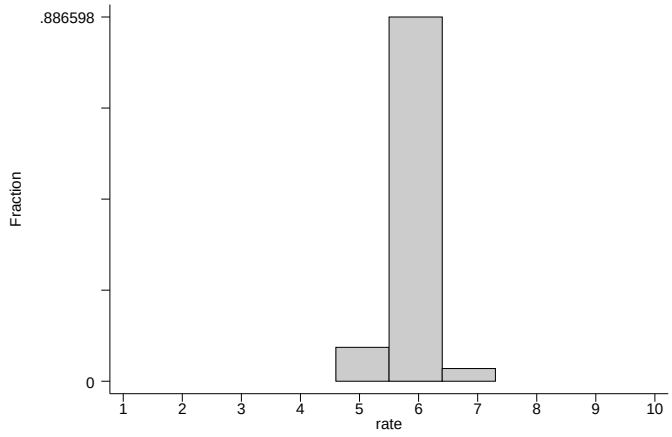
Figure 2: The Distribution of Brokers Commission Rates in Four Cities



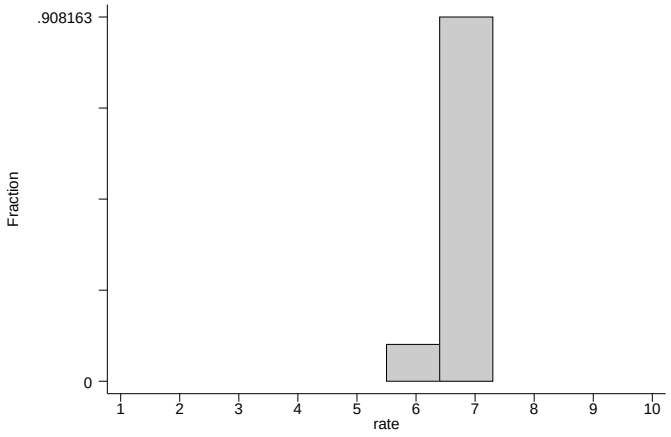
(a) Boston



(b) Minneapolis/St. Paul

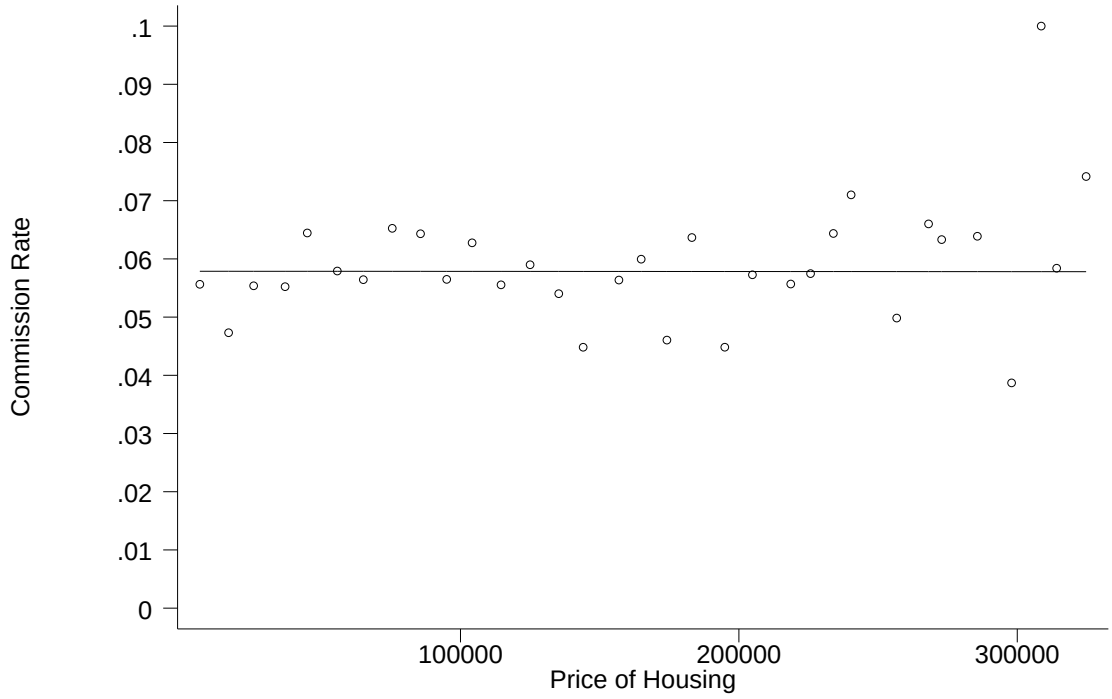


(c) Los Angeles



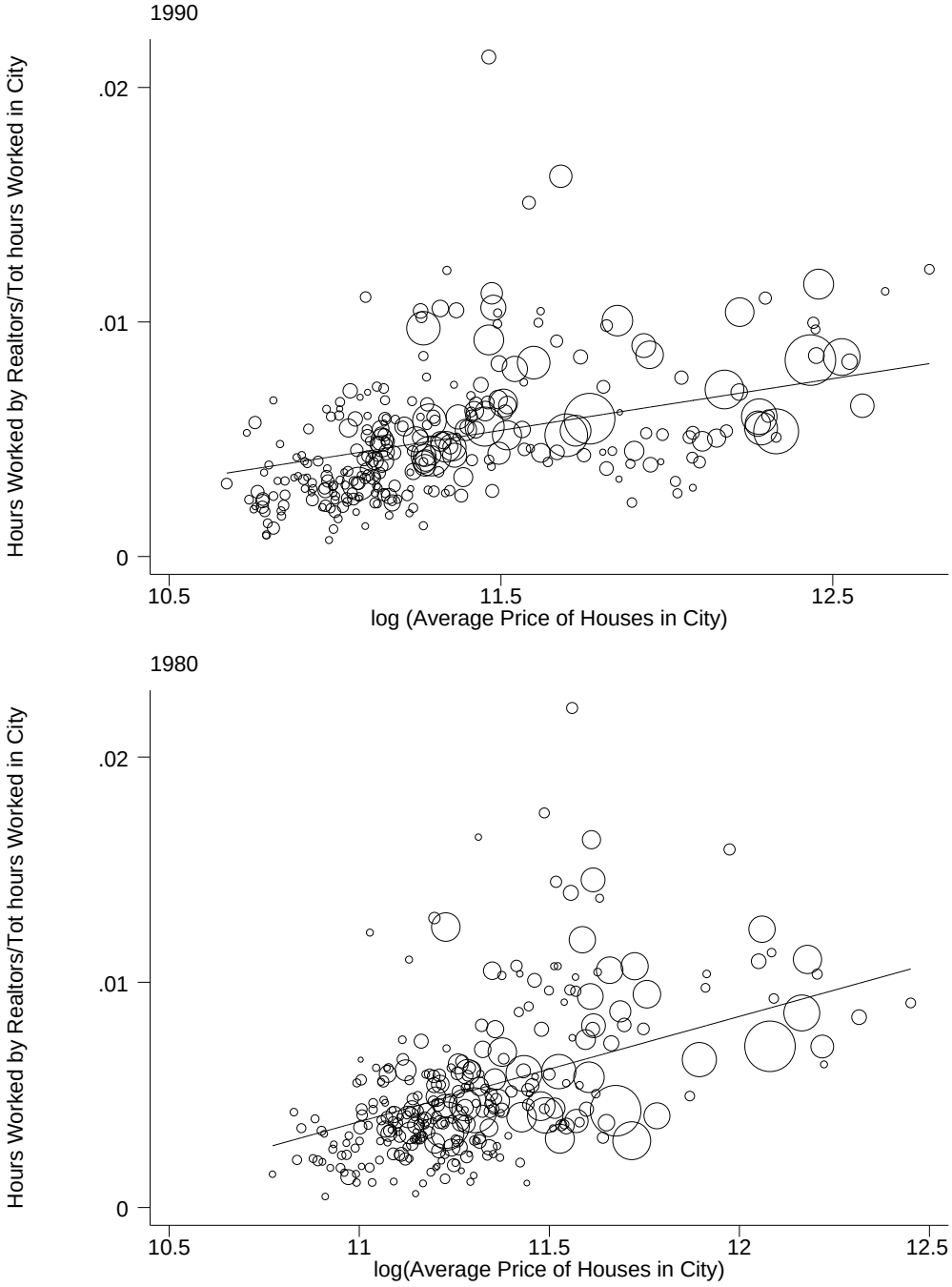
(d) Seattle

Figure 3: Commission Rates against Price of Housing in the CEX



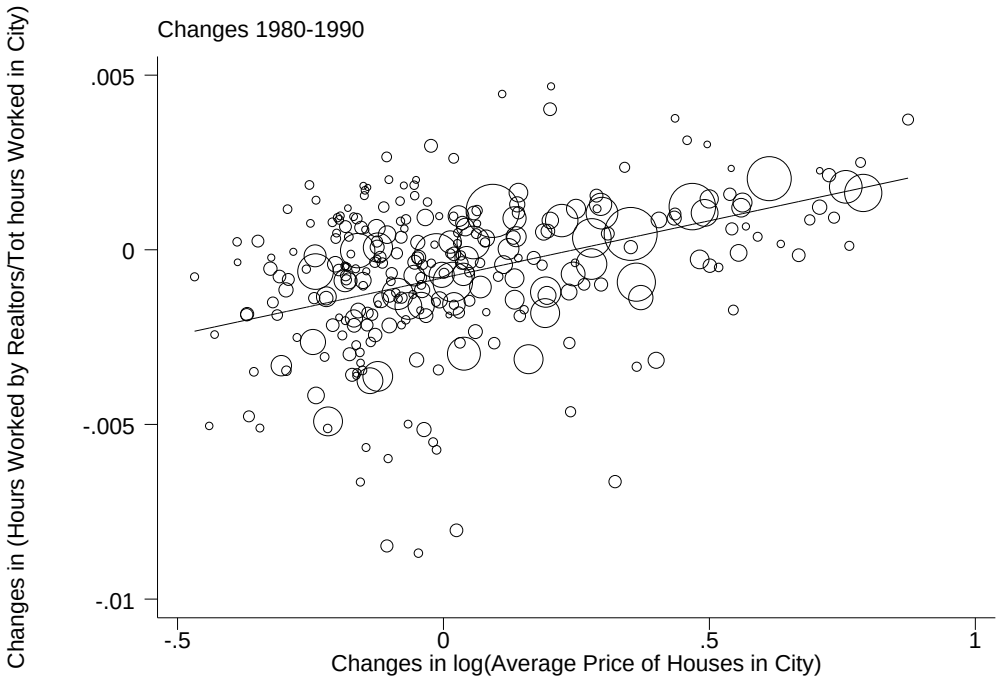
Notes: Each point in the Figure is the average commission rate within intervals in housing price $10,000 wide. The superimposed fit is from an household level regression of commission rates on housing prices. N = 406.

Figure 4: The Relationship between the Percentage Real Estate Agents in the Labor Force and the Average Cost of Housing in 282 Metropolitan Areas



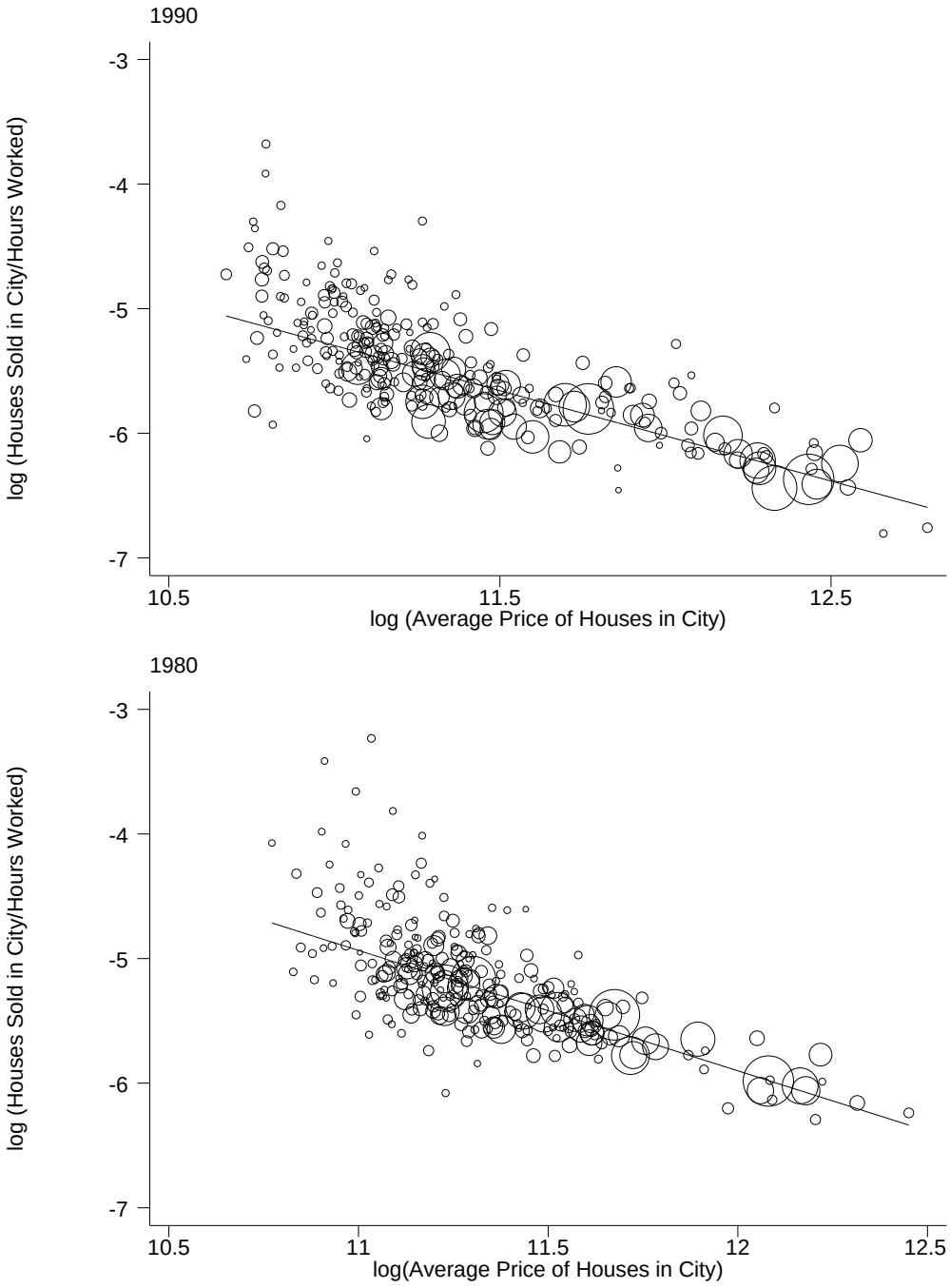
Notes: The top panels refers to 1990. The bottom panels refers to 1980. Data are from the Census of Population and Housing.

Figure 5: The Relationship between Changes in the Percentage Real Estate Agents in the Labor Force and Changes the Average Cost of Housing in 282 Metropolitan Areas



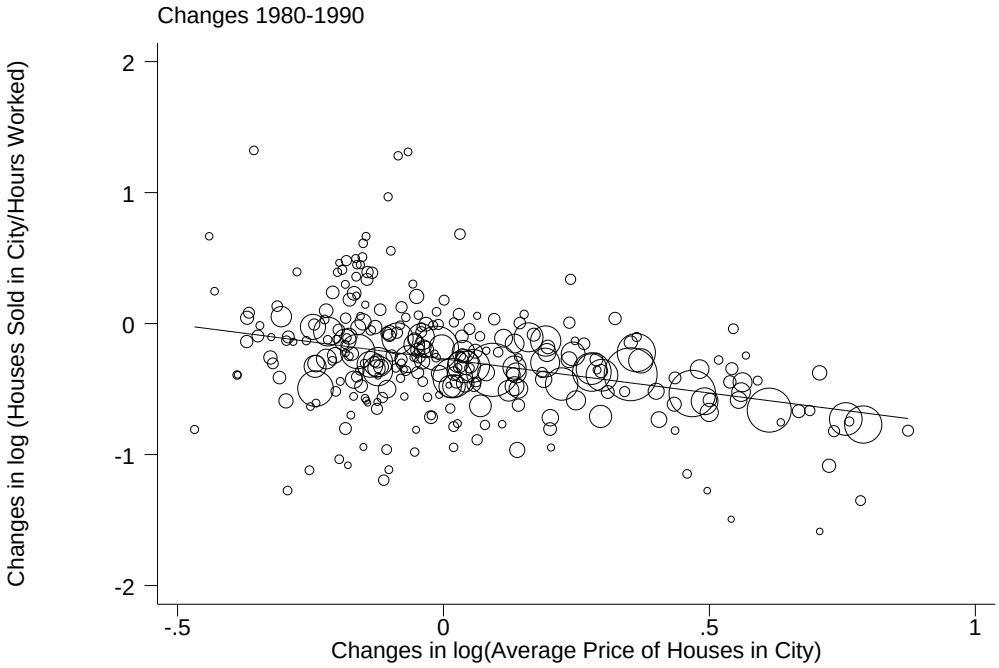
Notes: Data are from the 1980 and 1990 Census of Population and Housing.

Figure 6: The Relationship Between the Productivity of Real Estate Agents (Number of Houses Sold in the City / Number of Real Estate Agents) and the Cost of Housing in 282 Metropolitan Areas



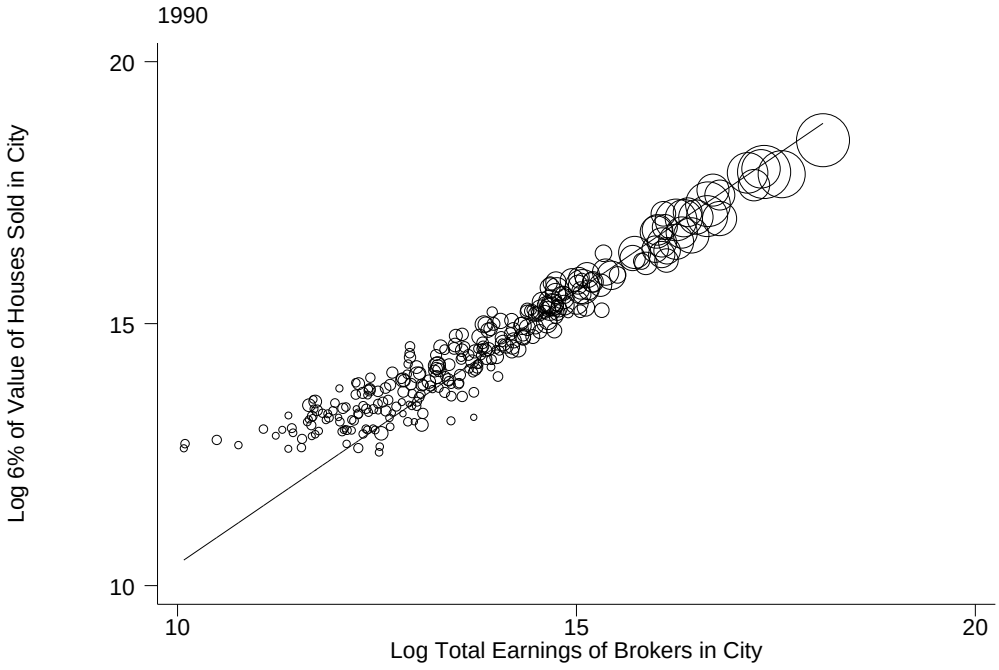
Notes: The top panels refers to 1990. The bottom refers to 1980. Data are from the Census of Population and Housing.

Figure 7: The Relationship Between Changes in the Productivity of Real Estate Agents (Number of Houses Sold in the City / Number of Real Estate Agents) and Changes the Cost of Housing in 282 Metropolitan Areas



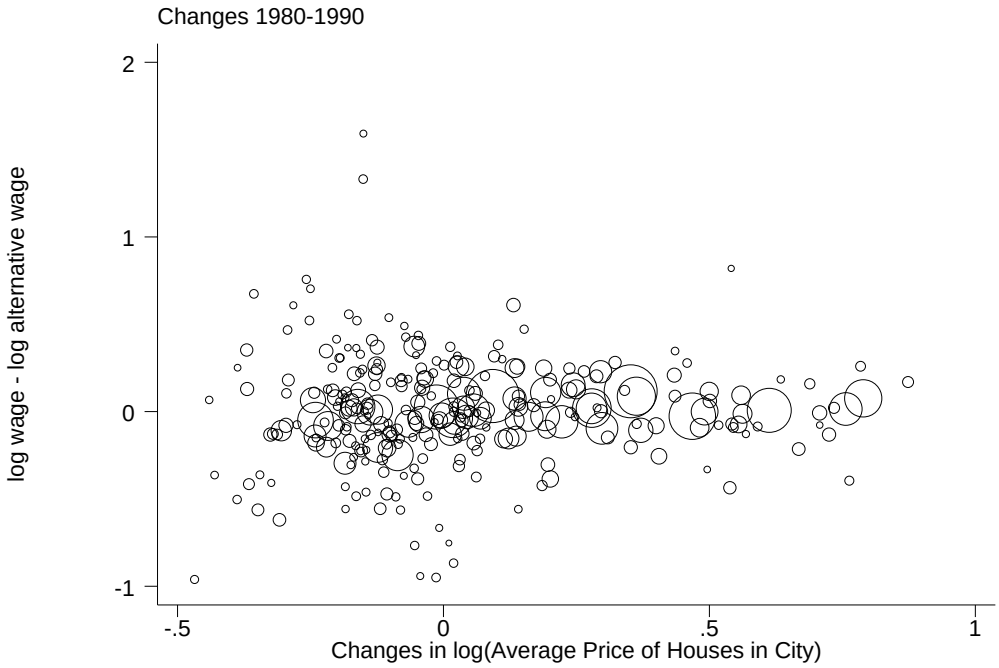
Note: Data are from the 1980 and 1990 Census of Population and Housing.

Figure 8: The Relationship Between Earnings of Brokers and 6% of the Total Value of Homes Sold in 282 Cities



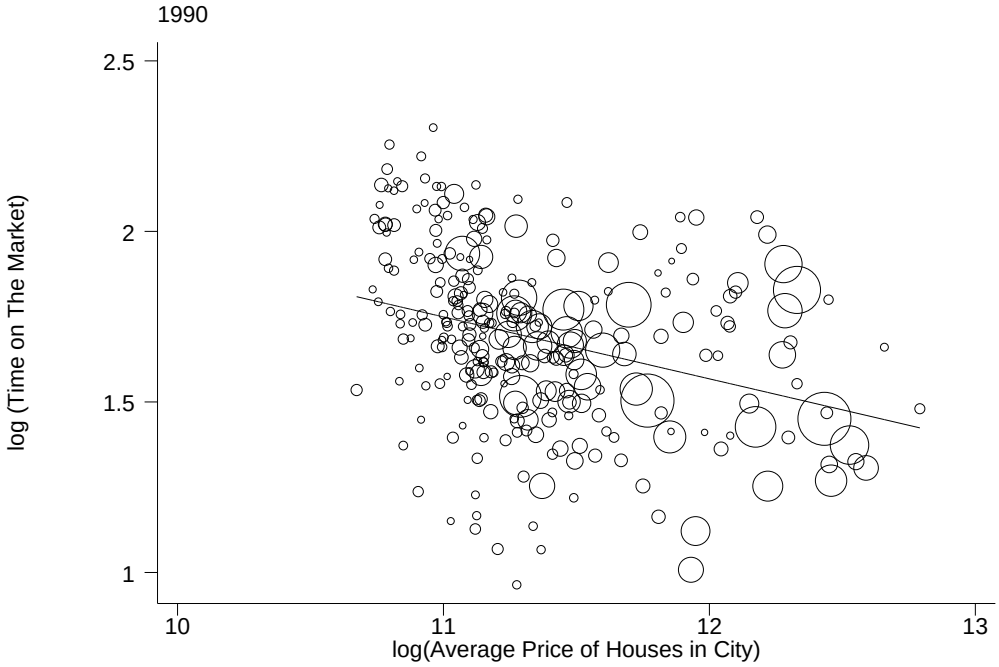
Notes: The y-axis is the expected revenue of real-estate agents, calculated as 6 percent of the total value of homes sold in a city. The x-axis is the total value of brokers' earnings in the city. Data are from the 1990 Census of Population and Housing.

Figure 9: The Correlation between Cost of Houses and the Adjusted Earnings of Real Estate Agents in 282 Cities



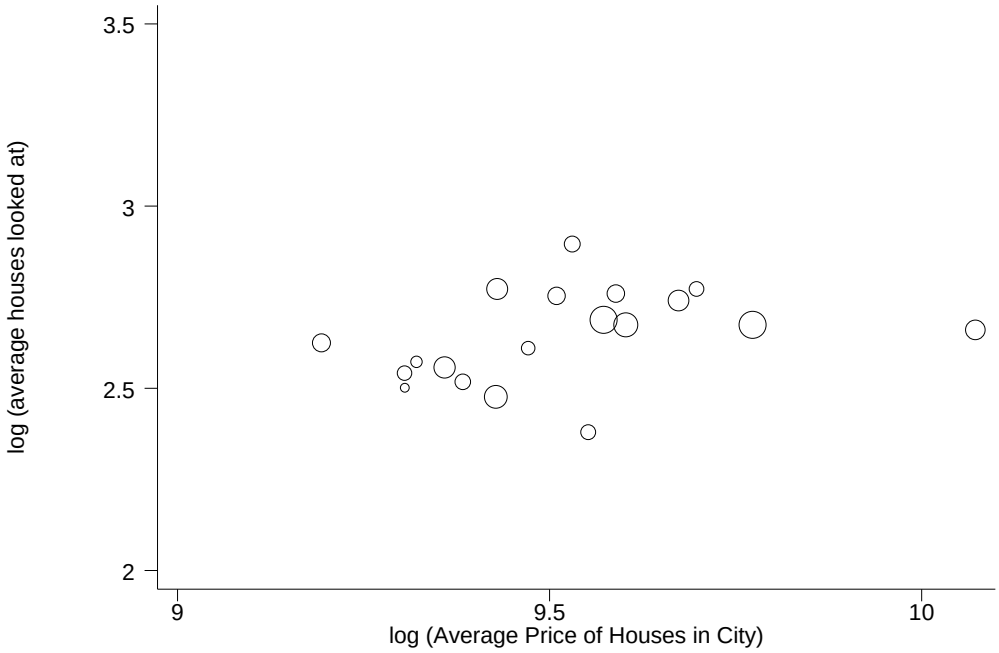
Notes: The y-axis is the log difference between average earnings in a city and brokers' reservation wage. The reservation wage of real estate agents is a weighted average of the wages of workers in all other occupations in the same city. We assign weights to individuals in the sample who are not brokers based on how similar their observable characteristics are to the observable characteristics of brokers. See text for details.

Figure 10: The Relationship between the Cost of Housing in 282 Metropolitan Areas and Vacancy time



Notes: Data are from the 1990 Census of Population and Housing.

Figure 11: The Relationship between the Number of Houses Looked at and the Cost of Housing.



Notes: Data are from the 1997 Chicago Title and Trust Company Annual Survey of Recent Home Buyers, a representative sample of approximately 1,800 home buyers in 20 cities. The cities included in the survey are Atlanta; Boston; Chicago; Cleveland; Dallas/Fort Worth; Denver; Detroit; Houston; Los Angeles; Memphis; Miami; Minneapolis/St. Paul; New York City; Orange County; Orlando; Philadelphia; Phoenix; San Francisco; Seattle/Tacoma and Washington, D.C.

Table 1: Summary Statistics

	1990 (1)	1980 (2)
Number of cities	282	282
Number of obs per city	7,457.2	5,288.7
Number of realtors	137.78	112.0
Hours worked by realtors	232,814.3	181,503.2
Number sales	708.3	768.2
Productivity	.004	.005
Log productivity	-5.68	-5.40
Log reservation wage	2.33	2.31
Price of Houses Sold	94,142.3	85,826.7
Age of house	26.9	25.3
Number of bedrooms	2.56	2.50
One family house	.73	.73
Condominium	.03	.02
Has plumbing	.99	.98
Has kitchen	.99	.97
Fraction renters in city	.35	.33
Months on the market (vacant homes)	7.7	5

Notes: Date are from the 1990 and 1980 Census of Population and Housing. Prices are in 1990 dollars.

Table 2: Expensive and Affordable Cities

Rank	City	Average Cost	log Productivity
	Ten Least Expensive		
1.	MCALLEN-EDINBURG-MISSION,TX	43191.7	-4.75
2.	ODESSA, TX	45884.3	-5.40
3.	STEUBENVILLE-WEIRTON, OH-WV	46205.1	-4.50
4.	LAREDO, TX	46856.2	-4.30
5.	BROWNSVILLE-HARLINGEN, TX	47037.1	-5.85
6.	PINE BLUFF, AR	47099.4	-4.35
7.	JOHNSTOWN, PA	47401.3	-5.23
8.	WHEELING, WV-OH	48102.8	-4.89
9.	HUNTINGTON-ASHLAND, WV-KY-OH	48110.2	-4.76
10.	BEAUMONT-PORT ARTHUR, TX	48154.0	-4.62
	Ten Most Expensive		
273.	LOS ANGELES-LONG BEACH, CA	250836.0	-6.37
274.	SANTA BARBARA-SANTA MARIA-LOMPOC, CA	253086.7	-6.28
275.	SANTA CRUZ, CA	254757.5	-6.07
276.	OXNARD-VENTURA, CA	255392.3	-6.15
277.	ANAHEIM-SANTA ANA, CA	257170.8	-6.40
278.	SAN FRANCISCO, CA	275669.8	-6.24
279.	HONOLULU, HI	282350.8	-6.43
280.	SAN JOSE, CA	293341.2	-6.05
281.	NORWALK, CT	314269.5	-6.80
282.	STAMFORD, CT	359127.6	-6.75

		Change in Average Cost	Change in log Productivity
	Ten Smallest Changes		
1.	ANCHORAGE, AK	-43585.4	-.01
2.	LAFAYETTE, LA	-39937.5	-.80
3.	RICHLAND-KENNEWICK-PASCO, WA	-37362.3	.66
4.	PROVO-OREM, UT	-33453.4	1.32
5.	EUGENE-SPRINGFIELD, OR	-32418.5	.08
6.	RENO, NV	-32118.4	-.00
7.	BILLINGS, MT	-30524.2	-.39
8.	SALT LAKE CITY-OGDEN, UT	-28532.8	.05
9.	WATERLOO-CEDAR FALLS, IA	-28457.1	.24
10.	PEORIA, IL	-26157.6	.04
	Ten Largest Changes		
272.	OXNARD-VENTURA, CA	84169.5	-.51
273.	POUGHKEEPSIE, NY	84894.9	-.66
275.	SAN JOSE, CA	90929.3	-.28
276.	JERSEY CITY, NJ	95505.0	-1.3
277.	LAWRENCE-HAVERHILL, MA-NH	102523.2	-.81
278.	NEW YORK, NY	103634.2	-.66
279.	STAMFORD, CT	103678.5	-.51
280.	NORWALK, CT	110939.7	-.81
281.	BOSTON, MA	114739.2	-.72
282.	NASSAU-SUFFOLK, NY	117356.7	-.77

Notes: prices are in 1990 dollars. Average cost is the average price of houses sold in 1989. Change in average cost is the change in average price of houses sold in 1979 and 1989.

Table 3: Effect of Average Price of Houses on the Supply of Brokers

	1990	1980	Changes 1980-1990
	(1)	(2)	(3)
Dependent Variable: Percentage Brokers			
Cost of Houses	0.623	1.142	0.917
	(0.058)	(0.097)	(0.078)
R-squared	0.28	0.32	0.32
Dependent Variable: Percent Hours Worked by Brokers			
Cost of Houses	0.667	1.228	0.838
	(0.060)	(0.099)	(0.081)
R-squared	0.30	0.35	0.27

Notes: Standard errors in parenthesis. In the top panel, the dependent variable is the log share of real estate agents in the labor force in the city. In the bottom panel, the dependent variable is the log of the ratio of hours worked by real estate agents over total hours worked in the city. All models are weighted by city population. N=282.

Table 4: Effect of Average Price of Houses on the Productivity of Brokers

	OLS				IV	
	1990	1980	Changes 1980-1990	Changes 1980-1990	Changes 1980-1990	Changes 1980-1990
	(1)	(2)	(3)	(4)	(5)	(6)
Cost of Houses	-0.929	-1.098	-0.646	-0.714	-0.706	0.694
	(0.059)	(0.049)	(0.069)	(0.080)	(0.091)	(0.089)
Age				0.011	0.007	0.011
				(0.007)	(0.008)	(0.007)
Number of Bedrooms				0.405	0.261	0.405
				(0.175)	(0.213)	(0.175)
One family home				0.875	1.428	0.856
				(0.328)	(0.398)	(0.330)
Condominium				-0.271	-0.207	-0.308
				(0.330)	(0.374)	(0.336)
Plumbing				-1.150	-3.085	-1.172
				(2.766)	(4.266)	(2.766)
Kitchen				3.335	1.341	3.374
				(2.696)	(3.641)	(2.696)
First Stage						
Repeated Sales Price Index					0.783	
					(0.031)	
Census Price Index						0.608
						(0.018)
R-squared	0.65	0.63	0.23	0.30		
N	282	282	282	282	119	282

Notes: Standard errors in parenthesis. The dependent variable is total number of houses sold over total number of hours worked by real estate agents. All models are weighted by city population.

Table 5: Robustness Checks: Effect of Average Price of Houses on the Productivity of Brokers

	1990	1980	Changes 1980-1990
	(1)	(2)	(3)
1) Base Case	- 0.929	-1.098	-0.714
	(0.059)	(0.049)	(0.080)
2) Number of Bedrooms	-0.992	-1.139	-0.759
	(0.042)	(0.048)	(0.071)
3) Control for City Population	-0.883	-1.089	-0.745
	(0.045)	(0.048)	(0.083)
4) Control for Percentage Renters	-0.822	-0.987	-0.668
	(0.047)	(0.059)	(0.086)
5) Median Cost of Houses	-0.823	-1.112	-0.531
	(0.038)	(0.056)	(0.068)
6) Drop New York city	- 0.900	-1.088	-0.689
	(0.041)	(0.049)	(0.073)

Notes: Standard errors in parenthesis. All models are weighted by city population.

Table 6: Effect of Average Price of Houses on the Relative Wage of Brokers

	1990	1980	Changes 1980-1990
	(1)	(2)	(3)
Cost of Houses	0.079	0.163	0.064
	(0.019)	(0.027)	(0.041)
R-squared	0.05	0.10	0.01

Notes: Standard errors in parenthesis. The dependent variable is the the log difference between average earnings of brokers and brokers' reservation wage. The reservation wage of real estate agents is a weighted average of the wages of workers in all other occupations in the same city. We assign weights to individuals in the sample who are not brokers based on how similar their observable characteristics are to the observable characteristics of brokers. See text for details. N= 282.

Table 7: Effect of Average Price of Houses on Vacancies

	1990	1980	Changes 1980-1990
	(1)	(2)	(3)
Cost of Houses	-0.181	-0.483	-0.224
	(0.025)	(0.047)	(0.058)
R-squared	0.14	0.26	0.05

Notes: Standard errors in parenthesis. The dependent variable is the log of the average monthly duration of vacancies in a city. Sample include all vacant houses. N= 281.

Table A1: Number of Active and Inactive Licensed Brokers by State

State	Active	Inactive
Alabama	19,599	4,435
Alaska	2,600	1000
Arizona	43,000	13,000
Arkansas	13,000	6,000
California	301,566	
Colorado	32,441	20,566
Connecticut	33,765	
Delaware	3,524	348
DC	7,047	
Florida	227,331	107,306
Georgia	37,837	15,235
Hawaii	14323	7,852
Idaho	5,007	3,639
Illinois	88,097	21,145
Indiana	43,635	19,200
Iowa	14,543	3,562
Kansas	13,900	3,000
Kentucky	19,340	2,345
Louisiana	28,804	6,584
Maine	5,974	2,622
Maryland	34,285	1,581
Massachusetts	150,736	24,324
Michigan	46,700	30,500
Minnesota	26,000	
Mississippi	8,474	3,453
Missouri	53,825	4,356
Montana	4,642	561
Nebraska	8,945	1,737
Nevada	6,327	3,930
New Hampshire	11,896	
New Jersey	82,200	
New Mexico	9,474	1,840
New York	127,047	
North Carolina	65,820	
North Dakota	2,325	100
Ohio	48,653	
Oklahoma	21,241	12,644
Oregon	14,731	1,652
Pennsylvania	46,789	57,354
Rhode Island	5,200	
South Carolina	20,922	1,620
South Dakota	3,165	1,702
Tennessee	21,980	13,240
Texas	154,564	22,965
Utah	9,316	7,884
Vermont	5,599	
Virginia	44,178	14,989
Washington	25,653	29,369
West Virginia	8,319	
Wisconsin	32,000	
Wyoming	2,322	1,505

Source: Digest of Real Estate License Laws, 1987.

Figure A1: Rent-Seeking with Heterogeneous Agents