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Publication Date

2020

Peer reviewed|Thesis/dissertation

Professionalism, Technology, and Rental Markets in the US

By

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A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

City and Regional Planning

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Associate Professor Carolina Reid, Chair
Professor Karen Chapple
Professor Enrico Moretti

Summer 2020

Professionalism, Technology, and Rental Markets in the US

Abstract

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by

Nathaniel B Decker

Doctor of Philosophy in City and Regional Planning

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Associate Professor Carolina Reid, Chair

Planners from the federal to the local level routinely grapple with how to establish an efficient and equitable policy regime for rental housing. In attempting to promote affordability, fair access, and good maintenance of rentals, however, few planners have a good understanding of those who set rents, select tenants, and are ultimately responsible for property maintenance - the rental property owners. This dissertation focuses on these owners and tries to understand if certain kinds of owners behave differently than other kinds of owners, how owners as a group might be changing over time, and the role of technological advances is driving those changes. This is especially relevant because of the changes to the owner population brought on by Foreclosure Crisis, and the likely change in who owns the nation's rentals that will happen because of the coronavirus pandemic. It also directly engages with the long but currently neglected scholarly conversation about rental property owner "professionalism," especially how technology fits or does not fit into that lens of viewing owners, and the very much un-neglected topic of single-family rental housing.

For all of the hue and cry over rents and nefariousness or benevolence of certain rental property owners, there is extremely limited data on rents and who rental properties in the US. I use a range of strategies to deal with this dearth of data. Firstly, I gathered my own data using a large survey of the owners of small rental properties in the US. This survey was sent to over 53,000 owners and I received approximately 1,000 responses from owners ranging from 1-unit portfolio owners to owners with hundreds of

properties. I also conducted follow-up interviews with about 160 of these owners. Secondly I joined under-utilized Census data on rental property owners with Census data on rental units and tenants to create a detailed picture of how hundreds of rental property owners set rents in the 1980s and 1990s. Lastly I used data scraped from the web to understand the influence of a specific technology, Craigslist, to measure the impact of the site over time. I feed these diverse data into OLS and logistic models to better understand how rental property owners have behaved and how technologies have changed rental markets across the US.

Chapter 1 sets the context for the dissertation, outlining the subjects of the owners of rental properties, professionalism, technology and how these relate to rents and fairness in rental markets. I pay particular attention to small rental properties, which are both distinct from and similar to multifamily rentals and owner-occupied single-family homes in many ways. Chapter 2 examines below-market rent-setting among the owners of small rental properties. There's been a long-standing debate about the extent to which small rental properties are a site of exploitation versus a site of opportunity for tenants and discerning whether owners knowingly set rents below market is an important part of that debate. I find that about half of small rental property owners do set rents at least $50 below market. The average amount that rents are below market is substantial, about $270 per month. The reasons for setting rents below market rate are diverse. There are economic reasons, such as minimizing turnover costs and attracting and retaining low-cost tenants. There are also social and ethical reasons, such as owners who reported that they "didn't need" the additional income or set rents based on what they thought their tenants could afford. Lastly there were information reasons, where owners raised rent when they realized the extent to which their unit was below market. The distinction between owners who set rent below market and those who did not didn't follow the typical dividing lines between professional and amateur owners. Portfolio size had only a very small effect, as did whether the owner held their properties in a corporate entity. Owners who held their property "As future security for family member(s)," owners who perceived their tenants to be low income, and owners who didn't use technology for property management or rent setting were more likely to report setting rents below market.

Chapter 3 keeps the national-scale frame but expands the scope of the analysis to multifamily, as well as small rental properties, and looks across a

decade to examine how different landlords set rents. Specifically, I track "rent stickiness," the owner's decision to hold rents flat over two years, and "rent shocks," the owner's decision to increase rents by 20% or more in a two-year period. From 1985 to 1995 stickiness and shocks were both fairly common. I examine whether these behaviors are correlated the extent to which an owner is a professional or amateur landlord, while controlling for the many other factors that influence rent-setting. Over a given two-year period about a quarter of units' rents "stuck" while about 15% rose sharply. Stickiness was far more common with continuing tenants (though was still pronounced upon turnover), while shocks were slightly more common at turnover. None of the traditional measures of owner professionalism were strongly correlated with either stickiness or shocks. The role of turnover, however, obscures how some owners might use stickiness to entice tenants to stay put, and shocks to entice tenants to move.

Chapter 4 concerns how technology has affected US rental markets generally, from both the supply and demand sides. Many scholars have hypothesized that, as technology makes it easier for buyers and sellers to gather and analyze information, markets, including rental housing markets, should become more efficient. The precise ways in which rental markets may become more efficient, however, is not clear. This chapter focuses on the rise of Craigslist in the mid-2000s and examines whether this particular technology had an impact on various measures of rental market efficiency. The rise of Craigslist appears uncorrelated with changes in vacancy dynamics and does not appear to have generated a rise in non-family households or affected renter mobility. Craigslist also appears to have had little to no impact on the rental vacancy rate. The rise of the site, however, was correlated to an increase in rents. This may be related to the finding from Chapter 2 that owners who consulted online sources for comparables when setting rents were less likely to set rents below market.

Chapter 5 discusses the broader implications of the research and identifies promising avenues for further study. Rental housing market are changing on many fronts, from shifts in who owns rental units to changes in how owners manage their properties now that they can access and analyze information thanks to technology. Much attention has been paid to the former change, but my analysis shows that the latter change might be at least as important for rent levels and changes in rents and that the distinctions between owners may need to be more nuanced than the typical metric of portfolio size. Fur-

ther I argue that planners should view below-market small rental properties as an affordable housing asset in their communities and consider policies to preserve and generate more of this stock.

Contents

Chapter 1: Introduction

This dissertation is about whether who your landlord is makes a difference in what your rent is. You pay your rent to the 80-year old landlord who lives in the first floor, your friend rents in a 520-unit tower owned by a REIT with hundreds of properties across the country. Does this difference matter when it's time for lease renewal? Does it matter when you or your friend move and the unit is advertised for a new price? Are there some kinds of owners who often sharply increase rent by 20% more - and some owners who never do this? Every day thousands of landlords and managers make decisions about how to set the rent for their units. Some owners consider their tenant, as some know their tenants quite well or are their friend or relative. Other owners have no idea who their tenant is and have no interest in knowing.

Rents are set by individuals, not the market, but the market is a real thing and has a profound impact on rent-setting. Nearly all scholarship and study of rents has focused on the market, not the person or company that sets rents. This leaves scholars and policymakers with a fairly good sense of the forest, while providing no sense of the trees themselves. In some cases the collective picture alone may be adaquate to understand rents and the rental affordability problems that plague low- and moderate-income households across the US. The 80-year old landlord downstairs and the team that puts together the algorithm that sets rents for the management of the REIT's properties may, in the end, be doing the same thing: responding to market conditions. While they won't set rents identically, over the long run there may be no meaningful difference in the rent changes and levels over time.

There are, however, a number of reasons to suspect there may be more to the process of setting rents than simply assessing market conditions. Owners may want their tenants to vacate a unit, either because they don't like the tenant or because they want the unit vacant to sell or do work on the unit. Owners can sharply raise rents to get tenants to move. Conversely owners may want their tenants to stay in the unit and may choose to hold rents flat upon lease renewal or even lower rents. Owners' individual financial needs may play a role as well, with financially-strapped owners attempting to maximize the return of their rental units, while financially secure owners allow rents to fall below market because they "don't need" the extra income.

And the rents for individual units, while usually following the market, display

patterns that a difficult to explain with market logic. According to the American Housing Survey about a quarter to a third units' rents do not change at all over a given two-year period. While some markets are stagnant, the frequency of rent changes that are *exactly* zero over multiple lease renewals and even upon turnover, is difficult to explain. Even harder to explain is why this "rent stickiness" is more pronounced among smaller rental properties relative to larger multifamily properties. Since the 1970s it has also been clear that long-term tenants pay less for their units than recent movers. Even for units that are exactly the same and in the same market (such as identical units on the same floor in a large apartment building), tenants who have been there five years pay less than tenants who have been there one year. This is again difficult (though not impossible) to explain as market-driven.

That non-market factors that may affect rent-setting, and that some common rent-setting phenomena are hard to square with market factors, does not necessarily mean that some kinds of owners set rents differently than other kinds of owners, though it would stand to reason that "professional" landlords behave in a more market-driven way than "amateur" or "mom and pop" landlords. The owners of rental properties are extremely diverse. Large chunks of the rental stock are owned by nation-wide REITs, but large chunks are also owned by "mom and pop" landlords who own just one or two units. These two extremes are typically seen as two ends of the spectrum of the "professionalism" of an owner. This term encompasses portfolio size, market savvy, managerial capacity, and the extent to which investment and management activity is driven by market logic and the objective to maximize risk-adjusted returns.

The entrance of institutional investors into the single-family rental space, first with the foreclosure crisis and now (potentially) with the novel coronavirus, has raised concern that the profile of rental property owners is becoming more professionalized, and that with professionalization comes rising rents (Seidman & Pardo, 2019). While institutional investors still only comprise a very small part of the single-family rental market (about 2%) the foreclosure crisis substantially changed the profile of single-family rental ownership in as much as a large portion of owners were now the buyers of distressed formerly-owner occupied properties. Another change in the owners of properties that is less remarked upon, but may be no less profound, is the extent to which technology now allows a small portfolio "mom and pop" owner to behave more like a professional owners than a "mom and pop" owner of the 1990s.

Technology has made it possible for small-scale investors to gain market knowledge that was previously only available to highly professional investors and managers. Sites like Craigslist and Zillow make marketing properties far easier and also allow owners to get up-to-date market comps to estimate the going rate for their unit. Sites like Rentometer go further, feeding scraped listings into a hedonic model to provide landlords with a data-driven estimate of the current market rent for their unit. Roofstock allows users to peruse cash flowing single-family rentals across the US, and provides automatic cap rate filters and recommendations of local property managers, and other other services. Online tenant screening services make criminal background checks and credit report pulls easy. It is not unreasonable to say that the amateur investor of today can see the market and (to a certain extent) act in much the same way as a professional investor of the 1980s.

I use a variety of data sources and methods to examine whether different kinds of owners set rents in categorically different ways and if technology affects these rent-setting decisions. Chapter 2 is based on a large survey of small rental property owners that I conducted to examine the extent to which owners knowingly set rents below market rate. Chapter 3 joins two existing data sets (the American Housing Survey and the Property Owners and Managers Survey) to see if different kinds of owners hold rents flat or sharply increase rents. Chapter 4 examines the rise of Craigslist on rental market efficiency, particular the equilibrium vacancy rate.

1.1 Technology, Professionalism, & Small Rental Properties

Because I am interested in differences between "professional" and "amateur" owners I pay particular attention to small rental properties, which I define as properties with 1-4 units including condominiums. Most of the unsubsidized rental housing in the US is in these small rental properties (or "SRPs"), and the dynamics of this part of the market are more poorly understood than the dynamics of unsubsidized multifamily rentals. Figure 1 shows that unsubsidized SRPs alone provide more low-rent homes than all subsidized units in the US combined. Understanding the owners and managers of SRPs is important because they have the most direct control over these properties, and therefore the housing quality and affordability for millions of LMI families.

Units with Rent Less than $600 by Building Type and Subsidy Classification
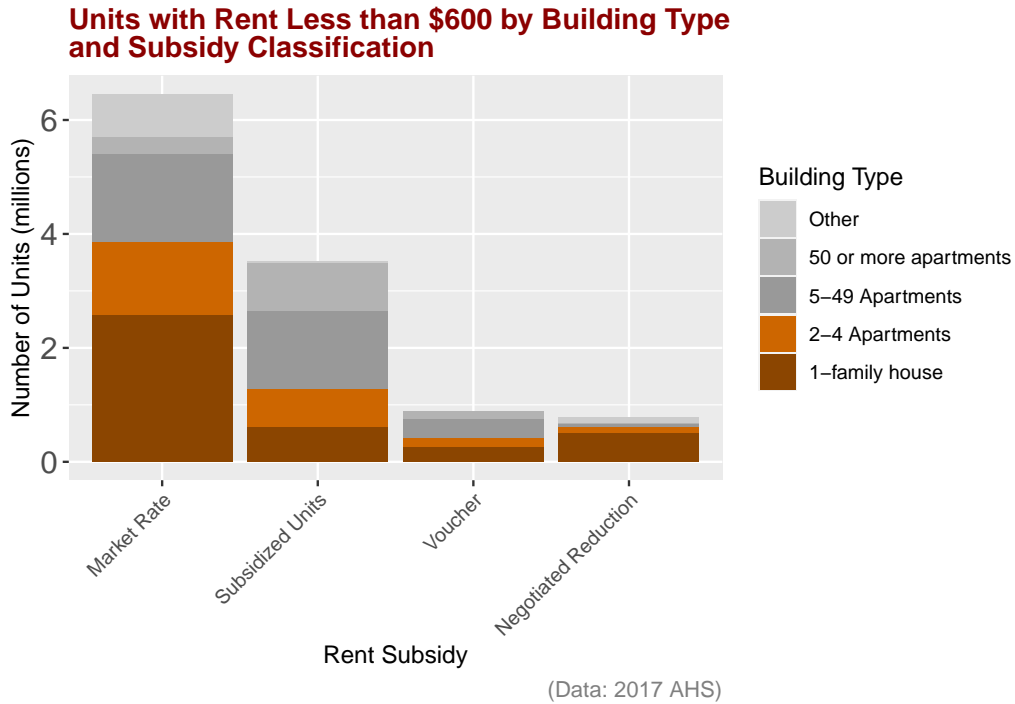
Figure 1: Affordable Units by Subsidy Status and Size

This dissertation picks up on Malpezzi's (1999) call to examine the industrial organization of the US residential rental market.

There is a substantial literature on the ownership and management practices of single-family owner-occupied homes and multifamily rental properties, particularly subsidized rentals, but very little on small rental properties. Recent scholarship has touched on SRPs in the context of the widespread changes in tenure mix in the aftermath of the foreclosure crisis (see, for example, Pfeiffer & Lucio (2015) and Immergluck (2018)) and on the role of low-end SRPs in the reproduction of poverty (see Desmond (2016) and Pendall, Theodos, & Hildner (2016)). But while many SRPs are owned by distressed property investors or are in low-end urban markets, most are not. SRPs comprise about 19% of the nation's total housing stock and are the majority of rental units in the US. While SRPs are diverse, a first step in better understanding what this part of the stock looks like is examining how they are distinct from single-family owner-occupied (which comprises about 56% of the nation's

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stock) and multifamily rental properties (which comprises about 16% of the nation's stock). (The remaining 10% of the nation's housing units are mobile homes and multifamily owner-occupied homes, such as condos.) I review this contrast briefly in terms of the physical characteristics of these three groups, their tenantry, their neighborhoods, and their ownership. The comparisons are summarized in Table 1.

Table 1: A Summary of Small Rental Properties (SRP), Multifamily Rental Properties (MF Rental), and Owner-Occupied Single-Family Properties (SF Owner Occupied) (data: 2017 5-year ACS)

	MF Rental	SF Owner Occupied	SRP
Portion of Total US Housing Stock (%)	15.7	56.5	18.8
Structure			
Median Year Structure Built	1985	1975	1965
Mean Number of Bedrooms	1.5	3.3	2.5
Mean Number of Rooms	3.5	7	5.1
Tenants			
Median Household Income	36201	79985	41560
Mean Household Size	1.9	2.6	2.7
Median Duration of Residency (years)	3	15	3
Households with children (%)	22.4	31	40.2
Neighborhoods			
% of Stock Type in Central City	52.8	22	37.3
Mean % of Tract that is Non-Hispanic White	51.2	69.3	56.2
Mean Tract Home Ownership Rate (%)	41.1	72.4	56.1
Mean % of Tract Below Poverty Line	18.8	11.9	18.2

Nationally, SRPs physical resemble modest owner-occupied single-family

homes. This is to be expected, as substantial parts of the single family stock churn back and forth between renters and owner-occupants over time (Weicher, Eggers, & Moumen, 2016). SRPs tend to be somewhat older than owner-occupied single family homes and smaller. On average they have one fewer bedroom and have yards that are nearly half the size of owner occupied homes. From the vantage point of renter households, however, SRPs are substantially larger than multifamily apartments. Most SRPs have a yard and the average SRP has about 1.5 more rooms than the average multifamily apartment.

It comes as no surprise, then, that SRPs attract larger households, particularly households with children. The households in SRPs are even slightly larger than the average household in owner-occupied units. About 41% of SRPs are occupied by families with children, relative to 31% of owner-occupied single-family homes and only 22% of apartments. In other respects the tenants of SRPs are not dissimilar from apartment-dwellers. They move at approximately the same rate, about every 3 years, and have incomes that, though slightly higher than apartment-dwellers, are far below the incomes of owner-occupants.

While many SRPs are in predominantly single-family owner-occupied neighborhoods SRPs are, on average, in neighborhoods that occupy a middle ground between the neighborhoods of apartment units and owner-occupied homes. SRPs are much more likely to be in the center city of a metro area than owner-occupied homes. The average SRP is in a tract with a higher poverty rate than the tract of the average single-family owner-occupied home. Poverty-wise, the neighborhood of an average SRP is similar to the neighborhood of an average multifamily rental. SRPs are in tracts that have proportionally fewer non-Hispanic whites and lower home-ownership rates than the neighborhoods of owner-occupied units.

1.2   Dissertation Road Map

This dissertation is composed of three substantive chapters, bookended by this introductory chapter and a brief conclusion chapter. The three substantive chapters all examine the impact of technology and/or owner professionalism on US rental markets. The first substantive chapter, chapter 2, examines whether some owners of small rental properties routinely and

knowingly set rent below market rate and, finding that they often do, examines which owners do so and why. Chapter 3 uses changes in the rents of specific units over time, from 1985 to 1995, to examine whether certain kinds of owners are more likely to either hold rents flat or sharply increase rents. Chapter 4 uses the rapid rise of Craigslist in the mid-2000s to examine whether this particular technology improved the efficiency of rental markets, particularly with regards to the "equilibrium vacancy rate," a characteristic of rental markets that has been shown to affect rent levels. Chapter 5 concludes the dissertation by examining the implications of the findings of the three substantive chapters and identifies avenues of further research.

1.3   Research Questions and Contributions

Below are the main research questions and their answers.

- Do owners of small rental properties knowingly set rents below market? If so, why, and do certain types of owners do this more than others?
    - About half of surveyed small rental property owners reported setting rents at least $50 below market. Typically these owners set rents substantially below market, averaging 15%, or about $270 per month, below market.
    - The reasons for setting rents below market rate are diverse. There are economic reasons, such as minimizing turnover costs and attracting and retaining low-cost tenants. There are also social and ethical reasons, such as owners who reported that they "didn't need" the additional income or set rents based on what they thought their tenants could afford. Lastly there were information reasons, where owners raised rent when they realized the extent to which their unit was below market.
    - The distinction between owners who set rent below market and those who did not didn't follow the typical dividing lines between professional and amateur owners. Portfolio size had only a very small effect, as did whether the owner held their properties in a corporate entity. Owners who held their property "As future security for family member(s)," owners who perceived their tenants

to be low income, and owners who didn't use technology for property management or rent-setting were more likely to report setting rents below market.

- How common is rent stickiness (owners' holding rent flat over a 2-year period) and rent shocks (owners raising rent by 20% or more over a 2-year period) and are there certain types of owners who engage in these behaviors more often than others?

  – From 1985 to 1995 stickiness and shocks were both fairly common. Over a given two year period about a quarter of units' rents "stuck" while about 15% rose sharply. Stickiness was far more common with continuing tenants (though was still pronounced upon turnover), while shocks were slightly more common at turnover.
  – None of the traditional measures of owner professionalism were strongly correlated with either stickiness or shocks. The role of turnover, however, obscures how some owners might use stickiness to entice tenants to stay put, and shocks to entice tenants to move.

- Did the sudden rise of Craigslist in the mid-2000s improve rental market efficiency in US metros?

  – The rise of Craigslist appears uncorrelated with changes in vacancy dynamics and does not appear to have generated a rise in non-family households or affected renter mobility. Craigslist also appears to have had little to no impact on the rental vacancy rate. The rise of the site, however, was correlated to an increase in rents. This may be related to the finding from Chapter 2 that owners who consulted online sources for comprables when setting rents were less likely to set rents below market.

Chapter 2: Technology, Professionalism, & Small Rental Property Ownership

2.1 Introduction

This chapter examines how the owners of small rental properties set rents and the role that technology plays in that decision. Rents have been extensively studied for decades, but there is relatively little work that examines the process that specific owners go through to set rents for specific units. Most scholarship treats owners as setting rents mostly or entirely based on the "market" for their units. The exact nature of the "market" may be complicated, but, unless owners have a monopoly on rental units, owners themselves are usually theorized as simply reflecting the market when they set rents. There are a number of reasons to doubt that this framework applies to the owners of small rental properties.

Small rental property ownership is extremely fragmented and dominated by non-professionals who may set rents below market rate either knowingly or un-knowingly. About half of all rental units in the US are in small rental properties and most of these are held by owners with one or two units. These owners are rarely real estate professionals and may have limited knowledge of the market for their units. Even if they do understand the market, they may not see it as worth their time to maximize the profit of their units.

Technology is making market information more accessible and making investment in small rentals easier, potentially shifting rent-setting behaviors across the US. Sites like Zillow and Craigslist make it easy to find up-to-date comparables for even idiosyncratic rentals in thin markets. Sites like Roofstock make it easy for individuals to buy and sell small rental properties as though they were equities in an investment portfolio. It is possible that the ownership of small rental properties is professionalizing in a way that affects how owners set rents. Collectively this has implications for the affordability of housing across the US.

Millions of families face severe housing affordability problems, often paying half of their income or more for shelter. The traditional public-sector programs to address this problem, such as project- and tenant-based subsidies, help many families but would need to be funded at far greater levels to help

all those in need. Low-cost and below-market rate housing that is unsubsidized is another existing resource that helps families deal with housing costs. Scholars and policymakers have noted that "naturally-occurring affordable housing" is likely quite common, particularly among small rental properties (1-4 unit properties, or "SRPs"), but the size of this stock of housing, the existence and depth of the private discounts, and the reasons for any discounts are unclear. This chapter provides insight into how often SRP owners set rents below market, how big the discounts are, and why owners provide discounts.

I answer these questions by surveying the owners of SRPs in the top 149 US metros. The survey collected data on (among other topics) the owner's property, their tenants, the rent, the owner themselves, and whether the owner had decided to set rents below market levels. Approximately 950 owners responded to the survey. I also conducted follow-up interviews on rent-setting practices with 161 of the respondents.

I find that many owners knowingly set rents below market, often substantially so. About 45% of owners reported setting rents more than $50 per month below market levels. Among this group, discounts in excess of $200 a month were typical. This behavior is partially the result of many owners providing a discount to long-term tenants. A substantial portion of owners, however, set rents below market even for new tenants. These discounts arise for a range of reasons: some economic, some social, and some having to do with the owner's knowledge of the market.

I add to the literature on how the individual owners and managers of rental properties make decisions that, collectively, have a substantial public impact. I provide a nationwide look at a hard-to-reach group of rental property owners and find many substantial differences among owners in rent-setting practices. I provide a nuanced look at what specific owner characteristics are associated with specific rent-setting behaviors.

Below-market rate housing can be an important resource for local governments as they strategize about how to address housing affordability. SRPs have always been present in every metro area in the US and, while some have been the site of exploitation, they have also provided millions of low- and moderate-income families with stable, safe, and affordable homes. The public sector has an important role in this stock, as state and local regulations of all kinds can pose greater challenges to small-scale owners relative to large-

scale ones and tax programs tend to favor owner-occupied small properties even when owner-occupants are generally higher-income than SRP tenants. Planners should be aware of the complexity and potential benefits of this diverse stock of naturally-occurring affordable housing and should consider it when crafting housing, building, and tax policies.

2.2 Literature Review

Rental affordability is a severe problem across the US. Cities and states have responded to the crisis with various measures but even municipalities that have generated large numbers of affordable units, such as Montgomery County, MD and New York, NY have persistent affordability problems (Schuetz, Meltzer, & Been, 2009; Schwartz, 1999). Most LMI renters live in units that are not subsidized or income restricted, often in small rental properties of 1-4 units that are almost never subsidized (except when the tenant is a voucher-holder) and are normally exempt from policies like rent control. According to the 2017 American Housing Survey (AHS) approximately 60% of the three million unsubsidized poor renter families with children in the US live in SRPs. Some low cost SRPs, particularly in weak markets, are low cost because because they are owned by exploitative investors (Desmond, 2016; Mallach, 2010). However detailed case studies of SRPs have found that some owners of desirable SRPs nevertheless charge below-market rents, effectively providing a discount to their tenants (Gilderbloom, 1985; Krohn, Fleming, & Manzer, 1977; Sternlieb, 1966).

The different rent-setting practices of SRP owners are not precisely known, but the diversity of these owners suggests that they might set rents in very different ways.[1] Unlike the owners and managers of large apartment complexes, which are highly professionalized, SRP ownership is fragmented and is dominated by individuals with small portfolios. Mallach (2007) noted that in

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[1]The one part of the stock where unsubsidized below-market rents have been documented are units in 2-4 unit buildings where the owner of the property lives in the building (Ellen, Been, & Gross, 2013; Krohn et al., 1977; Noland, 1979). This part of the stock is important and, particularly in many northeastern cities, substantial. The experience of these landlords is, however, categorically different from non-resident landlords. A resident landlord's rental property is also that landlord's home. A resident landlord's tenants are, in many ways, that landlord's housemates. Almost no resident landlords were included in my survey so this part of the housing stock will not be considered in this chapter.

the mid 1990s about one out of every thirty US households owned at least one SRP, and this statistic has not dramatically changed since then (Strochak, 2017). It's also clear that two specific rent-setting practices, tenure discounts and rent stickiness, are more pronounced in SRPs relative to larger rental properties. It has long been apparent that tenure discounts are common in rental housing and SRP tenants tend to stay in their units longer than many multifamily tenants (Deng, Gabriel, & Nothaft, 2003). Tenure discounts refer to the phenomenon of long-term tenants paying substantially less than current asking rents for similar units in the same neighborhood. This may be related to the more recent discovery that rents are also "sticky" or "rigid," meaning that a substantial portion of rental units have no change in rent year over year. This rent-setting behavior is seen much more frequently among SRPs (Genesove, 2003). Lastly, there are a number of empirical and theoretical studies that suggest that some owners, particularly small-portfolio owners, may set rents below market levels regardless of their tenant's duration of residence.

That long-term renters pay less than new tenants for comparable units is well established. The reasons for this difference are debated. One of the first empirical studies that revealed this discount was Noland (1979), who found a reduction of about 3% per year for the first 3.5 years, then no significant discount in the subsequent years. Later studies consistently found tenure discounts with levels ranging from 3% to 10% per year with the largest discounts happening in the years shortly after the first year (Clark & Heskin, 1982; Goodman & Kawai, 1985; Guasch & Marshall, 1987; Malpezzi, Ozanne, & Thibodeau, 1980). Marshall & Guasch (1983) divided the tenure discount into two components: a "sit" discount that occurred at the first lease renewal (usually the first year but sometimes the second) and an additional, smaller discount in later years.

While none of these studies pinpointed the reasons for this discount, scholars noted a number of probable causes. Reductions in costs were often cited. Turnover usually incurs cleaning, painting, and advertising costs and discounts could also be used to retain tenants, thus avoiding turnover. Downs (1983) identified turnover costs as a principal reason to expect a rent discount among SRP owners, writing that "most small-scale landlords [are] *turnover minimizers* rather than *rent maximizers*" (emphasis original) (Downs, 1983, p. 35). Turnover can also result in lost income from vacancy, particularly if demand is weak when the tenant vacates the unit.

The fear of costly tenants could be a powerful motivator (Goodman & Kawai, 1985; Hubert, 1995; Miron, 1990). Tenants can easily generate costs to the landlord beyond what landlords can recoup through a security deposit, but after the first or second year landlords might have a good sense of whether their tenant was "costly," and could provide a discount to those were not. From this vantage a "tenure discount" might be a misnomer for a "risk premium" levied on all new tenants until they prove themselves to be low-cost. Larsen and Sommervoll's (2009) finding that that small-scale landlords and personal connections between the landlords and their tenants were correlated with lower rents supports this theory. They suspected that small portfolio landlords had better tenant screening and therefore a better assessment of the costliness of their tenants.

Tenure discounts are challenging to study because a tenant's duration of residence is related to rent changes over time. Marshall & Guasch (1983) argued that tenure discounts may simply be the result, not of any "discount" provided by an owner, but of random variations in rent-setting. In this theory landlords guess at rent increases, with some guessing over and some under market levels. The under-guessers will disproportionately keep their tenants, the over-guessers will lose them. Thus a snapshot of tenants will show a "tenure discount" even if landlords aren't trying to provide a discount. Guasch & Marshall (1987) showed that tenure discounts are statistically insignificant when tenant mobility is modeled as endogenous. They were careful to note, though, that their findings didn't show that landlords definitively did not provide discounts, and made it clear that they might expect tenure discounts among small portfolio owners because of aversion to vacancy and turnover.

Later research discovered a probable mechanism for at least a part of the tenure discount: rent stickiness. Panel data on rents from the American Housing Survey (AHS) show that a quarter to a third of rental units in the US see no change in rent over a given 2-year period (Genesove, 2003). Stickiness was even commonly observed upon turnover, where new tenants paid the same rent as the prior tenants. While the level of stickiness is related to the conditions of the local markets, it is more powerfully correlated with property type with very high levels of "stickiness" among SRPs (Verbrugge & Gallin, 2017).

The precise reasons for this behavior were unclear. Genesove (2003) sug-

gested that landlords used this strategy to reduce costs, particularly the costs of figuring out what the market rent for their unit was, the lost time spent re-negotiating rent, and the "emotional stress" of that re-negotiation. He proposed that the difference by structure type might arise because SRP owners tended to have small portfolios and might have more direct interaction with their tenants. If a "personal relationship . . . has developed . . . the issue of fairness comes to the fore" when setting rents (Genesove, 2003). Verbrugge & Gallin (2017), examining similar data at later periods, suggest that differences in rent stickiness by property type were a manifestation of differences in investor sensitivity to turnover. The costs and lost income of turnover are more substantial for small portfolio holders, thus small-scale landlords (as nearly all SRP owners are) might provide discounts to tenants even if there was only a small chance that tenant would have moved.

Studies on tenure discounts and rent rigidity provide reasons to expect below-market rents for tenants who have been in their unit for over a year, but there are also reasons landlords would choose to set rents low when marketing a vacant unit. Landlords face a trade-off between marketing a relatively high asking rent, which can bring in more revenue over a long time-span, and offering a relatively low asking rent, which could allow for the unit to be rented more quickly, limiting vacancy losses (Allen, Rutherford, & Thomson, 2009). The average SRP owner has a 1- or 2-unit portfolio, so a vacancy represents the loss of 50% or 100% of their rental income in a given month. This means that upon vacancy the property immediately becomes cash flow negative, and this loss is felt particularly quickly and severely if the property is mortgaged.

SRP owners are very different from the owners and managers of multifamily properties and these differences may result in a greater willingness to accept below-market rents. Many of studies have used mathematical models to show why profit-maximizing owners would accept or even offer rent discounts (Goodman & Kawai, 1985; Hubert, 1995; Miceli & Sirmans, 1999; Miron, 1990), but very large numbers of SRP owners do not appear to act in a profit-maximizing way. A number of in-depth studies of SRP owners in diverse locations and time periods have found that many SRPs were held by owners who did not purchase their unit to be a rental (Savage, 1998; Stegman & Sumka, 1976; Sternlieb, 1966). The Property Owners and Managers Survey, a large survey of rental property owners conducted by the Census Bureau in the mid-1990s, revealed that a substantial portion of all SRPs were held

by these owners-by-accident, with 10% of SRP units owned by someone who had inherited the property and an additional 24% reporting that the initially purchased their rental property to be their own home. 15% of SRPs properties were owned by people who "didn't know or weren't sure" whether their property made a profit or broke even in the prior year. These findings suggest that large numbers of SRP owners are non-professional and may not have the maximization of profits as the primary goal for their properties.

Owners may set rent below market levels for a variety of non-economic reasons. Krohn et al. (1977) found that some amateur landlords that lived in very close proximity with their tenants had numerous non-economic interactions that affected rent-setting. For example a current tenant might help the landlord find a new tenant for a vacant unit and the landlord might factor this action in their decision whether or not to raise the tenant's rent months later. The authors concluded that this system amounted to "private subsidies" from landlords to tenants that made the low rents for these units possible. While this may partially be the due to the particulars of Krohn et al. (1977)'s study site (close-knit ethnic neighborhoods in the relatively weak market of Montreal in the 1970s) interviews with small SRP landlords from other scholars show that some owners set rents below market out of concern for their tenants (Ellen et al., 2013; Gilderbloom, 1985; Mallach, 2007). Information barriers also might also provide a reason why SRP owners may sets rents below market for new tenants. Gilderbloom & Appelbaum (1988) found that metros with high levels of SRPs tended to have lower rents than metros dominated by multifamily rentals. Their explanation, based on interviews with landlords, was that the owners of multifamily properties generally based their rents on market studies, while the amateur owners had neither the time nor expertise to find comparable units in the market and furthermore had no ability to "test" the market by asking higher rents, as they marketed units very infrequently.

This existing scholarship allows us to pose and hypothesize answers to two questions. First, to what extent are the owners of SRPs knowingly setting rents below market rate? While it is clear that low rent levels are common among SRPs the extent to which this is the result of below-market rent setting, the tenure discount, or because the units are low-quality is unknown. It is likely that some owners provide tenure discounts, while some do not, and that some owners provide a discount regardless of how long a tenant has lived in the unit. The depth of discounts is also unclear.

Second, if owners are setting rents below market, why are they doing so and is this correlated with any observable owner characteristics? Specifically, the literature suggests that having a small portfolio, having a personal connection to tenants, and being poorly informed about the market will make owners more likely to set rents below market. It also suggests that discounts may take multiple forms. A "risk premium" discount might explain low rents to tenants who are known to the owner before they move in, or to tenants who have been in a unit for a year or more. Additional discounts might come from altruism or simply benign neglect from owners who have little interest in the cash flow from their rentals and/or do not have much knowledge of their rental market.

2.3   Data: An original survey and follow-up interviews

I answer these questions with data collected through an original survey of the owners of small rental properties, which I conducted. The sample frame consists of the private owners of 1-4 unit rental properties in the top 149 metros of the US. The sample was created in collaboration with Roofstock, Inc., a firm that provides services to small rental property investors, and uses county assessors and recorders data provided by ATTOM. Roofstock performed extensive owner identity resolution on the ATTOM data to clarify portfolios of small rental properties. These estimates of owner portfolio size allowed for a stratification of sample by portfolio size and ensured that owners were not solicited multiple times.

The sampling data provide a detailed picture of SRP ownership in the US, though it excludes 2-4 rental properties with resident landlords. The source ATTOM data contained standardized information on the type (e.g. residential, commercial) and size (unit count) of all properties in the US. Tenure was imputed by comparing the address of the owner to the address of the property itself. Roofstock's identity resolution algorithm uses a range of fields provided in the ATTOM data to identify instances where owners, while not having exactly the same name, are likely to be the same person or legal entity. This process returns estimated portfolios from the fog of mis-spellings, alternative spellings, omissions, and anonymous corporate entities that obscure true patterns of ownership. The results are not perfect (the standard deviation of difference between the portfolio size of owners reported by Roofstock relative to the portfolio reported by the owner through my survey was 31

units), but is a major improvement over the raw ATTOM data. The identification method excluded resident landlords (situations where a property owner lives in one of the units of a 2-4 unit property), and reproduces any mistakes in the source data.[2]

The sample was stratified by portfolio size to (i) achieve an adequate number of responses from larger portfolio owners and (ii) achieve an adequate number of responses overall. Sampling posed challenges for both very small and large portfolio owners. Larger portfolio owners are relatively rare in the context of the SRP stock overall, so a representative sample would have provided very few responses from owners with portfolios of more than 10 units Because the survey is meant, in part, to test theories about the importance of "professionalism" between owners, I chose to over-sample large portfolio owners. Very small portfolio owners posed an identification challenge. There was no practical way to distinguish between rental properties and second homes or situations where home buyers had moved to a new home before selling their old home. Thus the quality of the sampling data, and therefore the likely response rate, for very small portfolio owners was low. To increase the overall response rate I chose to under-sample 1- and 2-unit portfolio owners. Table 2 shows the stratification of the owners who were solicited for the survey.

Table 2: Stratified Survey Sample

Owner Portfolio Size	Number	Percent
1 unit	13,330	25.1
2 units	965	1.82
3-50 units	33,657	63.5
>50 units	5,051	9.53

The survey was solicited by mail and conducted online from March to August 2019. Table 3 shows the response performance of the survey. A total of 53,000 owners were solicited for the survey. Solicitations consisted of an initial invitation to the online survey via postcard and two rounds of follow-

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[2]That mistakes are relatively common is assessor's data is known (see, for example Landis, Hood, Li, Rogers, & Warren (2006) and Krause & Lipscomb (2016)). The patterns of these mistakes are not well known.

up reminders, also via postcard. The survey consisted of approximately 150 questions covering topics including the characteristics of the rental property, tenants, owner characteristics, and decision-making processes for rent-setting. 1,949 solicitations were found to be undeliverable. 155 owners logged into the survey but were found to not be part of the sample frame (e.g. the respondent had recently sold their rental property or the property was never a rental). Of the 50,896 remaining solicited owners, 1,109 began the survey with 695 clicking through the entire survey and the remaining 259 ending the survey prematurely. Not all respondents who clicked through the entire survey answered all applicable questions. The final response rate, including partial responses, was 1.8%. Collectively, respondents owned 17,037 units.

Table 3: Survey Performance

Results	Number	Percent
Total Sample	53,000	100
Bad Addresses	1,949	3.7
-		
Survey Starts	1,109	2.1
Out of Population	155	0.3
Partial Responses	259	0.5
Click Throughs	695	1.3
-		
Click Throughs + Partial	954	1.8

In addition to the survey I conducted 161 interviews to develop a more detailed understanding of SRP owners. Interviews were solicited at the conclusion of the online survey and conducted via phone. Interviews generally lasted from thirty minutes to an hour and covered basic information such as the owners' portfolio size, the markets they operated in, and their properties and tenants, and more detailed discussions of their acquisition, financing, rent-setting, maintenance, and tenant selection strategies, and their tenant screening procedures.

2.3.1 Generalizability: Sampling and non-response bias

The responses to the survey provide data from a diverse set of owners holding diverse properties. When considered by portfolio size, the region of the country their properties are in, the type of property, and the type of legal entity that holds the property, there are no major kinds of owners that are missing from the respondents collectively, relative to the sample frame of the owners of SRPs in the top 149 metros. Nevertheless the respondents do not perfectly reflect the sample frame population. This is largely due to my stratified sampling strategy. While some of the ways in which the survey respondents differ from the full population are unknowable, others can be approximated using a few different data sources.

There are very few data sources about the owners of SRPs. The most natural unit of analysis for detecting bias is the *owners* of SRPs in the top 149 metro areas. Analysis of assessors and recorders' records provides some insight on owners (and is the derivation of the portfolio size stratification) and the Census Bureau's Rental Housing Finance Survey (RHFS) is fielded to the owners of rental properties. But the information that can be gleaned from assessors and recorder's records is limited both because of reporting inconsistencies (Krause & Lipscomb, 2016) and the widespread use of LLCs (Travis, 2019). Roofstock provided me with the sample, including portfolio estimates, and a national estimate of the distribution of SRP units and properties by portfolio size. However these data are proprietary and Roofstock also acknowledged the poor data quality of small portfolio owners. While the RHFS is filled out by owners, it asks very few questions about the owners themselves, being mostly focused on the finances of specific properties.

Nevertheless there are a few data sources that can provide some perspective on possible sampling and non-response bias in the survey using the housing unit as the unit of analysis. Sampling bias refers to the differences in the group characteristics of the 53,000 owners who were sent solicitation postcards relative to the sample frame: the entire population of the owners of SRPs in large metros. Non-response bias refers to the differences in the group characteristics of the 954 owners who responded to the survey relative to the entire population of owners of SRPs in large metros. The very low response rate could potentially make the non-response bias look different from the sampling bias. I analyze differences between my survey and the sample frame by (i) portfolio size, (ii) property type, (iii) corporate entity, and

(iv) geography. (Property type refers to the distribution of all SRP units in large metros by the kind of property, e.g. single-family homes, 2-4 unit homes, condos, etc..) The unit of analysis for all comparisons is, by necessity, housing units. These data are from Investability, American Housing Survey (AHS), the RHFS, and the American Community Survey (ACS). For instances where comparisons between some national baseline and the survey are close I conduct a 2-proportion z-test to see if the difference in ratios is statistically significant.

2.3.1.1 Portfolio Size

Figure 2 shows the distribution of SRP units by the portfolio size of their owner nationally, relative to the distribution of units that were solicited, and the units where the owner returned a survey. Relative to the national distribution of SRP units, units held by owners with more than 10 properties were heavily over-sampled, while 1-unit portfolio owners were under-sampled.[3] Response rates differed by portfolio size. As expected the smallest owners had lower response rates, further contributing to the final under-sampling of this group. The largest portfolio owners (those with more than 50 units) also had relatively low response rates. No institutional owners responded. The largest portfolio respondent had 465 units. Thus the final survey data are heavily skewed to large portfolio owners (though not the largest) relative to the national distribution. Nevertheless 97 respondents had 1-unit portfolios and 53 had 2-unit portfolios.

2.3.1.2 Property Type

Figure 3 shows the distribution of SRP units by property type nationally relative to the distribution among survey respondents. My survey over-

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[3]The national data presented in this chart show the distribution only of 1-unit rental properties, not all SRPs. These are the best available public data. Roofstock has analyzed the distribution of SRPs by portfolio size and my survey sample is stratified based on those data. Unfortunately those data are not public. The Census's Property Owners and Managers Survey (POMS) does provide a national distribution of SRPs, but these data are from 1995/6. Both Strochak (2017) and Freddie Mac (2018) provide summaries of the distribution of 1-unit rental properties based on data from Investability and HouseCanary, respectively. These data roughly match each other, showing that about 88% of 1-unit buildings are held by owners with less than 10 properties. The Investability data from Strochak (2017) are shown here.
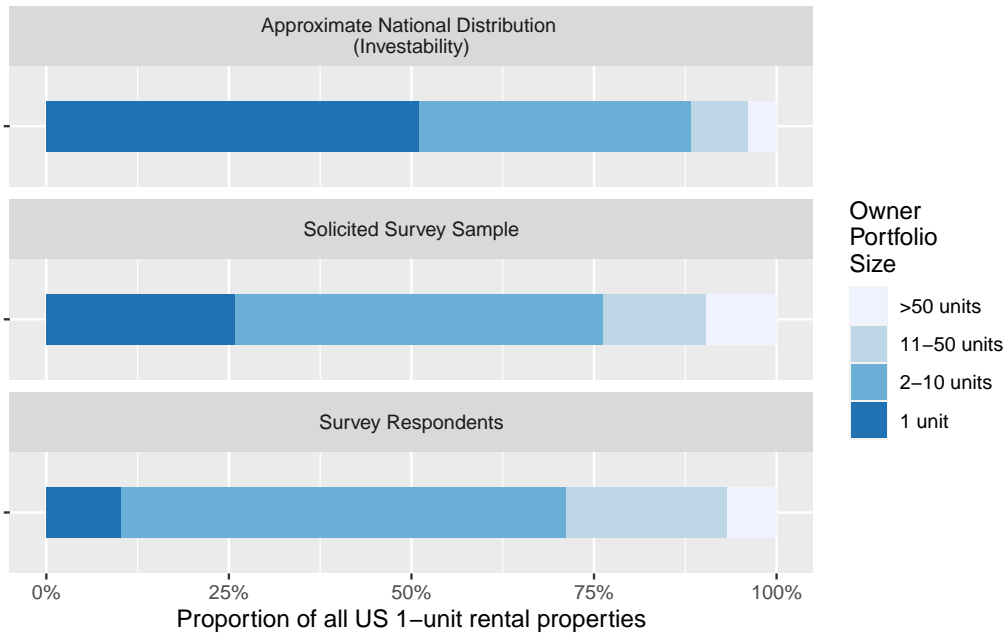
Figure 2: SRP Units by Portfolio Size of Owner
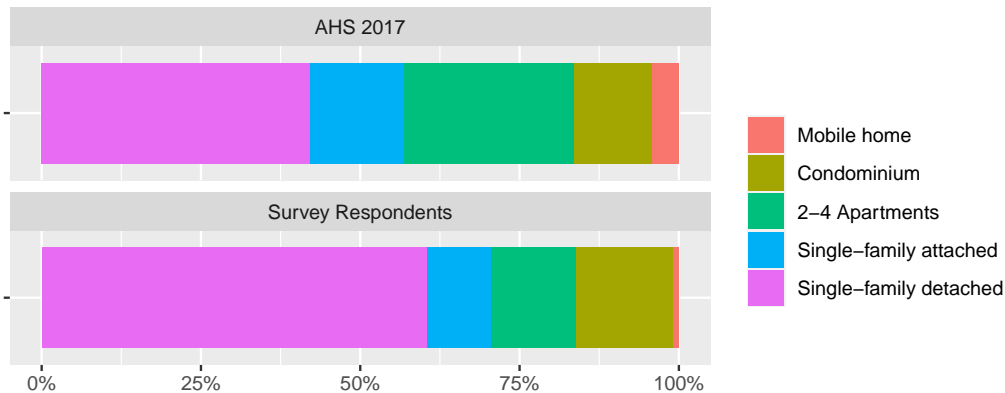
Figure 3: Distribution of SRP units by Property Type: Nation Relative to Survey Respondents

represents single-family detached rentals substantially, mostly at the expense of 2-4 unit rentals.[4] Condominium units, mobile home rentals, and attached single-family homes are all nearly proportionally represented among respondents, only differing from the national proportions by a few percentage points. (While slight, all of these differences are significant at the 5% level, except for the condominium units for which there is no significant difference between the national distribution and the survey distribution) The difference between the respondent distribution and the national distribution by property type may be driven in part by the exclusion of SRPs with resident landlords. According to the 2017 AHS 15% of the units in metro 2-4 unit buildings have a resident landlord.

2.3.1.3 Legal Structure

My survey under-represents individual owners relative to corporate owners.

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[4]The American Community Survey doesn't ask survey-takers whether their unit is a condominium. The American Housing Survey public-use data doesn't distinguish between the top 149 metros and other metropolitan areas. This particular analysis of bias nevertheless uses the AHS data for all SRPs in all metropolitan (excluding micropolitan) areas in the US. The top 149 metros house about 85% of the total population of all the metro areas in the US, so the distribution of SRPs by property type for the top 149 metros probably isn't substantially different from the distribution of SRPs in all 389 metropolitan areas.

The Survey Over–Sampled Corporate Owners
Relative to Individual Owners
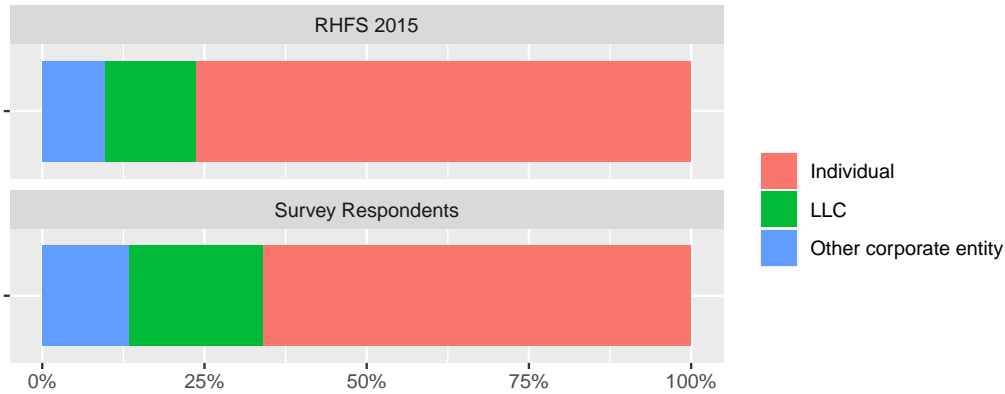
Figure 4: Distribution of SRP units by Owner Type: Nation Relative to Survey Respondents

As shown in figure 4, approximately 75% of SRPs nationally are owned by individuals (as opposed to an LLC or some other type of corporate entity) whereas only about 66% of the units in my survey are owned by individuals.[5] This difference is likely driven by the over-sampling of large portfolio owners, who are more likely to hold their properties in a legal entity separate from themselves. The difference in distributions for all categories is statistically significant at the 5% level.

2.3.1.4 Geography

The survey captured nearly all of the 149 metros sampled. The survey was designed to capture SRPs that are in the top 149 metro areas by population, thus providing a national picture of metropolitan SRP ownership.[6] Owners of properties in 149 metros were solicited. Owners with properties in 144 metros responded. Figure 5 shows the distribution of respondents by metro.

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[5]The Rental Housing Finance Survey (RHFS) provides the legal entity of the owner, but whether a surveyed unit is a condominium is not provided in the public use data.

[6]Roofstock's data didn't have a reliable metro area field so the sample was made by filtering rental properties by their zip code. Because zip codes do not share the same boundaries as metros or counties it is possible that some properties lie slightly outside of the OMB-defined metro areas.

Respondents held Properties in 144 Metro Areas

Counts of Survey Respondents by Metro
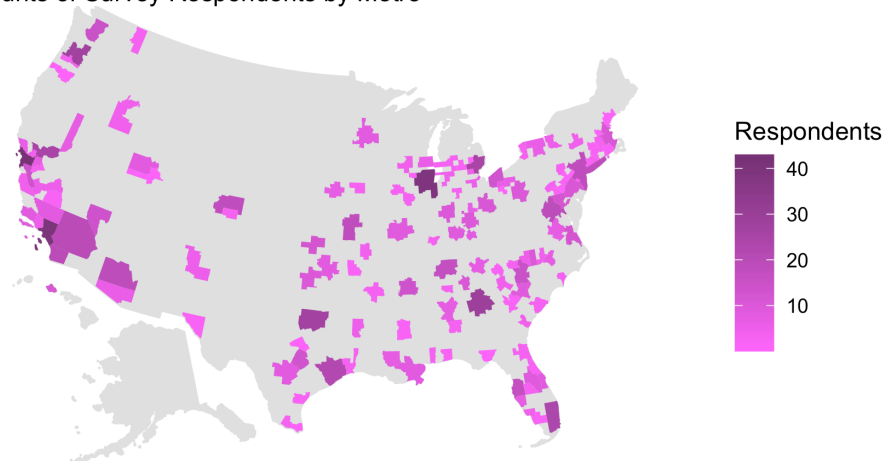
Figure 5: Counts of Survey Respondents by Metro

Metros in Puerto Rico and other US territories were not included in the sample.

To check if the distribution of SRP units across the sample frame and across respondents matches the real distribution of SRP units across metro areas I use SRP counts from the 2017 5-year ACS by metro.[7] These counts do not include rented condominiums (the AHS does provide this field but only provides metro-level data for 15 metro areas). I use the ACS SRP counts to calculate the distribution of metro SRP units by metro across the US. For example the Los Angeles metro area had about 5.9% of all large metro SRP units, while Louisville metro had 0.6%. I perform the same calculations with the distribution of SRP units in the sample and among respondents, then compare these two distributions with the ACS sample frame distribution. Figures 6 and 7 show the results. The colors show the metro-level differences between two distributions with orange showing an over-sampling, blue an under-sampling, and green a distribution that is close to the ACS national

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[7]It would be preferable to examine the distribution of the *owners* of the SRPs in each metro, but this information is unavailable. By using SRP unit counts as the baseline and comparing these counts to numbers of owners solicited and respondents, I implicitly assume that all metro areas have roughly the same distribution of owners by portfolio size. This assumption may or may not be correct.

The Solicited Sample was Close to National Distribution,
Except for LA and NYC

MSA-level differences between SRPs in Sample Frame Relative to National Distribution

Figure 6: MSA-level differences between SRP units in the sample frame relative to the sample

distribution.

The solicited sample matched the sample frame distribution well, with three exceptions. Regionally, the distribution of solicited SRP owners matched the distribution of SRP properties fairly well. At the metro level, the distributions were also quite similar, though the Los Angeles metro is slightly under-sampled and the Miami metro is slightly over-sampled. The outlier is the New York City metro. 7.8% of metro SRP units were in the New York metro, while only 3.6% of solicited owners were in the NYC metro. The reasons for the under-sampling of the New York metro are unclear. The exclusion of SRPs with resident landlords undoubtedly contributes to the difference (12.3% of SRP units in the New York metro have a resident landlord), but does not fully explain it. It is possible that SRP owners in the New York metro have large portfolios relative to other metros, which could explain the apparent under-sample.

Differences in response rates resulted in a distribution of survey respondents that is mostly close to the national distribution, but slightly over-samples some West Coast metros and severely under-samples the New York Metro. The solicited owners in west coast metros like San Francisco, Sacramento and Portland responded at a relatively high rate, resulting in the over-sampling

Survey Respondent Distribution is Close to National Distribution,
Except for some West Coast metros and NYC

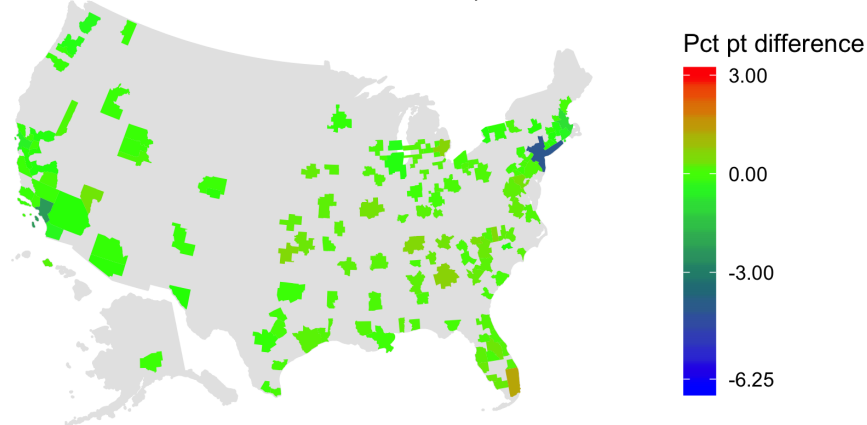MSA-level differences between SRPs in Sample Frame Relative to National Distribution
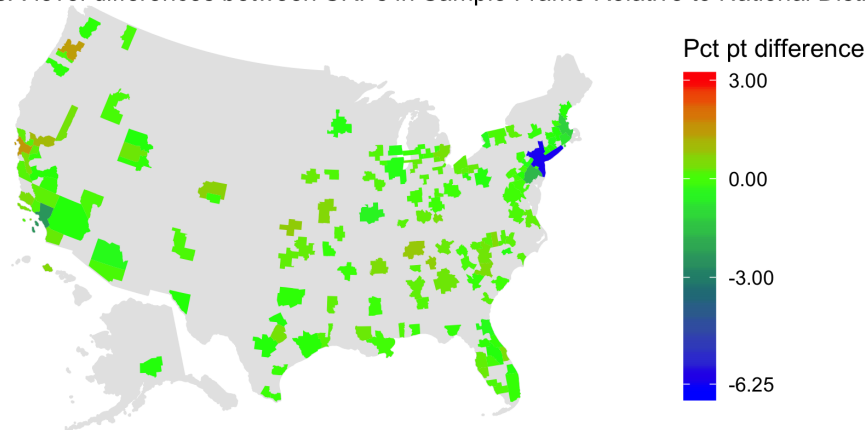
Figure 7: MSA-level differences between the distribution of respondents'
units relative to the sample frame

of these metros by about 1 percentage point each. The Los Angeles metro,
conversely, is under-sampled by 2.4 percentage points. The big outlier is,
once again, New York. While 7.8% of metro SRP units were in the New
York metro, only 1.6% of respondents were. The reasons for the metro-level
variation in response rates is unknown, but could be driven by language
differences. The survey solicitation was only in English, as was the online
survey.

While some bias is in the survey is clear (and by design) other biases may be
present but hidden. The survey sample was stratified and was not meant to
reflect the national distribution of owners by portfolio size. This bias likely
drives the observed bias by owner legal entity. The sampling strategy, for
unclear reasons, caused a bias toward single-family detached homes relative
to 2-4s and severely under-samples the New York metro. Differences in re-
sponse rates exacerbated the under-sampling of New York and also resulted
in a slight over-sampling of a few west coast metros. Beyond this it is difficult
to discern other biases in the survey. It is possible that anything from owner
demographics to local market conditions may have affected response rates,
but national owner demographics are not known and the relationship between
owner portfolio size and markets conditions would cloud any estimation of

bias by market.

The known sources of bias in the survey either do not have a substantial impact on generalizability or can be controlled for. The survey was meant to provide a picture of large metro SRPs nationally, so relatively slight under- and over-sampling by metro area isn't a major concern. In my analysis of rent-setting I attempt to control for the most importance source of bias: portfolio size.

2.4   Methods

Whether owners knowingly set rents below market levels was a question on the survey and the factors considered when setting rents were also probed in the survey and follow-up interviews. The survey asked if a unit was "At or very close (within \$50 per month) to the market rate for similar units," "Below the market rate for similar units," or "Don't know." The survey also asked owners "What are the most important factors considered when setting rents at your property" and allowed them to choose up to four factors. Many other owner characteristics were asked about in the survey, including portfolio size. In follow-up interviews I asked owners about their rent-setting strategy (i) when they were bringing a unit to market for the first time or after a turnover and (ii) when setting rents for continuing tenants.

In addition to asking whether an owner sets rents below market, I also estimate the approximate amount reported rents are below market. To do so I compare rents as reported in the survey to median rents per square foot of units of the same property type (single-family rental), in the same month, and in the same ZIP code using the Zillow Rent Index (ZRI). ZRIs provide monthly snapshots of rental markets at various levels of geography in the US (Bun, 2012). ZRI data provide a more timely source of market rents than other commonly used data sources, such as the ACS (Anenberg & Kung, 2018; Coles, Egesdal, Ellen, Li, & Sundararajan, 2017). For this analysis I remove outliers with rents below the 3rd percentile and above the 97th percentile relative to the ZRI predicted rents.

I also examine the pattern of BMR rent-setting by the tenant's duration of residence by cross-tabulating the prevalence of below-market rent setting and the extent of discounts by the tenant's duration of tenure. Scholarly literature is unanimous that longer-term term tenants tend to pay lower

rents. I examine the data to see how much of below-market rent setting appears to be the result of tenure discounts. I also examine the pattern of tenure discounts over various residence durations to see if there is evidence of a "sit" discount separate from an annual discount.

Descriptive statistics from the survey and interview analysis provide some sense of the prevalence of below-market rent setting and the depth of the discounts. The tenure discount literature has by no means showed that rental property owners regularly and purposefully set rents below market for continuing tenants, so substantial numbers of owners reporting that they do, in fact, knowingly provide discounts is noteworthy. The studies that have shown below-market rate rent setting in SRPs have been based on interviews of a dozen landlords or less (Ellen et al., 2013; Gilderbloom, 1985; Mallach, 2007) or have been focused on cases who particulars limit generalizability to all SRPs in the US (Krohn et al., 1977).

Nevertheless additional analysis is necessary to understand how the prevalence of below market-rate rent setting among the survey and interview samples reflects the prevalence of this practice among US SRP owners in general. As noted above the survey sample does not reflect the distribution of SRP owners by portfolio size, nor was it meant to. Understanding the differences between owners who choose to set rents below market and those who do not will provide a much better sense of the prevalence of this practice than descriptive statistics from the survey.

I examine the correlation between owner characteristics and rent setting by analyzing interviews and using multiple regression analysis. I coded and analyzed interviews with particular emphasis on the rationales owners provided for setting rents below market. I also create multiple regression models to model two dependent variables. I create a linear probability ordinary least squares and a logit model to estimate the likelihood that an owner chooses to set rent below market levels. I also create an ordinary least squares model predicting the log difference between the reported rent for a unit and the ZRI market rent for the unit. (The log difference is equivalent to the log of the ratio of the reported rent to the ZRI estimated market rent.)

2.4.1 Conceptual Framework for Regression Models and Variable Selection

Existing scholarship has identified three general reasons why owners may knowingly set rents below market. There are economic reasons, as setting rents low allows owners to avoid costs, particularly costs associated with turnover. Ethical or social reasons also affect rent setting, as owners have reported considering the ability-to-pay of the tenant and/or feeling that there are moral reasons to set rents below market. Lastly, there are knowledge or information reasons, as owners may wish to have rents at market, but may not know how to properly assess the market, or may be unable to gain the knowledge necessary to understand what the market rate for their unit is.

Tenants, markets, public policies, and the characteristics of the properties and units themselves also likely have an impact on rent-setting. The amount of time that a tenant has been in the unit is clearly correlated with the rent of the unit relative to market, though as discussed above, this is not necessarily the result of the owner consciously setting rents below market. Another tenant factor identified by the literature is the perceived or real "costliness" of a tenant vis-á-vis the owner. Market factors, while not discussed in the literature, also likely affect rent-setting decisions. Market conditions such as a stagnant or weakening rent market, or markets where owning is affordable relative to renting, might make some owners more likely to provide rent discounts to tenants, particularly for owners who are averse to turnover. State and local policies like rent control and differences in tenant protection laws would likely have an impact on rent-setting decisions. It is also possible that characteristics of the property itself (such as the age of the unit or when it last had a capital improvement) put the property into some kind of sub-market that is not accounted for by the ZRI.

Multiple regression models can reveal the generalized influence of specific variables on rent-setting, but the influence of owners and tenants pose a modeling challenge. Factors such as tenant protection laws, market conditions, and property characteristics can all be incorporated into multiple regression models with relative ease. They are exogenous to the owner's rent-setting and can be measured accurately. An owner's economic vision for their rental, their knowledge of the market, and their ethical or social considerations when setting rent are hard to measure. Furthermore owners are not randomly distributed. Some owners choose specific market types in which

they purchase properties while many owners have no choice in the market type of their unit, having inherited their property from a relative or continue to hold it because they cannot sell it. And, as described above, the duration of tenure for tenants is at least somewhat endogenous, as it is related to an owner's past rent-setting and their tenant selection practices. It is likely that some tenants choose to stay in their unit because they recognize that their rent is relatively low, while some tenants stay in their unit regardless of whether their rent is below market or not. To deal with the tenure duration I'll examine the model for signs of endogeneity and examine whether the impact of various factors changes when controlling for, or not controlling for the duration of tenure. To deal with owner characteristics I'll use a wide range of owner variables and control for markets as best as possible.

I run a series of variable selection analyses to determine which owner variables to include in the models. Variable selection to specify the influence of tenant, market, and the property on rent-setting is relatively straightforward. While some important factors, such as whether tenants have children, are unknown, duration of tenure is known, as are many details about the property. The location of the rental units is known and market information is relatively easy to find. The important factors about owners themselves, however, are the extent to which economic, informational, and/or social considerations affect their rent-setting decisions. The survey asked dozens of questions about the owner, many of which were meant to clarify the process by which they set rents. The literature on rent-setting in SRPs is very thin, providing little insight into what owner characteristics matter, and the sample size is not large enough to add all of the questions to the model. I begin variable selection with a very long list of variables that may impact an owner's rent-setting decision. Using univariate analysis and random forest models I select a few variables that appear to matter. These variables are then used in the multivariate models.

2.5 Results

2.5.1 Prevalence and Patterns of Below-Market Rate Rent Setting in Survey Sample

44% of survey respondents knowingly set rents for their units below market rate relative to 47% who reported that their rents were approximately at
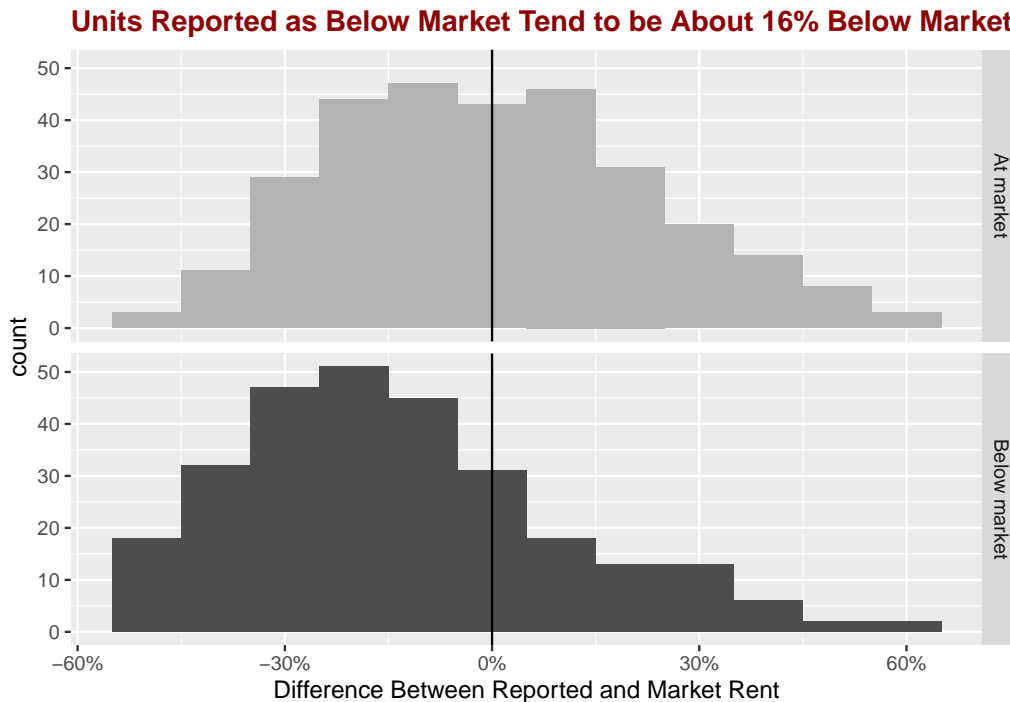
Figure 8: Distribution of Rents Relative to Market

market rate. This can be considered as an approximately even split between market-rate and below-market-rate rent setting among the sample group, as the difference between these proportions is not statistically significant. (10% of respondents reported not knowing whether their unit was at or below market.) Survey respondents who reported setting rents below market often set rents well below market. While the median unit reported at market rate was $4 from the rent predicted by the ZRI, the median below-market unit was $240 per month below the ZRI estimate. Considered as a percent reduction from market, the median below-market unit was 16% below the ZRI rent. Figure 8 shows the histograms of the distribution of reported rents relative to the ZRI comparable for owners who reported setting rent at market rate and those who reported setting rent $50 or more below market.

Figure 9 shows the proportion of units reported as below market rate by the duration of the current tenant's residence. Landlords reported setting rent below market more often for longer-term tenants. However it appears that

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The Longer the Tenant Has Been in the Unit, the More Likely the Owner Sets Rent Below Market
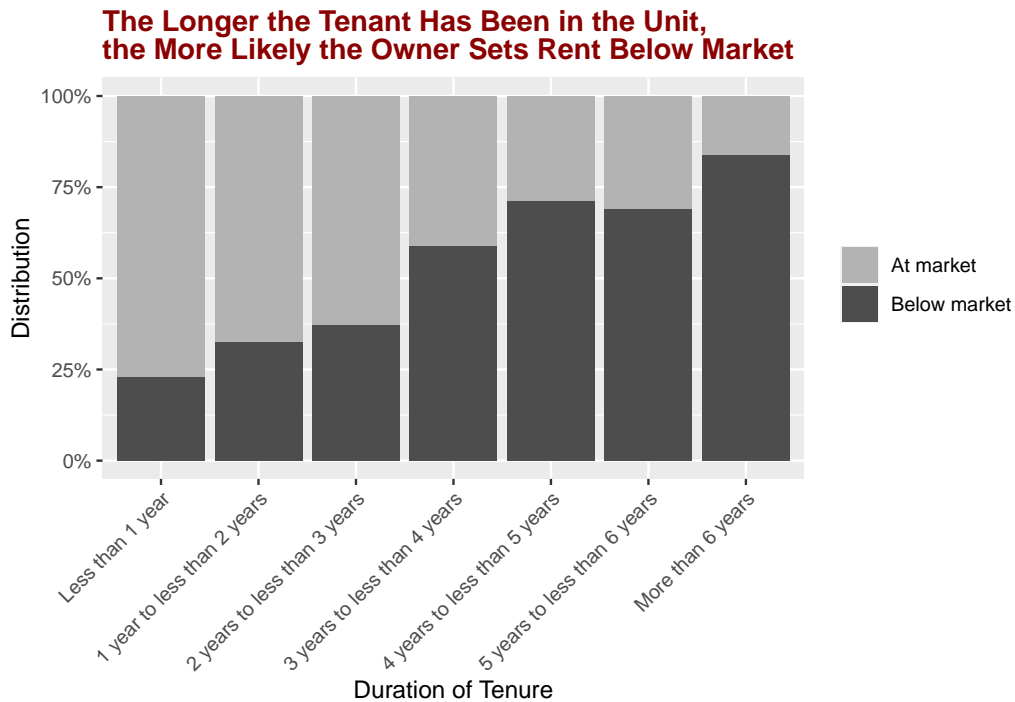
Figure 9: Proportion of Units Below Market Rate by Duration of Tenure

some landlords set rents below market regardless of their tenants' duration of residence and some landlords do not provide discounts, even for long-term tenants. Rents are set below market for nearly a quarter of tenants who have resided in their unit for less than one year. Conversely a quarter of surveyed landlords with long-term tenants (tenants who had lived in the unit for over 6 years) reported charging market rent.

The depth of discounts over a tenant's residence suggest a pattern of annual discounts that start in the tenant's third year and continue to accrue at least through the seventh. Figure 10 is box-and-whisker plot of reported rents relative to market rents by the tenant's duration of tenure. The boxes represent the 25th to 75th percentiles, with the median shown as a line in the box. The whiskers approximately show the extent of the 90% confidence interval. Median rents are within 2 percentage points of market rents (shown as the horizontal grey line) in the first and second year of residence; drop to 7% below market in the third year, 13% and 14% of market in the fourth and
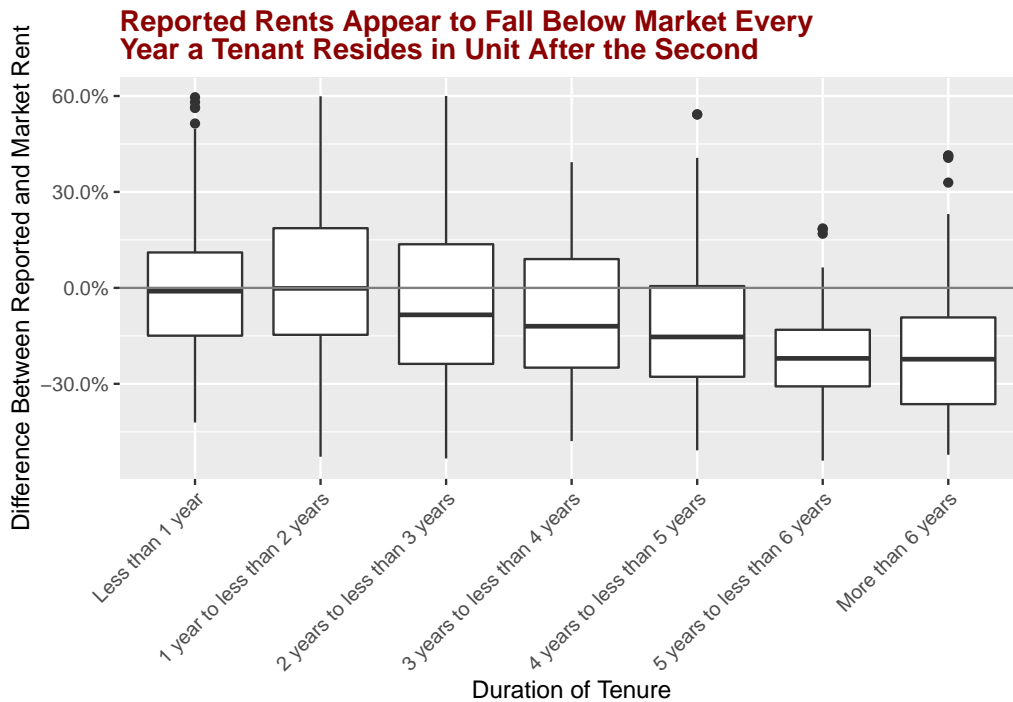
Figure 10: Distribution of Rents Relative to Market by Tenant Duration of Residence

fifth year, respectively; 22% below market in the sixth year; and 25% below for tenants who had lived in the unit beyond their sixth year.

Evidence of a "sit" discount, where the tenant receives a discount from market after the end of the first lease period, is mixed. There does not appear to be any increase in the depth of discounts at the end of the first year.[8] However the proportion of owners reporting below-market rents for tenants who lived in their units between one and two years is 9.5 percentage points higher than for tenants tenants who lived in their unit for less than a year (this difference is statistically significant at the 5% level). There is also a significant rise of 30.3 percentage points in below-market rent-setting at the start of year three.

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[8]Only 67 survey respondents reported having lease durations of 2 years or longer.

2.5.2   Why do Landlords Set Rents Below Market?

Interviews conducted in conjunction with the survey show that owners who set rents below market level do so for diverse reasons. Many owners mentioned trying to keep rents below market to limit vacancy losses and attract and retain "good tenants." When an owner or manager is bringing a unit to market setting rents low can shorten the period a unit is vacant and generate more applications for the unit. Typical vacancy periods reported by landlords varied from a few weeks to up to 5 months, so a discount of even $200 relative to market could be economically justified if it results in a unit being rented a month or two faster. More applications for the unit also provide owners with a larger pool of potential tenants, allowing them to choose a tenant who better fits their criteria. Once the unit is occupied, owners and managers use rent-setting to retain "good" tenants (usually by keeping rents flat over the course of multiple years) or encouraging "problem" tenants to move (usually by notifying them that they were raising rents to market levels).

Interviews and written-in answers to survey questions showed that SRP owners often also consider their current tenant's income, in addition to whether the tenant is "good," when setting rents. While this was not a given response in the survey the most common write-in response for "Other factors" considered in rent setting were tenant related, particularly their ability to pay. One owner wrote "Taxes are skyrocketing, trying to keep rent down so renters can afford with their income." Another owner wrote, simply, "ability for tenant to pay."

It's also clear, however, that there is substantial variation among owners in their propensity to set rents below market and that this variation is not solely based on how long the tenant has occupied the unit. Interviews showed that better-informed, larger portfolio landlords were generally less likely to set rents below market. Exceptions to this norm were telling, and often involved a "professional" intervention. An owner of 3 small rental properties in the Denver metro stated:

> "I didn't raise rents at all for a long time and then I got with a financial planner and she told me I was making something, like, 4.5% on my rentals. I said, 'what? What?' [chuckling] She said, 'Well, you have to raise the rent. I mean you can't just let them

sit there.' So I took that to heart and I started raising the rent every year. I've been doing that ever since."

Furthermore larger portfolio owners, though they had the same concern over turnover, often had different rent-setting practices than smaller-portfolio owners. An owner of 32 SRPs in the St. Louis metro stated "my leases have automatic rent increases built in to them" and though she noted that she had some flexibility in the increases, the default of increasing rents mattered. "I have tenants [for whom] there's never been any question. I've never had to send them a letter saying 'your lease is renewing [and] this is your new rent amount' - they just automatically send the new amount each year," she said.

Larger landlords also appeared to check more sources of market data in determining their rents. The same owner stated: "I look at a lot of different sources: I'll go to Zillow, I'll go to Trulia, I'll look at GoSection8.com, socialserve.com to get a general idea of how things look." The owner of 50 SRPs in the Fort Worth metro stated "When we're renting a house I'm going to look on Zillow and on MLS [for] how much are things renting for. I want it to be spot on, middle of the market not trying to push it, not trying to give it away, just want it fair for everybody, because if it's fair they'll stay in there. My goal is to try to keep the tenant in there as long as I can." An owner of 45 SRPs in the Bay Area in California and Detroit, MI stated that while he tries to "go just a little bit under" market rents, he also actively tested the market in his unit.

> "Let's say, for example, I'm going to have a vacancy at the end of May, so what I'll do is on May first, while the tenant is in their last month, I'll put the property up for rent and have an open house while the tenant is still living there. But I'll put it for a high amount. If I'm not getting any calls, it's too high. I'll lower it the second week. If I'm still not getting calls I'll lower it a little bit more on the third week. And then I start to see, it's been a year or two or three, [but] this is where the market's at because now my phone does not stop ringing."

2.5.2.1 Variable Selection for Models

I selected variables for the two models (whether an owner chose to set rents below market and the extent to which rent deviated from market) with the following steps. First I put constructed a long list of 133 variables that intuition, interviews, or existing theory would suggest were important to owner's rent-setting. The relevance of each variable was tested with two methods: random forest and univariate OLS models. The OLS models predicted either the difference in logged reported rent and logged market rent or whether the owner reported rent as being at market or not as the dependent variable. The R^2 was used to examine the relevance of each variable. Importance statistics were used for the random forest models. Lastly I selected a short list of variables based on the results of the analysis.

The two model types provide different perspectives on the variables' relevance to rent-setting. The univariate models have the advantage of providing an easy-to-interpret indication of the strength of a linear relationship. However it is likely that owner decisions on rent setting are correlated with a range of factors, and may not have a powerful correlation with just one observable aspect of owners. Random forest models have the advantage of accommodating many variables at once with relatively few observations, thus providing a perspective on the impact of different combinations of variables on rent-setting.[9] They are also better able to detect non-linear relationships. Random forest models, however, can be difficult to interpret and for this reason they are only used to select variables that are then applied to linear models. The statistic used in this analysis is permutation importance, which tests the extent to which randomly rearranging the variable values across cases diminishes the predictive power of the model.

Unsurprisingly, both model types showed the outsized importance of tenure duration on rent-setting. The R^2 for the univariate tenure duration OLS model predicting whether a unit was BMR was 0.194, with the next highest R^2 0.037. The permutation importance for tenure duration in the random forest models was 0.053 with a next-highest value of 0.012. The results were similar for the rent differential models as well. This is unsurprising for two reasons. Firstly the literature has consistently shown this correlation across different populations and at different times. Secondly, regressing rent on

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[9]However the numerous incomplete surveys mean that a single model for all variables on the long list would only have 4 observations. For this reason I created three separate random forest models for each dependent variable, each with a subset of the variables with substantial numbers of missing values.

Univariate Models Show the Outsized Importance of Tenure Duration and About 20 Additional Variables with Some Correlation to BMR Rent–Setting
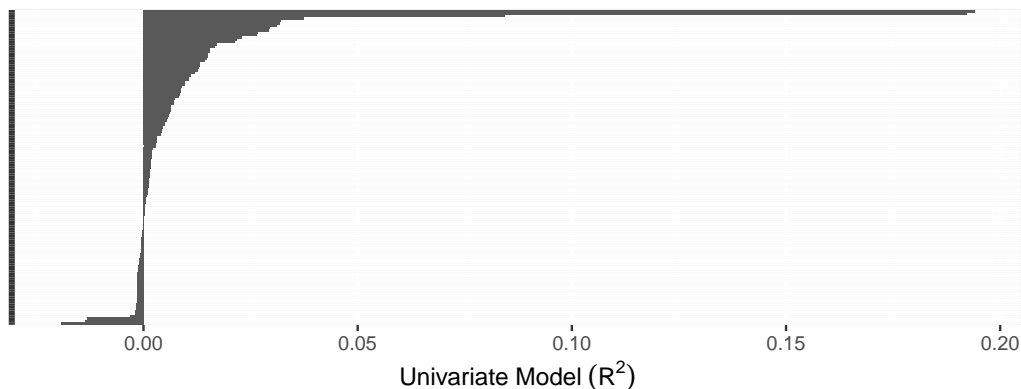
Figure 11: R^2s of Univariate OLS Models on Whether a Unit is BMR

tenure captures both the impact of owners responding to tenants (by setting rents low in response to tenants not moving) and the impact of tenants responding to owners (by not moving in response to relatively low rents). Thus the measures of variable importance show the *cumulative* impact of renter and owner decisions.

Overall, the models showed that, with the exception of tenure duration, every single factor was, at best, only very slightly correlated with rent-setting. Figures 11 and 12 show the results of the variable selection analysis for whether a unit is below market. The top bar on each is the tenure duration of the tenant. The other variables have either very slight or no explanatory power in the models. The models diverged somewhat on placement of specific variables in the range of slight to no importance.[10]

Both the linear and random forest models have a far better ability to predict whether an owner set rents below market than by how much rents deviated from the market. The adjusted R^2 for the best bivariate BMR model was 0.22 while for the rent differential model it was only 0.12. The highest R^2 for the random forest rent differential models was only 0.10 (for a model with

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[10]Technically, the values shown above are adjusted R^2s (hence the negative values), as many of the variables in the analysis are categorical and are treated as a series of dummies in the OLS models. I use adjusted R^2s because variables with many categories would otherwise have artificially high R^2s.

Random Forest Models Show Similar Results to Univariate, but Fewer Relevant Variables
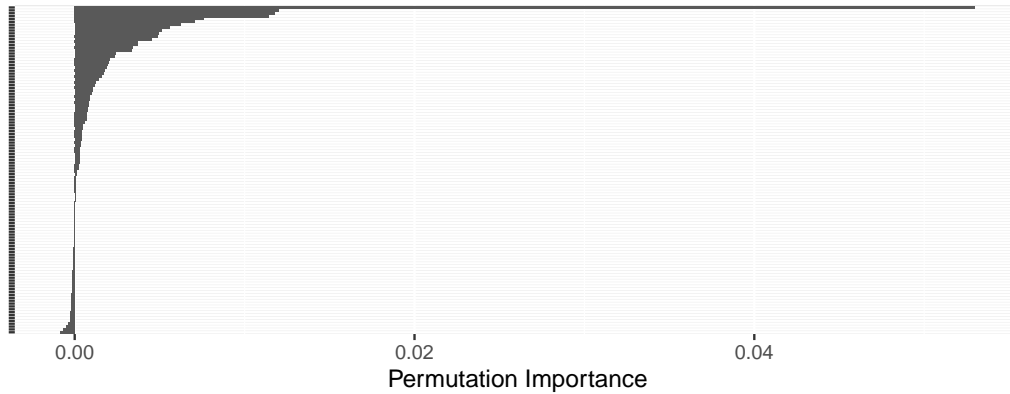
Figure 12: Permutation Importance on Whether a Unit is BMR

56 predictors).

2.5.2.1.1 Variables Omitted from BMR Model

While the goal of this analysis is to determine the factors that influence owners' rent-setting decisions, it's worth noting some surprising factors that do not appear to affect rent-setting. I created the long list of covariates based on what intuition or past scholarship suggested would be correlated with below-market rent setting. The vast majority of these variables appeared to have correlations that were either non-existent or so slight that they were statistically indistinguishable from zero with the sample size. I note these non-associations below with associated p-values. (Most of the variables are categorical, and thus use a χ^2 test to derive p-values, but a few are ordinal so p-values are derived using a Wilcoxon-Mann Whitney test.) The following factors did not have a statistically significant impact on below-market rent setting:

- **Most reasons for acquiring or holding the property**: Only one of the twelve commonly cited reasons owners selected for owning and continuing to hold the property had a statistically significant correlation with the decision to set rents below market (all others have p

values above 0.05).[11] This is surprising, as it would be reasonable to expect that owners who acquired properties "For income from residential rents" might be less willing to rent below market than owners who acquired the property "As a future residence for self or family member(s)." The only commonly cited reason that was correlated to rent-setting was holding the property "as future security for family member(s)," and is included in the regression models.

- **Tenant selection criteria**: Krohn et al. (1977) posited that personal connections between the owner and renter contributed to lower rents. However there was no statistically significant difference between owners who selected tenants because they were "already personally known to the owner or the owner's friends or family." (p = 0.269)

- **The frequency with which the owner visited the rental property** Following Krohn et al. (1977), it might be expected that owners who visited their surveyed rental frequently (e.g. "about once a week"), might be expected to provide below-market rents more frequently than owners who visited the property "never or almost never." A bivariate Wilcoxon-Mann Whitney test barely crosses the 5% threshold (p= 0.0499998), but this significance disappears in multivariate models.

- **Owner demographics** Neither race, ethnicity, nor gender had any significant impact on owner's decisions to set rent below market (p = 0.236, 0.859, 0.585, respectively). The owner's age did (p = 0.003), but the effect was highly colinear with the amount of time that the owner had owned rental properties and is therefore excluded from the multivariate model.

- **Financing characteristics** The economic reasons for setting rents below market would suggest that higher financing costs might make owners less willing to set rents low. Still, none of the financial variables, not even the presence or absence of a mortgage (p = 0.231), had a significant impact.

- **Owner's employment** Scholars who have examined owners of small rental properties outside of the context of rent-setting have distinguished between "mom and pop" and owners who are full-time real estate professionals (Gilderbloom & Appelbaum, 1988; Stegman &

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[11]A few rarely cited reasons, such as holding the property "to provide affordable housing in the community" or "as a tax shelter for other income" were significantly related, but were only chosen by 40 and 32 owners (respectively) who set rents below market

Sumka, 1976; Sternlieb, 1966). This distinction might be expected to affect rent setting as well, but does not have a statistically significant impact when measured by the amount of time an owner spends investing in and managing rentals or the type of employment they have if they are not full-time investors/managers (p = 0.342 and 0.102, respectively).

- **Many property characteristics** The year the unit was built, the size of the parcel of land, and the frequency of routine maintenance are unrelated to whether owners set rent below market (p = 0.188, 0.19, and 0.168, respectively).

2.5.2.1.2 Variables Selected for BMR Model: Definitions and Descriptive Statistics

I selected variables that were within the top twenty by importance rank for each model. Of these forty variables 9 were present in both lists. I also removed variables that were redundant (such as the 1-year log difference in rent versus the 2-year log difference in rent) and those that had many missing values. I then added portfolio size, given the known bias of the survey. In the end I included 17 variables in the model. They are listed below and the data source is identified parenthetically. Summary statistics are provided in tables 4 and 5.

Tenant Variables

- **Tenure Duration** - The reported of time the current has resided in the surveyed unit (survey).
- **Tenant Income** - The owners' impression of their tenant's income level (survey).

Owner Variables

- **Portfolio Size** - The number of rental units held by the owner. (survey).
- **Owner Distance** - The logged distance in miles between the owner's residence and their surveyed rental property. (survey).
- **Owners' Assets** - The logged liquid assets of the owner at the time of the survey (survey).

40

- **Time in Business** - The number of years since the owner acquired their first rental property (survey)
- **Rent-Setting** - I identified owners as using tech in rent-setting if they selected "Rents for similar units gathered from tech source, e.g. online listings" or "Rents determined using software or computer algorithms" when asked "What are the 4 most important factors considered when setting rents in the surveyed property?" (survey)
- **Management** - I identified owners as "using tech" in management if they reported using any "technological tools are used to manage this property," including spreadsheet software such as MS Excel. (survey)
- **Management Co.** - Whether the owner contracted with a third-party property manager for the surveyed property (survey)
- **Reason for Holding the Property** - Whether the owner cited "As future security for family member(s)" among their "reasons for continuing to own this property today." (survey)
- **Turnover** - Whether the owner reported taking "active measures to reduce turnover at the surveyed property" (survey)

Market Variables

- **Log 2-year rent delta** - The difference in logged rents between the ZRI of the zip code in the month the survey was completed and the ZRI two years before (Zillow).
- **Metro Construction Rate** - The average ratio of permitted units to the total housing stock at the metro level over the past three years (Census of Construction and ACS).
- **Metro Price to Rent Ratio** - The ratio of the average home purchase price to average rent at the metro level (Zillow).
- **Metro Rental Vacancy Rate** - The metro rental vacancy rate (ACS).

Policy Variables

- **State Policy** - The classification of the tenant protection laws in the state of the surveyed rental property per Hatch (2017). "Pro-business" refers to landlord-friendly legal regimes, "protectionist" refers to a tenant-friendly regime and "contradictory" refers to a regime that has a mix of laws and policies (Hatch, 2017).

Property Variables

- **Recent Capital Improvements** - Whether the property has had a substantial capital improvement in the past three years. (survey)

Table 4: Summary of Interval Variables for BMR Model

Variable	mean	Std Dev
Log 2-year rent delta	0.05475	0.04
Metro Construction Rate (%)	1.029	0.69
Metro Price to Rent Ratio	159.8	32.79
Metro Rental Vacancy Rate (%)	7.152	2.33
Owner Distance (mi)	164.7	479
Owner's assets (log)	13.2	1.6
Portfolio Size (log)	1.988	1.13
Time in Business (years)	18.48	11.79

Table 5: Summary of Categorical Variables for BMR Model

Variable	Value	ratio (%)	Std Err
Tenure Duration	Less than 1 year	21	3.6
Tenure Duration	1 year to less than 2 years	21.5	3.59
Tenure Duration	2 years to less than 3 years	15.1	3.73
Tenure Duration	3 years to less than 4 years	9.9	3.85
Tenure Duration	4 years to less than 5 years	11.2	3.82
Tenure Duration	5 years to less than 6 years	4.3	3.96
Tenure Duration	More than 6 years	17.1	3.69
State Policy	Protectionist	32.6	3.29
State Policy	Contradictory	23.6	3.5

Variable	Value	ratio (%)	Std Err
State Policy	Pro-business	43.7	3.01
Tenant Income	Low income	33.1	3.42
Tenant Income	Middle income	59.7	2.66
Tenant Income	Upper income	7.2	4.03
Rent Setting	Used Tech	59	2.61
Management	Used Tech	64.3	2.53
Management Co.	Self Managed	73.9	2.05
Reason for Holding	Future security for family	28	3.44
Turnover	Trying to Keep Tenants	69.6	2.23
Capital Improvements	Recent Improvement	62.2	2.46

2.5.2.1.3   Below-Market Rent-Setting Model

I model the choice of owners to set rents below market with a linear probability OLS model and a logit model. The OLS model provides easily-interpretable results. The coefficients reflect the impact on the probability a unit's rent will be set below market. Thus a coefficient of 0.10 for a dummy variable shows that when the dummy is "turned on," the chance that a unit is below market will increase by 10 percentage points. The adjusted R^2, as usual, shows the extent to which the variation in whether a unit is below market is explained by the selected covariates, on a scale of 0 to 1. Linear probability OLS models are commonly used, however they violate some of the basic assumptions of OLS. To ensure that the conclusions of the analysis are justified, I also run a logistic, or logit, model. The coefficients of logit models are the impact that each variable has on the logged odds ratio of the unit being below market. Thus a coefficient of 0.10 for a dummy would mean that "turning on" the variable would increase the likelihood of a unit being below market by 10.5% ($e^{0.10}$) relative to the dummy being "off."

Owners often stated that they kept rents low to keep long-term tenants in the unit. From the tenant's perspective, a relatively low rent could entice them to stay in the unit when they would otherwise have moved. Thus rent-setting is endogenous to tenure duration. Regressing rent-setting with tenure duration directly should produce a biased estimator for tenure duration, effectively ignoring the extent to which owners rent-setting has resulted

in longer-term tenants. Unsurprisingly, when the regressions are modeled this way the duration of tenure covaries with the error term of the model confirming the endogeneity between tenure duration and rent-setting. While the errors for both models are consistent across tenure durations, the models disproportionately guess that shorter-term tenants units' are market when they are below market, while at long tenures the models disproportionately mistake market-rate units for below market units.

To deal with the endogeneity of tenure duration I contrast two models: one with tenure duration and one without. Contrasting the coefficients of the other variables between the models should provide some perspective on how owner's rent-setting drives a tenants' moving decisions. The coefficients of the other independent variables may vary between the two models because they mean something different. In the saturated model (i.e. the model with tenure duration) the coefficients of the other variables refer to their impact (i) independent of the amount of time that the tenant has chosen to stay in the unit for reasons unrelated to rent and (ii) independent of any *additional* time that the tenant has stayed in the unit because of lower rents provided by the owner. Assuming that tenants move for reasons unrelated to rent discounts at rates that are uncorrelated with the covariates, the difference between the coefficients in the saturated and unsaturated models should provide some perspective on effect (ii): the extent to which the variable is correlated with rent discounts that have kept the tenant in the unit.

Model results are shown in table 6. Broadly, the models are in agreement. The significant variables all have similar magnitudes between models and the same direction of effect. The models also show the idiosyncrasy of owner rent-setting. None of the models come close to fully explaining the decision of owner. The saturated logit model produces incorrect results for 24% of the model cases, while the saturated OLS model gets 24% of the model cases wrong. Both models are an improvement over the null (i.e. guessing that none of the cases were below market would produce incorrect results for 49% of the cases.) Results regarding variable coefficients are below:

Tenant Variables

- **The duration of tenure is highly significant.** The models do not suggest a substantial "sit" discount. The models show no significant difference between the first and second year. Relative to tenants who

Table 6: BMR Results

	Dependent variable:			
	BMR			
	OLS		*logistic*	
	(1)	(2)	(3)	(4)
2nd Year Tenure	0.083		0.506	
	(0.077)		(0.442)	
3rd Year Tenure	0.130		0.748	
	(0.086)		(0.485)	
4th Year Tenure	0.368***		1.875***	
	(0.093)		(0.511)	
5th Year Tenure	0.486***		2.485***	
	(0.093)		(0.542)	
6th Year Tenure	0.315**		1.556**	
	(0.133)		(0.700)	
7+ Year Tenure	0.509***		2.720***	
	(0.085)		(0.514)	
Middle-Income Tenants	−0.099*	−0.107*	−0.552*	−0.542*
	(0.057)	(0.061)	(0.321)	(0.285)
High-Income Tenants	−0.032	−0.085	−0.144	−0.433
	(0.105)	(0.111)	(0.588)	(0.524)
Portfolio Size (log)	−0.037	−0.030	−0.251*	−0.145
	(0.026)	(0.027)	(0.146)	(0.127)
Owner Distance (log)	−0.012	−0.011	−0.064	−0.052
	(0.010)	(0.011)	(0.056)	(0.050)
Owner Assets (log)	−0.026	−0.028	−0.136	−0.141*
	(0.016)	(0.018)	(0.093)	(0.082)
Time in Business	0.016	0.059*	0.106	0.268*
	(0.032)	(0.034)	(0.178)	(0.156)
Tech Rent-Setting	−0.029	−0.097*	−0.168	−0.457*
	(0.057)	(0.059)	(0.313)	(0.270)
Tech Management	−0.142**	−0.156**	−0.758**	−0.730**
	(0.059)	(0.062)	(0.325)	(0.286)
Holding for Family	0.126**	0.099*	0.702**	0.466*
	(0.056)	(0.059)	(0.312)	(0.273)
Self-Managed	0.013	−0.0005	0.049	−0.019
	(0.064)	(0.068)	(0.350)	(0.309)
Limit Turnover	−0.123**	−0.130**	−0.683**	−0.622**
	(0.054)	(0.058)	(0.301)	(0.268)
Metro Vacancy Rate	1.194	1.506	7.502	6.794
	(1.368)	(1.453)	(7.752)	(6.630)
2-Year Rent Delta	0.756	1.162*	3.858	5.371*
	(0.627)	(0.669)	(3.428)	(3.101)
Average Construction Rate	1.144	0.760	10.217	3.696
	(4.133)	(4.453)	(23.157)	(20.457)
Price-to-Rent Ratio	0.001	0.001	0.007	0.007
	(0.001)	(0.001)	(0.006)	(0.005)
LL-Friendly State Policy	−0.062	−0.111	−0.367	−0.527
	(0.075)	(0.080)	(0.426)	(0.370)
Contradictory State Policy	−0.044	−0.055	−0.263	−0.273
	(0.075)	(0.080)	(0.422)	(0.369)
Cap Imp	−0.005	−0.008	0.005	−0.043
	(0.051)	(0.055)	(0.287)	(0.254)
Constant	0.653**	0.824**	0.758	1.725
	(0.318)	(0.332)	(1.762)	(1.575)
Observations	325	334	325	334
R^2	0.306	0.155		
Adjusted R^2	0.251	0.107		
Log Likelihood			−168.357	−203.277
Akaike Inf. Crit.			386.714	444.554

Note: *p<0.1; **p<0.05; ***p<0.01

have been in the unit for less than a year (the omitted category), the likelihood of BMR rents only sees a substantial rise starting the fourth year the tenant has resided in the unit. By the 7th year tenants have a chance of receiving below market rents that is 51 percentage points higher than a new tenant. The logit models show that these tenants are 15 times more likely to receive below market rents relative to new tenants.

- **The landlords of low-income tenants were more likely to set rents below market,** relative to middle income tenants. The OLS models, show that, relative to a low income tenant, middle-income tenants are about 10 percentage points less likely to receive below-market rents. Similarly the logit model shows that landlords of middle income tenants only set rents below market at 58% the frequency of landlords of low-income tenants. There was no association between rent-setting and having high-income tenants, but there were very few properties with high-income tenants. While there is a difference between the coefficient of tenant income between the saturated and unsaturated model, it is not statistically significant at the 5% level.

Owner Variables

- **Many of the owner variables either have very weak or no correlation with BMR rent-setting** The distance between the owner's residence and their surveyed rental property has no statistically significant association with BMR rent-setting. The portfolio size of the owner has a very small effect that is significant only in the saturated logit model. The coefficient suggests that doubling the portfolio size of the owner is associated with a 16% decrease in the likelihood of setting rents below market. Similarly owners' investable assets have a real but minor effect, which is only significant in the unsaturated logit model. Doubling of owners assets is associated with a 9% decline in the chance of below-market rent-setting. The amount of time since the owner first acquired a rental property has a weak association with higher rates of below-market rate rent setting. Doubling the amount of time an owner has been in the business is associated with an 8% increase in the chance they are setting rents below market.

- The unsaturated models also show that **using online comps to set rents was associated with owners being less likely to set rents below market.** The OLS model shows a 10 percentage point decline in the probability that a unit is below market, while the logit shows that online comp users are only 63% as likely to set rents below market relative to owners who do not use online comps. The fact that these relationships show up in only the unsaturated models suggests that the influence of online comps affects rent setting in a way that also affects a tenant's decision to stay in the unit.
- All models showed that **owners who did *not* use technological tools for management were more likely to hold rent below market** (this includes using spreadsheet software such as Microsoft Excel). The OLS models shows a 15.6 percentage point increase in the chances a unit had below market rents relative to owners who used any technological tools. The logit model showed that owners who used no tech in management were 1.5 times as likely to hold rent below market relative to those who did.
- **Owners who reported "actively trying to minimize tenant turnover at this property" were somewhat less likely to set rents below market.** The OLS models showed a 13 percentage point decrease in the chances that these owners kept rents below market. The logit model showed that owners who were trying to limit turnover set rents below market at only 51% the rate of owners who didn't report trying to limit turnover. This surprising result is likely driven by the fact that owners used many means aside from rents to limit turnover. Only 25% of the owners who reported wanting to limit turnover stated they did so with "Rent concessions or reductions." Other owners tried to limit turnover by improving the property or providing better services. This finding also suggests that a portion of owners hold rent below market for reasons that have nothing to do with limiting turnover.

Market Variables

- **Three of the four market measures do not have a statistically significant impact.** Vacancy rates, construction rates, and price-to-rent ratios have no statistically significant association with below-market-rate rent setting.

- The unsaturated models showed that **rising median rents by Zip codes were weakly associated with higher changes owners set rents below market.** One standard deviation in rent increases increased the chance an owner will set rents below market by 3 percentage points.

Policy Variables

- The direction of the impact of the policy variables suggests that tenant-friendly state policies may be associated with more below-market rate rent setting. This association is so weak, however, that it may be due to chance variation.

Property Variables

- None of the models show a statistically significant impact of recent capital improvements on owner's rent-setting.

2.6 Discussion

Many of the attributes of owners that are normally associated with professionalism (and therefore a diminished likelihood of set rents below market) appear to have little to no impact on BMR rent-setting. Portfolio size is the standard measure of the "professionalism" of owners (Gilderbloom & Appelbaum, 1987; Krohn et al., 1977; Stegman & Sumka, 1976; Sternlieb, 1966). Other standard indicators of professionalism, such as corporate structure (Lee, 2017; Travis, 2019), and the distance between the owner's residence and their rental (Krohn et al., 1977), have similarly small or negligible impacts. "Owners by accident," such as owners who had previously lived in their unit or had inherited it, do not appear to set rents in a substantially different way than owners who purchased their property as an investment.

Nevertheless, there are a number of signs that professionalism, particularly measured by portfolio size, matters for rent-setting. Interviews showed that larger portfolio owners had different approaches to rent-setting than small portfolio owners. No small portfolio owners reported escalator clauses in their leases, while some large portfolio owners' leases included scheduled rent

increases. Smaller portfolio owners tended to speak of their properties as assets or in personal terms, while larger portfolio owners tended to speak of their properties in business terms or as investments.

There is evidence that market information matters in rent-setting. Owners who used some technological tool, even as simple as a spreadsheet, were less likely to set rents below market. The same was true for owners that went online to examine rents for comparable properties when setting rent. It is possible that this is a difference driven by owners, not by the source of data they use, but this is unlikely. Owners who reported that they considered "demand for rental units in the area" when setting rents showed no propensity to set rents disproportionately at market once tech factors were controlled for. Interviews showed a few examples of owners who changed their rent-setting behavior after presented with new information about their properties (e.g. the IRR of their rental portfolio). This suggests that the source of information, rather than the owner's general intention, was the driver of the difference in rent-setting patterns.

Ethical and social factors appear to matter in rent-setting. Owners frequently cited tenant's ability to pay and, controlling for a range of factors, owners who believed their tenants were low income were more likely to set rent below market than owners who believed their tenant was middle income. This attitude may be linked to owner's stating that they "didn't need" the additional income.

There is little evidence that below-market rent setting is driven by landlords who are particularly averse to turnover. If anything the regression models suggest the opposite: that landlords who are actively trying to avoid turnover are *less* likely to set rents below market. Nearly all landlords interviewed expressed a desire to avoid turnover, suggesting that there is little variation in this sentiment among SRP owners.

2.7 Conclusion

Small rental properties house a large portion of low- and moderate-income families across the US. The owners of these properties are, for the most part, small-scale and have limited knowledge of market conditions relative to the highly-professionalized owners of multifamily properties. A large survey of

these owns suggests that about half of owners knowingly set rents below market levels, often substantially below market, for various reasons.

These findings have a number of implications for planners and other policymakers. Firstly they suggest that a large portion of the existing stock of small rental properties (which are present in nearly every municipality in the US) is an asset to communities interested in providing good-quality, low-cost housing to families. The opposite side of this coin, however, is that there appears to be substantial room for rents to rise, given that these units appear to be able to command rents much higher than their current level. This raises the complex issue of whether state and/or local policymakers should consider programs and policies that are designed to "preserve" this naturally-occurring affordable housing, and what policies and programs would be appropriate to achieve this goal (see Howell, Mueller, & Wilson, 2019 for a description of the challenges of preservation even with subsidized rental properties).

This research also opens up a number of questions for further research. This chapter suggests a link between rent-setting and tenant selection strategies. If tenants are perceived as "good" by the owner, the owner may provide them with a lower rent relative to a "bad" or riskier tenant. The implications of this strategy for different kinds of tenants (e.g. families with children or voucher-holders, for example) are important to understand, but beyond the scope of this dissertation.

Related to both issues, it is unclear how state and local policies affect rental investor decisions including rent-setting. Because the vast majority of small rental property owners are non-professionals, programs that require paperwork, fees, or other actions that are routinely undertaken by multifamily (particularly affordable multifamily) owners may have low uptake rates among SRP owners, even if they are in the economic interest of the owner. SRP owners are directly affected by numerous public policies including housing inspections, property taxes, and the numerous state and federal laws regarding tenant selection. Compliance with these laws, and the impact of suites of programs and policies, are unknown and deserve attention and research.

Chapter 3: Owner Professionalism & the Drivers of Change of Rents

3.1 Introduction

When scholars and policymakers discuss rents, why rents are changing, why rents are so high, and what to do about making rent for affordable, they typically talk about the rental market. What market forces are changing, what combination of market factors result in high rents, and how policy can intervene in the market to lower rents. This is a reasonable approach. But the rent for a specific unit is not set by the market. While rents, collectively, are driven by the market, rents are also set by individuals making distinct choices. A rent is a decision that is informed by market forces and an understanding of the market, but it is driven by other factors as well. Chapter 2 made it clear that owners consider the specifics of their current tenants when setting rent, which has little to do with the market factors that affect rents.

When rents are understood to come from individuals, as opposed to a more abstract market, it becomes reasonable to ask whether some landlords set rents in different ways from other landlords. This has been an active topic of scholarly debate for some time. As I alluded to in Chapter 2, some scholar have suggested that a difference might exist in the rent-setting behaviors of amateur landlords relative to professionals. What exactly these differences are and the extent to which there is a differences isn't known. This chapter measures whether there is a real difference in the rent-setting behaviors of amateur landlords relative to professionals. I distinguish the professionalism of landlords with various measures and look at differences in two rent setting behaviors, stickiness, or holding rents nominally flat for two or more years, and shocks, or increasing rent by 20% or more over two years.

To do so I join, for the first time, a large Census Bureau dataset on the owners of rental properties, the Property Owners and Managers Survey (POMS), with a large Census Bureau dataset on properties and tenants, the American Housing Survey (AHS). This provides detailed, longitudinal data on rental properties and rent setting decisions for hundreds of units nationwide from 1985 to 1995. I then use multiple regression models to isolate differences in the rent-setting behaviors of different types of owners controlling for the numerous, tenant, market, policy, and property characteristics that might

otherwise confound the differences between amateur and professional owners.

I find that rent stickiness and rent shocks are quite common. Traditional measures of professionalism, including portfolio size, the reasons that the owner purchased the property, the factors they considered when setting rents, and whether the landlord was corporate or not, make little to no difference in an owners propensity to hold rents flat or sharply increase them. Similar to the findings regarding below market rent setting presented in Chapter 2, the decision to stick or shock rents appears to be very idiosyncratic, with the models explaining only a small portion of the total variation. The most substantial differences between units where rents stick or shock is whether or not the unit has turned over and the unit's position in the market. Specifically, the owners of higher-end units choose to hold rents flat relatively rarely, and low-end units were substantially more likely to see rent shocks than mid- or high-end units, though some of this difference may be an artifact of the definition of market segments. Metro rent trends, unsurprisingly, also have a substantial influence on rent-setting. The major caveat to these findings is that they do not adequately capture the extent to which some landlords use rent-setting to either keep their tenant in the unit or to encourage their tenant to move out of the unit. There are reasons to suspect that amateur landlords may be more likely to hold rents flat to limit turnover for their unit.

The rise of new technologies that make it easier for amateur landlords to behave like professionals and the dramatic changes in the profile of who owns rental units make these findings especially relevant. Property management technologies, even as simple as spreadsheet software, give amateurs tools that make them resemble the professional landlords of the 1980s and 1990s far more than the amateur owners of that time period. Online marketplaces like Roofstock allow amateurs to purchase cash-flowing rentals nationwide providing market knowledge, access, and analysis that, again, is far more similar to the professionals of the 1980s and 1990s than the amateurs. Will a professionalization of rental property ownership in the US lead to a change in how rents are set? Probably not dramatically, though more research needs to be conducted to understand the link between rent-setting and turnover.

3.2 Literature Review

There is not a substantial body of scholarly literature that directly addresses how different rental property owners use different rent-setting strategies. However (as discussed in the prior chapter), there has been some theorization and empirical study about how to categorize landlords and some work on rent setting strategies. What is missing is the link between the two. Most scholarship that analyzes and categorizes the owners of rental properties focuses on the "professionalism" of owners, which may have implications about rent-setting behaviors. The rent-setting scholarship covers behaviors such as rent stickiness and the tenure discount, which may have implications about the type of owner or manager who sets the rent. For this analysis I focus on two specific rent-setting behaviors: stickiness and very sharp increases in the rent of a particular unit, or "rent shocks."

3.2.1 Owner Professionalism & Rent-Setting

The scholarship describing the landscape of rental property owners is limited and mostly focuses on the low end of the rental market, particularly in central cities, generally viewing the differences between owners through the lens of "professionalism." The first large-scale empirical work came in the 1960s and 1970s when major upheavals in urban markets generated a flurry of scholarship, mostly in the form of in-depth case studies. The 1980s saw a few smaller-scale studies of rental property owners. In the mid-1990s and in 2001 the Census produced national-scope data products on rental property owners that generated some national-scale analysis. From the 1960s until very recently most scholarship about rental property owners was motivated, not by the nation's rental affordability problems, but by a concern for distressed neighborhoods, particularly neighborhoods that appeared to be literally falling apart. Landlords are ultimately responsible for the physical condition of properties, so researchers sought out landlords and tried to understand how they behaved. Rent-setting provided insight into the financial picture of the properties, but was not the focus of these studies. Nevertheless, this body of scholarship may provide a useful theoretical lens to understand how landlords set rents.

George Sternlieb's (1966) seminal *The Tenement Landlord* established the template for the study of rental property owners. Sternlieb's team conducted

a field survey of hundreds of parcels (mostly tenement buildings of 3-6 units) in inner-city Newark coupled with 330 detailed, structured interviews of their owners. This methodology was adapted to Baltimore, MD (Stegman, 1972); New York, NY (Sternlieb, 1972), Newark, NJ again (Sternlieb & Burchell, 1973); small cities in North Carolina (Stegman & Sumka, 1976); and influenced a large study of landlords in Montreal, QC (Krohn et al., 1977). The primary concern of these works was to understand the behavior of the owners of rental properties in low-rent neighborhoods with old, often dilapidated stock. Understanding the owners might provide a way to understand how to improve the lives of the residents of these neighborhoods and the well-being of the greater cities as well.

These studies provided nuanced theories of how rental property owners behaved and what professionalism meant. The race, ethnicity, income, wealth, professional history, and the particulars of how the owners acquired and managed their properties were all detailed in these studies. In the end, though, these scholars concluded that owners could be categorized into two or three groups: non-professional owners (often resident landlords - owners of rental properties who lived in the same buildings as their tenants), smaller-scale professionals, and larger-scale professionals. Sternlieb (1966) argued that resident landlords behaved in starkly different ways than all other rental property owners because their properties were also their own homes. The resident landlords Sternlieb studied mostly bought their properties because they wanted to be homeowners, but due to mortgage and housing discrimination and a lack of income, were unable to buy a single-family home. These owners over-improved their properties because they saw them primarily as their homes. For the most part they took great pride in their property and saw it as a means to generate wealth and improve their financial stability. Stegman (1967), based both on his own empirical work in Baltimore and on Sternlieb's work in Newark, drew different conclusions. He argued that, while resident landlords looked good from a neighborhood perspective, their situation was dire and it would be asking too much of this population to stabilize or revitalize impoverished inner-city neighborhoods. The resident landlords of inner-city Newark and Baltimore were typically African-Americans who had over-paid for their properties using usurious debt products. Their cash flow barely covered their expenses and there was no reasonable expectation of appreciation for their properties. Stegman argued that *professional* owners, particularly large-scale professionals, could take advantage of economies

of scale to lower operating costs, and the high capacity staff of these owners could better deal with the public sector to work to stabilize neighborhoods.

Krohn et al. (1977) advanced a different theory, arguing that older units in weak markets were inherently unprofitable even for large professionals. Stegman and Sternlieb framed the problem of distressed neighborhoods in terms of low demand for housing meeting operating costs that were, at some level, fixed. If rents could not cover fixed operating costs, then buildings would deteriorate. Deteriorated buildings would not only be less rentable themselves, they would make every building on the block less rentable. Sternlieb saw promise in the economically irrational over-investment of resident landlords, driven by pride of ownership. Stegman saw promise in how efficiently large-scale professionals could lower operating costs. Krohn et al. (1977) saw promise in economically "irrational" over-investment driven, not from pride of ownership, but from the benefits that came from very frequent social interactions between landlords and tenants. These interactions, they argued, reduced operating costs. They observed that tenants of amateur landlords would frequently perform or assist with tasks for free that professional landlords would pay for. These tasks included marketing, tenant selection, routine maintenance, and even capital improvements. This relationship had the potential to be exploitative (and they observed some situations in which it was), but often the system benefited tenants by allowing them to live in units that were very low rent, but relatively well-kept.

A few studies in the 1980s shed additional light on rental property owners by emphasizing the difference between small property and multifamily property owners. The studies done in the 1960s and 1970s were substantial and had had budgets to match. The studies of rental property owners performed in the 1980s were smaller-scale, but brought clarity to an important aspect of ownership that was not emphasized by prior scholarship: that property size was a fairly good proxy for owner portfolio size. Interviews conducted in diverse settings across the US showed that it was very rare for the owners of small rental properties to have large portfolios (Downs, 1983; Gilderbloom, 1985; Gilderbloom & Appelbaum, 1987, 1988). This had not been demonstrated by prior research. Stegman (1972, p. 27), for example, had found that 25% of the Baltimore's entire rental stock (the vast majority of which was small single-family rowhouses) was held by just 50 owners. Because small rental property owners had small portfolios, Downs (1983) argued, they focused on turnover minimization, and were willing to accept lower rents in

order to limit turnover. Gilderbloom & Appelbaum (1987) went further, arguing that metros with more small rental properties saw slower levels of rent increases because the owners of small rentals were less savvy about the rental market and less interested in profits (this also was true in later decades as shown in Gilderbloom, Pan, Lehman, & Appelbaum (2008)).

In the 1990s and early 2000s the Census produced a few national-scale data products on rental property ownership. In 1995/6 HUD, spurred by Michael Stegman, who headed the Office of Policy Development and Research, contracted with the Census Bureau to produce the Property Owners and Managers Survey (POMS). The POMS focused on the owners of rental housing, and asked a set of questions that was similar in depth and subject matter to detailed studies of ownership in the 1960s and 1970s. Additionally the 2001 Residential Finance Survey (RFS) provided information about the operations of rental properties and their finances. The POMS has never been replicated and the Residential Finance Survey was stopped in 2001 and re-worked to become the triennial Rental Housing Finance Survey in 2012.

Since Sternlieb, a few studies have provided additional evidence that resident landlords behave differently than other landlords and even that they set rent differently. Sternlieb's initial observations were of resident landlords in a very specific place and time, but data from the POMS and 2001 RFS suggested that resident landlords in general are substantially different from non-resident owners. Using the POMS data Mallach (2007) found that, relative to single-family owner-occupants, 2-4 unit resident landlords were older, lower income, and disproportionately minority. The properties of resident 2-4 unit owners were about a decade older, and about 20% lower value than the 2-4 unit properties owned by non-resident owners. Resident landlords were also likely to spend more for capital improvements than non-resident owners. Porell (1985) used AHS data to find that resident landlords and resident managers didn't provide higher quality units in multifamily buildings than absentee owners, but did in the 2- to 4-unit properties. Porell (1985) suggested that because this effect was seen with both owners and managers, it is likely that something beyond the "pride of home" was at play, and suggested that living in the building substantially changed tenant selection and improved awareness of and deterrence of tenant problems. Examining SRP owners in New York City Ellen et al. (2013) found that some landlords reported knowingly setting rents over $100 below market rate. Regression analysis revealed that resident landlords charged less rent for units in their properties,

even after controlling for neighborhood and property/unit characteristics.

Later scholarship has also provided further evidence that small-scale professionals behaved very differently than large-scale professionals. Newman (2005) found that small scale professional owners of low-end SRPs in Baltimore were more likely to be cash-flow negative, did not have the technical skills to access benefits from government for which they were eligible, and had high operating costs because of their lack of economies of scale. Garboden & Newman (2012), looking at national POMS and 2001 RFS data, in addition to administrative data from Baltimore, argued for the professionalization of the ownership of low-end SRPs, noting that professionally managed low-cost SRPs were in better financial health than those owned by amateurs. For example professionally managed low-end rentals had an average vacancy rate of about 7%, while those managed directly by owners (who were nearly all small-scale) had vacancy rates above 22%. Mallach (2007) used the POMS to uncover substantial variations in professionalism by property type within the SRP stock. The owners of attached single-family rentals tended to have larger portfolios, higher incomes, and were more likely to hold white collar jobs than the owners of single-family detached homes and, especially, the owners of 2-4 unit properties.

3.2.2 Rent Setting & Owner Professionalism

As I discussed in Chapter 2, there are very few studies that examine rent-setting *per se*. The tenure discount and rent stickiness have been observed and studied for years (decades in the case of the tenure discount), but have been mostly treated as oddities that scholarship has sought to reconcile with the standard economic theory of rental markets. For example Guasch & Marshall (1987) acknowledged that small-scale owners might have ample reason to provide tenure discounts, but focused their attention on showing how tenure discounts could in fact be an artifact of tenants' reaction to noisy rent-setting, as opposed to any purposeful "discount" provided by owners. A few studies have examined rent changes over time, but findings related to patterns of rent-setting and what drives rent changes have been almost entirely incidental to the main arguments. For example Goodman (2005) aimed to develop a "constant quality" metric of rent inflation and, in so doing, found that rent changes have varied dramatically by market segment (low, middle or upper parts of the market). Clayton (1998) examined rent trends in

Vancouver for evidence of inefficiency and, in so doing, found substantial differences in rent trends by neighborhood. Even these studies aggregate rent changes, as opposed to examining the rent changes for individual units.

Part of the reason rent-setting hasn't attracted much study is that there are very few data sources that describe how rent changes for specific units over time. I have found only two national-scale data sets that provide panel data that include rents: the AHS and the Housing Survey conducted by the Bureau of Labor Statistics as part of their calculation of the Consumer Price Index. Both of these surveys have been conducted regularly for decades, but even by the late 2000s O'Flaherty (2009) could find only one study (Genesove, 2003) that examined the patterns and drivers of rent changes of specific units using the AHS. Verbrugge & Gallin (2017) used the CPI data and found no studies that used these data to examine rent-setting decisions for specific units.

Genesove (2003) and Verbrugge & Gallin (2017) used panel data on rents to examine rent-setting patterns, finding that rent stickiness is highly correlated with property type. The papers both suggest that the correlation is driven by differences in *who* owns and manages the different kinds of properties, as opposed to differences in the properties themselves. Genesove (2003) argues that large-portfolio landlords are less likely to hold rents flat because (i) determining changes in market prices is a fixed cost that small-scale landlords may choose to avoid, (ii) the personal and ethical issues that landlords might feel when raising rent might be stronger for small-scale owners, and (iii) large landlords often employ agents to fill and re-lease units who typically do not have discretion to negotiate rent. Verbrugge & Gallin (2017) develop an economic theory of stickiness that is based on differences in how small and large portfolio owners (which they define as 1-unit portfolio owners versus larger portfolio owners) react to not knowing their tenant's willingness to move. Large-scale owners can deal with this uncertainly by raising rents regularly - while some tenants will move many will not because the cost of moving outweigh the rise in rents. Thus large-scale owners can exploit tenant's moving costs. Small-scale owners deal with uncertainly in the opposite way, avoiding the chance of turnover by offering the same rent year after year.

Genesove (2003) and Verbrugge & Gallin (2017) do not directly observe a correlation between owner characteristics and rent-setting behaviors, but the patterns of stickiness by property type they describe are very similar to group differences in the owners of different property types. Mallach (2007),

Gilderbloom & Appelbaum (1988), and Downs (1983) all described sharp distinctions between who owns different kinds of properties. Larger properties tended to held by progressively more professionalized owners, as measured by portfolio size, wealth, and likelihood of being a white-collar worker, with two exceptions. Resident landlords in 2- to 4- unit properties tend to be particularly un-professionalized and the owners of single-family attached homes, are, on average, among the most professionalized SRP owners. These exact patterns, including the exception of single-family attached homes, are reflected in the stickiness findings of Genesove (2003) and Verbrugge & Gallin (2017).

In addition to rent stickiness and the tenure discount, a third rent-setting behavior, rent shocks, may help explain owners' rent setting strategies. O'Flaherty (2009), in a paper evaluating potential drivers of homelessness, examines rent increases of 20% or more over a two year period which he describes as "rent shocks." He finds that these shocks are fairly common, particularly among smaller units. In each two-year period from 1999 to 2005, about 19% of studio apartments had a rent shock. This behavior in and of itself is not O'Flaherty's focus, but his attention to rent increases that far exceed what can be explained by market changes suggests that rent shocks might be a complement to both the tenure discount and rent stickiness. Downs (1983) suggested that landlords might employ two distinct rent setting strategies: (i) increasing rents by a "reasonable" amount (which could be no increase at all) or (ii) estimating demand for a unit and changing rents accordingly. He suggested that these two strategies might explain both the tenure discount and describe some of the differences in rent setting between small and large portfolio owners. It is possible that some owners may follow a step-like pattern of rent setting, holding rents flat for many years, then sharply increasing rent, particularly at turnover. This behavior may be more prevalent among non-professional owners.

3.2.3 Potential Confounders

I am interested in whether *who* the owner of a property is influences how rents are set independent of the many other factors that affect owner's rent-setting decisions. These include local market conditions, who the owner rents to, local policies like rent control, and possibly the property itself. As described in chapter 2 there is strong evidence that who occupies a unit influences

how rents are set for the unit, particularly the tenant's duration of residence (Genesove, 2003; Verbrugge & Gallin, 2017). While there is less empirical evidence to support it, scholars have often pointed to tenant "riskiness" or costs, via-a-vis the landlord (Goodman & Kawai, 1985; Hubert, 1995; Miron, 1990). It is difficult to measure owner's assessment of a tenant's risk, however one source of risk is children in the household. In my conversations with landlords as part of my survey, children were often seen by landlords as an additional source of wear-and-tear on units, and have been cited as risky by landlords in Desmond (2016). There is also evidence that submarkets may exist by the race and ethnicity of tenants (Dawkins, 2004).

Rental market conditions will clearly impact rent setting, and a unit's place within the market may matter in addition to general market trends. Genesove (2003) found that levels of rent stickiness in metro areas varied substantially based on macro trends, specifically the rate of inflation, and regional trends, measured with the change in the median rent at the metro level. There are also signs that submarkets, differentiated by rent relative to metro rents, move separately from generalized metro trends. Goodman (2005) shows that, when divided into thirds by rent relative to the metro, different parts of the market do not move in lockstep. Mallach (2007) also proposes dividing rentals by their place in the market using a similar framework (though he divides the market by perceived appreciation potential in addition to rent levels). The low end of the market might be particularly different, as expenses from operating expenses to taxes tend to be flat across property values, damaging the financial performance of lower-cost properties. Turnover tends to be higher in low cost properties, leading to higher vacancy allowances and marketing expenses. There are few management options available to deal with these problems. Increasing rents results in higher rent burdens and can increase collection costs. Decreasing expenses can threaten the quality of the property and the ability to charge reasonable rents and attract reliable tenants (Stegman, 2017).

There is some evidence that rents are set differently for different kinds of properties, though the mechanisms of this impact are murky. Upgrading units should be associated with increases in rent, but typical upgrades, such as the addition of granite countertops, are not even included in detailed datasets like the AHS. Genesove (2003) and Verbrugge & Gallin (2017) both find a powerful association between rent stickiness and property type, however both explain this difference by noting differences in the *owners* of prop-

erties as opposed to the property itself. O'Flaherty (2009) finds variation in rent setting by the size of the unit measured by the number of bedrooms in the unit. He does not provide an explanation for this finding and it is possible that this difference is driven by changes in turnover patterns by unit size, as turnover is not controlled for in that analysis.

The public policy environment, especially rent control, will also affect rent-setting. Rent control would be expected to have a profound, but complicated impact on rent-setting. Controlled properties might be less likely to have rents stick, as owners would be relatively eager to increase rents when they had the opportunity and few rent control programs freeze rents regularly, usually allowing increases up to a local measure of inflation (Barta, 2020; New Jersey Department of Community Affairs, 2009; NYC Rent Guidelines Board, 2020). Shocks might be more common, as most programs allow rents to rise to market levels (or at least closer to market levels) when the unit is vacated.

Existing scholarship provides a framework for operationalizing owner professionalism and rent-setting behaviors and hints that professionalism may drive rent-setting. However aside from the different behavior of resident landlords, there's no large n evidence that different kinds of owners set rents in different ways. I examine whether indicators of professionalism of the owners of properties are correlated to a predilection to rent stickiness or rent shocks.

3.3 Data & Methods

In order to understand how owners set rents I need longitudinal rent data with information about the owners and managers of properties and data on the many other factors that affect rent setting. I have found no national dataset that provides all this information, so I join longitudinal data on rents, units, and tenants from the American Housing Survey (AHS) with ownership data from the POMS. Both are Census Bureau products. The AHS is a panel survey completed by tenants, conducted every two years for a sample of units across the US. The AHS provides detailed data on tenants, properties, and some information about rent regulation and subsidy status. The POMS was a one-off survey completed by rental property owners, designed by HUD, and conducted by the Census over 1995 and 1996. The POMS provides detailed data about properties and their owners. The POMS sample of surveyed

units was a subsample of the units surveyed in the 1993 AHS. I match units in the POMS with the 1995 AHS, and use the year of the purchase of the property provided in the POMS to join past years' AHS data to observe rent-setting patterns of owners over time, using every AHS back to 1985. While I would like more current data, the POMS was a one-time survey and this combination of data products allow for an analysis that isn't limited to a single geographic area.

Similar to the analysis in the first chapter I use logit and linear probability models to discern the impact of market, tenant, policy, property, and particularly owner characteristics on rent-setting. I model two dependent variables (i) rent stickiness, or the decision of the owner to hold rent flat over a two-year period, and (ii) rent shocks, or the decision of the owner to increase rent by 20% or more over a two-year period. While I would like to examine below-market rent setting as well, the POMS did not ask this question.

3.3.1   Data: Joining the POMS to the AHS

While the POMS was generated from a subsample of the 1993 AHS there is no official key to join the two data sets. I contacted the Census Bureau for a key, but they declined, citing privacy concerns. Every unit in the POMS was surveyed in the 1993 AHS. Two years later, while the owners were filling out the POMS, tenants for nearly every unit in the POMS were filling out the 1995 AHS (a few units were vacant). The challenge, then, is to find the 8,258 units in the POMS among the 18,924 units in the AHS that are privately owned rentals. I use the 1995 AHS to limit the potential for units to have changed between the two surveys. Many of the questions asked in the POMS are also asked in the AHS. Unique combinations of answers to these overlapping questions form a hidden code that shows which units in the AHS were selected for the POMS.

I join the POMS and AHS by finding the best combination of shared variables between the two surveys. First I find all variables that are shared. Then I assess how likely it is that the variables will align between the surveys and categorize each variable. Misalignment could happen for two reasons: differences in what the survey takers report about the unit (the owner and the tenant are asked the same question about a unit and report different answers because of differing thoughts on the unit) or differences in time the survey

was taken (the owner and the tenant report different answers because the unit itself has changed in the time between the tenant's and owner's responses). Even people who have lived in or owned properties for years might not know or guess incorrectly on questions about the same unit, though alignment on some questions be more likely than others (e.g. whether the building has an elevator is easier to agree on than specifying what kind of fuel is used to heat the building). POMS was administered from November 1995 to June 1996 (the public use data does not show the date of the response), while the 1995 AHS was administered from August 1995 to February 1996. This means that some questions where there would likely be no disagreement between the owner and the tenant, may not be reported as the same in the AHS and POMS (e.g. while tenant and landlord would likely both know and report the same rent, they may not if the rent had changed between the surveys) (Bogdon & Ling, 1998). Furthermore there are numerous non-responses in the POMS (non-responses cannot be used in the join) and there is demonstrable inaccuracy in some AHS answers, even for seemingly straightforward questions. For example the number of bedrooms in a unit has been shown to vary between AHS surveys in cases where it is very unlikely that the number of bedrooms actually changed (Weicher et al., 2016). I divide overlapping questions between the surveys into four categories.

1. **Answers that are coded by the Census Bureau in the AHS and POMS.** A few variables shared by the AHS and POMS have values provided by the Census Bureau, not whomever took the survey. For example the geographic variables in the survey are coded by the Bureau, and thus (as long as the codes themselves are the same) there is no chance that a specific unit would be coded differently in the POMS and AHS.

2. **Questions where it is likely that the owner and tenant will respond with the same answer.** The POMS and AHS ask many questions about the property that should be reasonably obvious to both owners and tenants. These include the number of units in the building, the rent of the unit, the number of bedrooms in the unit, and whether the building has an elevator.

3. **Questions where it is possible the tenant and owner will respond with the same answer.** This category includes the age of the building, the heating system and fuel of the building, and the water heating system and fuel.

4. **Questions where there is not a reasonable expectation of alignment between answers.** These include questions in the AHS that are known to be of poor response quality (such as whether a unit is rent controlled) and questions that align between the POMS and the 1993 AHS but are not included in the 1995 AHS.

Categories 1 and 2 are used to perform the join, category 3 is used for join validation, and category 4 is not used in the join.

Of the 8,258 units in the POMS, I matched 923 to the 1995 AHS, for a 11.2% match rate. The principal reasons for the low match rate was the high frequency of missing values in the POMS and the relative rarity of unique combinations of the matching variables. For example 2,740 responses in the POMS did not specify if their property had an elevator. Many combinations of all the joining variables in the AHS described multiple AHS units, making a match impossible. For example 44 units in the AHS were single family detached houses in the Western US that were inside the central city of metro areas, did not have an elevator and rented for $1,100 per month. To validate the match I examined a set of six variables in category 3 that match between the POMS and the 1995 AHS, but were not used to generate the matched POMS - 1995 AHS dataset. The validation used two criteria, (i) at least three of the validation variables need answers in both surveys (non-responses are common in the POMS) and (ii) at least half of the variables where there are answers in both surveys need to agree. 905 of the matched POMS - 1995 AHS dataset had at least three validation variables available in both surveys. 808 had at least half of validation variables in agreement. The 132 cases that did not meet criteria (i) and (ii) were discarded from the dataset, resulting in a total validated matching POMS - 1995 AHS dataset of 791 observations.

The Census Bureau provides a unique identifier for all units in the AHS, making joining surveyed units across years straightforward. Joining prior AHS surveys to validated POMS - 1995 AHS results in 606 surveyed units with associated owners where at least two years' of data are observed through the AHS. The principal reason for the lost observations was that, of the validated POMS - 1995 AHS matches, 168 owners had held the surveyed property for under two years or did not report when they bought the property. Most surveyed units had been held for a long period, with 567 units having AHS data back to 1985. I do not include AHS surveys prior to 1985 as there

was a large re-sampling for the 1985 survey. The final dataset has 3,635 annual observations of units with known owners.

3.3.2 Methods: Logit and Linear Probability Models

I use logit and linear probability models to examine the drivers of rent changes for individual units. The form of the models is below:

$$y_{it} = \alpha_t + \sum_{a=1}^{A} \beta_a ownership_{ait} + \sum_{b=1}^{B} \gamma_b market_{bit} + \sum_{c=1}^{C} \delta_c tenant_{cit} + \sum_{d=1}^{D} \eta_d policy_{dit} + \sum_{e=1}^{E} \theta_e property_{eit} + \epsilon_{it}$$

Where:

- y_{it} is the dicotomous response variable; I model rent stickiness and rent shocks
- α_t is a year dummy, to account for national changes in inflation
- a indexes the set of A ownership characteristics
- b indexes the set of B market characteristics
- c indexes the set of C tenant characteristics
- d indexes the set of D policy characteristics
- e indexes the set of E property characteristics

3.3.2.1 Owner Characteristics

Scholars have typically operationalized professionalism with portfolio size, but also recognize that professionalism is more complex than a number of units. Verbrugge and Gallin's (2017) theory of sticky rents is based entirely on differences in owner portfolio size. Sternlieb (1966) defined "big time professionals" as owners with 12 or more properties (the property sizes in the study area meant this worked out to be between 36 and 72 units). (Krohn et al., 1977, p. 7) write that "the crux of the difference between the local-amateur and the national-professional economies is the scale of operations." However they are clear that it is the social interactions between tenant and landlord that drive the difference between the amateur and professional. This distinction by portfolio size maps fairly closely on property size. Very few

small property owners had large portfolios, and the owners of large properties (50+ units) tended to have more than one large property. Fundamentally, though, most scholars defined professionalism as the objective to maximize financial returns. Non-professionals had other objectives having to do with their lifestyle or quality of life, their desire to have steady, and have low-risk income in retirement (Krohn et al., 1977).

- **Resident Landlords** - Resident landlords of 2-4 unit buildings have been consistently shown to behave differently than non-resident landlords (Ellen et al., 2013; Porell, 1985). Residents landlords may also set rents differently. (AHS)
- **Portfolio Size** - Following Verbrugge & Gallin (2017), I divide owners into those with a single property and those with more than one property (POMS)
- **Level of Interaction between Tenant and Landlord** - Krohn, Fleming, and Manzer's (1977) theory is based on the differences that can arise between landlords who routinely have meaningful interactions with their tenants and landlords who do not. These interactions are hard to measure, but owners' response to the POMS question "In the past 12 months, about how often did the owner visit this property?" provides a useful distinction between owners that at least have the opportunity to have frequent meaningful interaction and those that do not even have this opportunity. (POMS)
- **Owner Intent** - Scholars have theorized that the owner's reasons for acquiring and holding property are important to understanding their behaviors (Gilderbloom & Appelbaum, 1988; Sternlieb, 1966). I use owner's answers to the question "What were the owner's reasons for acquiring this property?" to measure this difference. (POMS)
- **Factors Considered When Setting Rent** - Scholarship suggests that information barriers are important to understanding rent-setting (Genesove, 2003). To evaluate how owners set rents I use the answer to the question "What are the most important factors considered when setting rent at this property?" (POMS)

3.3.2.2 Tenant Characteristics

- **Tenure Duration** - The number of biennial periods the tenant has

lived in the unit. As discussed in chapter 2 tenure duration is intimately related to rent-setting and is endogenous with below-market rate rent-setting. The extent to which tenure duration is endogenous to stickiness and shocks is less clear. Genesove (2003) shows that stickiness is common even at turnover and Verbrugge & Gallin (2017) suggests that shocks might be expected even for continuing tenants. (AHS)

- **Tenant's Family Status** - A dummy indicator shows the presence of children under the age of 18. Landlords might set rents differently for tenants with children. (AHS)
- **Tenant's Race and Ethnicity** - Tenants filling out the AHS reported their race which I consolidate into "White," "Black," and "Other." Ethnicity was also reported as tenants being of "Hispanic or Spanish American" or not. Landlords may set rents differently for non-Hispanic whites relative to other races and ethnicites. (AHS)

3.3.2.3 Market Characteristics

- **Market Segment** - The rent of the unit relative to the HUD Fair Market Rent for similar-sized units in the metro, binned into three equal count categories (AHS-HADS)
- **Rental Market Trajectory** - The biennial change in metro median rent (AHS)

3.3.2.4 Policy Characteristics

- **Rent control** - Rent control should have a major impact on stickiness and shocks, but is difficult to measure Many units in the AHS are reported as being rent controlled, despite being in states where rent control is prohibited. Instead of using this field I impute rent control status by assuming that all units in multifamily properties in metros with rent control are controlled. This will result in few or no false negatives (cases where a unit is modeled as uncontrolled is in fact controlled), but at least some false positives (cases were a unit is modeled as controlled but is in fact not controlled). I use Genesove (2003) for sources detailing metros that have rent control during the study period. (AHS - imputed)
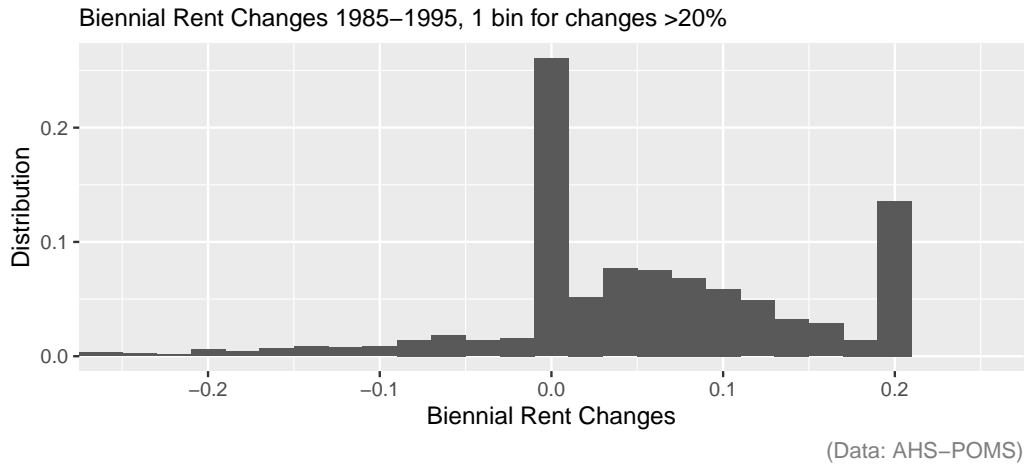
Figure 13: Rent Shocks and Stickiness are Common in the Sample

3.3.2.5   Property Characteristics

- **Building Age** - Newer units and properties built to be rentals may function in a different market than other units. (AHS)
- **Unit Size** - It is possible that sub-markets may exist by unit size (O'Flaherty, 2009). This is measured by the number of bedrooms in the unit (AHS).

3.4   Results

3.4.1   Baseline Stickiness and the Impact of Turnover

Rent stickiness and shocks are quite common, though the joined sample has a higher level of stickiness than the full AHS sample. Figure 13 shows the distribution of biennial rent changes from 1985 to 1995 in the joined sample. (Rent changes of 100% or more are excluded from this graph.) Over all biennial periods 25% of rents did not change. This is a slightly higher level of stickiness than the whole AHS sample, which saw 23% rents sticking biennially. About 13% of the biennial periods in the joined sample saw a rent shock. This is very close to the frequency of rent shocks in the full AHS sample, where 15% of rents increased by 20% or more.

Biennial Rent Changes 1985–1995, 1 bin for changes >20%

(Data: AHS–POMS)
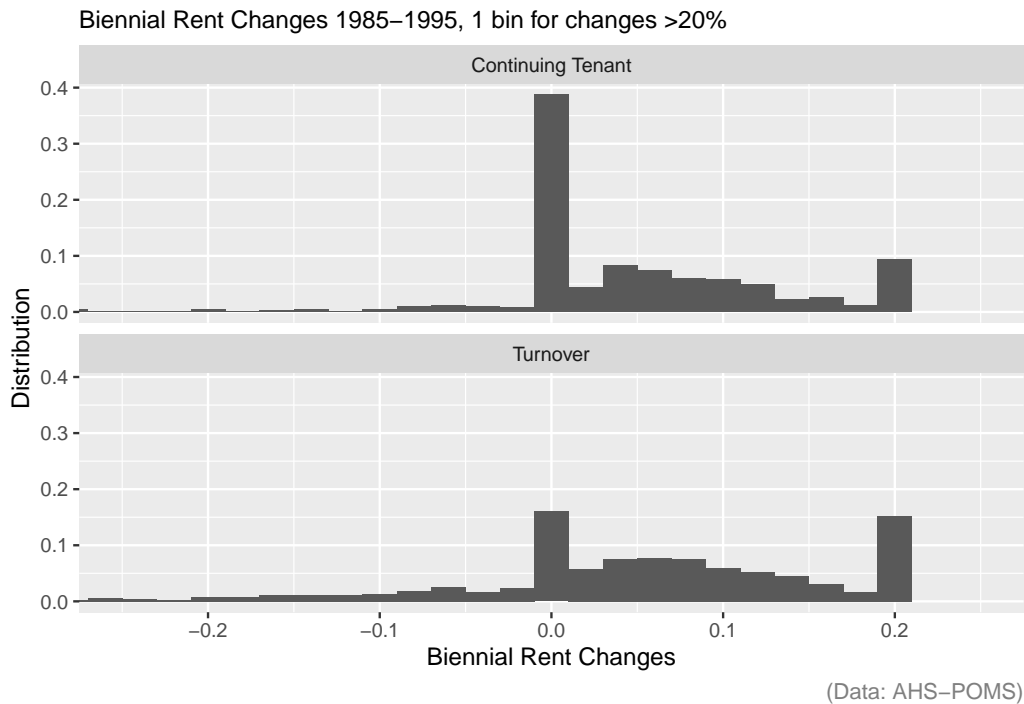
Figure 14: Stickiness is very common for continuing tenants, while shocks occasionally happen both at vacancy and to continuing tenants.

Stickiness is far more pronounced over biennial periods where tenants continued to live a unit, relative to periods where the unit turned over, though even upon turnover rents are notably sticky. Figure 14 shows rent changes by turnover status in the joined AHS-POMS sample. Owners held rents flat for 38% of biennial periods where tenants stayed put, relative to 16% for units that had turned over. This pattern supports theories suggesting that stickiness has at least something to do with the owners reacting to current tenants.

Turnover also matters for rent shocks, but has a smaller impact. 9% of biennial periods saw a rent shock for continuing tenants, relative to 15% at turnover.

Table 7 shows the summary statistics for the models. Non-professional or amateur owners are well-represented in the sample. 53% of owners have 1-unit portfolios. 15% of owners are resident landlords of 2- to 4-unit properties

and 5% were "landlords by accident" who had inherited, not purchased their rental property. About a quarter of owners had initially purchased their property to be their home. Larger-scale owners were present as well, with 17% using a corporate entity to hold the properties and 200 observations of units held by owners with 50 or more units. Many owners selected multiple factors when asked how they set rents, with demand-based factors such as the "demand for rental unit in the area" and the "rents for similar units in the area" being the most frequently selected.

Turnover was fairly high in the sample, with most tenants having moved in within the past two years. About a third of tenants had children under the age of 18. 66% of tenants were white, 14% Black, and 15% identifying as having Hispanic ethnicity, with the remainder identifying as another race.

The properties were in diverse markets with about 15% of properties being in the top third of rental for the metro and the remaining properties about evenly split between the lower and middle terciles by rent. The average biennial metro rent growth was about 8.5%. Very few units were rent controlled. Properties tended to be fairly old with the median age being about 64 years.

3.4.2 What Factors are Correlated with Rent Stickiness and Rent Shocks?

Table 8 shows the results of the models. Similar to the findings in Chapter 2, the models show that rent setting is idiosyncratic. While the models are an improvement over intercept-only model, they explain only a small portion of the total variability in stickiness and rent shocks. The OLS models explain only about 10% of the variation seen in the sample. Despite being based on prior theory about what factors matter in rent-setting, only a few of the factors in the models are significantly correlated to rent stickiness and rent shocks.

Owner Variables

- **Differences between owners generally appear to have little to no impact on owner's likelihood of holding rents flat or sharply increasing rents, with two exceptions.** Studies have shown that resident landlords of 2- to 4- units buildings charge below-market rents and over-improve their properties, but resident landlords appear to

Table 7: Summary Statistics for Shock and Stick Models

Statistic	N	Mean	Median	St. Dev.
Rent Stickiness	1,611	0.263	0.000	0.441
Rent Shocks	1,611	0.132	0.000	0.339
Resident Landlord	1,704	0.157	0	0.364
1-Unit Portfolio	1,501	0.611	1.000	0.488
Professionally Managed	1,634	2.657	2.000	2.479
Frequency that Owner Visits Rental (/month)	1,675	0.196	0.000	0.397
Bought to be Own Home	1,675	0.078	0.000	0.268
Bought to Provide Affordable Housing	1,675	0.593	1.000	0.491
Bought For Rental Income	1,675	0.380	0.000	0.485
Bought for Capital Gain Potential	1,675	0.120	0.000	0.325
Bought for Tax Shelter	1,675	0.324	0.000	0.468
Bought for Retirement	1,675	0.211	0.000	0.408
Bought for Family Security	1,704	0.055	0	0.227
Inherited Property	1,693	0.307	0.000	0.461
Set Rent Based on Demand	1,693	0.491	0.000	0.500
Set Rent Based on Similar Property's Rent	1,693	0.317	0.000	0.466
Set Rent Based on Inflation	1,693	0.194	0.000	0.396
Set Rent Based on Operation Cost	1,693	0.191	0.000	0.393
Set Rent Based on Expected Change in Costs	1,693	0.189	0.000	0.392
Set Rent Based on Impact to Turnover	1,704	0.832	1	0.374
Individual Owner	1,704	0.168	0	0.374
Corporate Owner	1,673	1.484	0.000	2.836
Duration of Tenure	1,704	0.303	0	0.460
Children in Unit	1,704	0.667	1	0.471
Non-Hispanic White Tenant	1,704	0.141	0	0.349
Black Tenant	1,704	0.143	0	0.350
Hispanic Tenant	1,704	0.049	0	0.215
Other Race Tenant	1,704	0.417	0	0.493
Low-End Unit	1,704	0.472	0	0.499
Mid-Range Unit	1,704	0.112	0	0.315
High-End Unit	1,377	1.086	1.083	0.205
Metro Rent Trend	1,704	0.092	0	0.288
Rent Controlled Unit	1,685	1.638	2.000	0.735
Bedrooms	1,704	72.294	74	26.235

Table 8: AHS-POMS Model Results

	Dependent variable:			
	Stickiness		Shocks	
	logistic	OLS	logistic	OLS
	(1)	(2)	(3)	(4)
Resident Landlord	0.331	0.063	−0.208	−0.018
	(0.210)	(0.040)	(0.273)	(0.032)
1-Unit Portfolio	0.234	0.048	−0.224	−0.023
	(0.179)	(0.032)	(0.223)	(0.025)
Professionally Managed	−0.226	−0.040	0.080	0.009
	(0.199)	(0.035)	(0.251)	(0.028)
Frequency that Owner Visits Rental (/month)	−0.023	−0.005	−0.073	−0.007
	(0.035)	(0.006)	(0.047)	(0.005)
Bought to be Own Home	0.128	0.023	0.163	0.026
	(0.219)	(0.040)	(0.272)	(0.032)
Bought to Provide Affordable Housing	0.121	0.026	−0.323	−0.044
	(0.304)	(0.055)	(0.425)	(0.044)
Bought For Rental Income	−0.118	−0.020	−0.093	−0.005
	(0.167)	(0.030)	(0.212)	(0.024)
Bought for Capital Gain Potential	−0.087	−0.014	−0.107	−0.014
	(0.167)	(0.030)	(0.220)	(0.024)
Bought for Tax Shelter	0.220	0.038	−0.107	−0.013
	(0.236)	(0.043)	(0.317)	(0.034)
Bought for Retirement	−0.160	−0.026	−0.245	−0.029
	(0.179)	(0.032)	(0.235)	(0.025)
Bought for Family Security	0.219	0.037	0.160	0.018
	(0.193)	(0.035)	(0.251)	(0.028)
Inherited Property	0.055	0.016	−0.096	−0.009
	(0.340)	(0.061)	(0.427)	(0.048)
Set Rent Based on Demand	0.012	0.003	0.338	0.036
	(0.178)	(0.032)	(0.226)	(0.025)
Set Rent Based on Similar Property's Rent	−0.149	−0.026	0.178	0.016
	(0.163)	(0.029)	(0.207)	(0.023)
Set Rent Based on Inflation	−0.145	−0.025	−0.006	0.003
	(0.175)	(0.032)	(0.226)	(0.025)
Set Rent Based on Operation Cost	−0.053	−0.010	−0.015	0.008
	(0.218)	(0.039)	(0.290)	(0.031)
Set Rent Based on Expected Change in Costs	0.429*	0.075*	0.064	0.008
	(0.220)	(0.040)	(0.290)	(0.032)
Set Rent Based on Impact to Turnover	0.057	0.012	0.756***	0.081***
	(0.194)	(0.036)	(0.243)	(0.028)
Corporate Owner	−0.367	−0.057	−0.293	−0.020
	(0.307)	(0.049)	(0.438)	(0.039)
Duration of Tenure	0.078***	0.015***	−0.102***	−0.011***
	(0.026)	(0.005)	(0.038)	(0.004)
Children in Unit	0.279	0.048	−0.162	−0.015
	(0.185)	(0.033)	(0.229)	(0.026)
Black Tenant	0.133	0.031	−0.017	−0.005
	(0.212)	(0.040)	(0.272)	(0.032)
Hispanic Tenant	−0.264	−0.045	−0.191	−0.023
	(0.240)	(0.043)	(0.290)	(0.034)
Other Race Tenant	−0.445	−0.069	−1.001*	−0.093*
	(0.380)	(0.065)	(0.574)	(0.051)
Mid-Range Unit	−0.163	−0.025	−1.435***	−0.172***
	(0.168)	(0.031)	(0.222)	(0.024)
High-End Unit	−0.706**	−0.114**	−1.919***	−0.205***
	(0.288)	(0.047)	(0.408)	(0.038)
Metro Rent Trend	−2.199*	−0.072	3.556***	0.143***
	(1.178)	(0.059)	(1.302)	(0.047)
Rent Controlled Unit	−0.680**	−0.109**	0.044	0.017
	(0.335)	(0.052)	(0.363)	(0.041)
Bedrooms	−0.187*	−0.034*	0.209	0.026*
	(0.110)	(0.019)	(0.139)	(0.015)
Age of Structure	−0.003	−0.001	0.009**	0.001**
	(0.003)	(0.001)	(0.004)	(0.0004)
Constant	19.027	1.211***	−20.690	−0.139
	(350.997)	(0.146)	(566.987)	(0.116)
Year FE	Yes	Yes	Yes	Yes
Observations	1,067	1,067	1,067	1,067
R^2		0.090		0.105
Adjusted R^2		0.059		0.075
Log Likelihood	−568.355		−383.589	
F Statistic (df = 35; 1031)		2.900***		3.457***

Note: *p<0.1; **p<0.05; ***p<0.01

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hold rents flat and sharply raise rents with the same frequency that non-residents landlords do (Ellen et al., 2013; Sternlieb, 1966). Properties under professional management no more or less likely to see rent stickiness relative to units managed directly by the owner. Likewise the frequency with while a landlord visited their property was not significantly correlated with stickiness or shocks. None of the reasons for purchasing the property were correlated with these rent-setting behaviors. Corporate owners engaged in stickiness and shocks at the same rate as individual owners.

- **Owners who set rents based on expected increase in operating costs were slightly more likely to hold rents flat, while owners who set rents while considering how rent affected turnover were more likely to engage in rent shocks.** Owners who reported considering "expected operating cost increases for the coming year" when setting rent were 53.6% more likely to hold rents flat, though this impact is only significant at the 90% level. The models show a much stronger correlation among the owners who reported the "effect on tenant turnover" was an important factor they considered when setting rent. These owners were nearly twice as likely to engage in a rent shock.

Market Variables

- **Low-end and mid-range properties are far more likely to have rents held flat than high-end properties but low-end properties are far *more* likely to see rent shocks.** Relative to properties in the bottom third of the market owners of properties in the upper third of the market are about half as likely to hold rents flat. But lower end properties see a higher frequency of rent shocks. The owners of mid-range properties sharply increase rent at only 23.8% the rate of low-end owners and high-end property owners only do at at 14.7% the rate of low-end owners.

- **Metro market trajectory has a weak effect on rent stickiness but substantially increases the chance of rent shocks.** A one standard deviation increase in metro rent growth is associated with a 32.2% reduction in the chance a landlord will hold rents flat over a to

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year period, though this impact is significant only at the 90% level. A similar shift is associated with a 87.5% increase in the chance an owner will sharply increase rents.

Tenant Variables

- **Turnover and the length of time tenants had lived in the unit dramatically influenced rent setting, as owners were far more likely to hold rents flat for continuing tenants than at turnover.** This effect is largely driven by turnover. Tenants who had resided in a unit for at least two years were substantially more likely to have their rents held flat. Longer-term tenants were more likely to have their rents held flat as well, though this impact is small relative to the impact of turnover.

- **Ethnicity, race, and the presence of children in the household did not appear to affect rent-setting.** None of these tenant variables were statistically significant at the 90% level.

Policy Variables

- **Rent control was associated with a substantial reduction in rent stickiness but appears to have no impact on rent shocks.** Relative to uncontrolled units, the owners of rent controlled units were only 49.3% as likely to hold rents flat over a two year period.

Property Variables

- **Owners of larger units were less likely to hold rent flat.** Owners of four bedroom units, for example, were 52.7% less likely to hold rents flat relative to owners of 1 bedroom units.

- **The owners of older properties were slightly more likely to sharply increase rents.** For every decade older a property was, its owners were 113% more likely to sharply increase rents.

3.5 Discussion

Controlling for market, tenant, policy, and property characteristics, the traditional measures of professionalism for landlords appear to explain very little about an owner's propensity to hold rents flat or sharply increase rents. Landlords with only one property hold rents flat or sharply increase rents at about the same rate as larger-portfolio landlords. Similarly there is apparently no difference between corporate landlords and individual landlords and landlords who routinely visit their rental property versus landlords who have never visited it. Landlords who purchased the property to be their home hold rent flat or shock it at about the same rate as landlords who purchased their property to generate rental cashflow. Landlords who consider rental demand when setting rents generally hold rent flat or shock it at about the same rate as those who consider operational expenses. This is somewhat surprising given the the enormous differences in market and property management savvy between amateur and professional landlords.

The the one major caveat, similar to the decision to set rent below market, is the extent to which rent stickiness and rent shocks drive tenants' decisions to move or stay put. Turnover explains a substantial amount of the variation in rent stickiness and rent shocks (stickiness is far more common for continuing tenants and shocks are somewhat more common upon turnover). But the amount of time that tenants have occupied the unit is also significantly correlated with rent-setting. This impact would align with amateur owners' demonstrable concern about turnover and would suggest that their rent-setting decisions are quite effective in lowering turnover. The models suggest that owners who seriously consider the impact of rents on turnover are substantially more likely to shock rents. This may be because these owners held rents below market for long-term tenants, then raised them at or close to market when their tenants moved. Omitting the duration of tenure from the models doesn't have a substantial impact on the model results, but this doesn't necessarily mean that the above theory is incorrect. Unobservables such as job loss, divorce, and other major changes in people's lives are major drivers of mobility and it is possible that differences in tenant selection practices result in group differences in these variables between owners (Clark & Onaka, 1983).

Local housing market conditions should be expected to affect rent-setting, and do, but the interpretation of this impact is complicated. As metro rents

rise, owners tend to hold rents flat less frequently and are more likely to sharply increase rents. This stands to reason. Even if there was a substantial difference between amateur and professional owners as general market trends are fairly easy to discern even for amateur owners setting rents in the 1980s. Newspapers articles on market conditions and even general trends from housing classifieds provided this general knowledge. Differences in rent-setting by the market segment of the property are tougher to discern. Verbrugge et al. (2016) notes that segmenting the market and looking at rent changes brings up the problem of regression to the mean. The rent for a specific unit is an imperfect measure of the market rent for a unit, many housing searchers would be willing and able to to pay more for some units that their current inhabitants, while other units are over-priced and tenants could find as-good units for less rent. Thus tracking changes over time will find that lower-priced units disproportionately see rent increases while higher-priced units disproportionately see rent decreases or stickiness. Lower end units are more likely than mid-range and, especially, high-end units to see rent shocks. However the findings for stickiness do not align with patterns to be expected from regression to the mean. High-end units are *less* likely to have their rents stick, relative to the low end of the market. This suggests that there is a real, non-random, difference in how rents are set for higher-end properties.

Chapter 4: Craigslist's Effects on Rental Market Efficiency

4.1 Introduction: The Impact of Housing Search Websites

The internet has changed how the owners of vacant units market their properties and how people search for rental housing. The 2017 American Housing Survey showed that about 37% of renters who moved in the past two years found their new home through an internet site such as Craigslist. It is likely that the internet will become even more dominant as more information that is useful to the housing search moves online. Online services now allow searchers to explore neighborhoods, apply to units with the click of a button, and receive immediate feedback about their application.

Scholars have often examined the shift of the housing search from traditional to online media through the lens of search costs and market efficiency. Owners of a vacant unit that once regularly paid $10 an inch or more per day for newspaper classifieds could suddenly reach a larger audience for free on Craigslist and provide much more information about a unit. People looking for a unit could now go to a website and search through thousands of ads easily using keywords, geographic filters, or other criteria. This shift neatly fit into existing economic theories and suggested that, as information flowed more freely, the rental housing market would become more efficient.

However what a more efficient rental housing market would exactly look like, and the ways in which these improvements could be measured, has been under-theorized and under-studied. Some scholars have anticipated that a more information-rich market would result in less "slack" in the market. Vacant rental units were the manifestation of this slack, so scholars looked for reductions in both rental vacancy rates and in how many vacant units rental markets needed before rents start to climb (the so-called "equilibrium vacancy rate"). Exactly how the rise of online searches could reduce vacancy rates, however, has never been clearly articulated. Economic theory suggested that the opening of information about vacancies in the rental stock will make it easier for both tenants and landlords to fill vacancies which, in the short term, should lower rents. However an open market also provides non-professional landlords, who often set rents below market, with market information that

could induce them to raise rents to market levels.

The freer flow of information in the housing search has the potential to affect "efficiency" in the rental marketplace in other ways as well. By making information on rentals more readily available, Craigslist might be expected to induce renters to move to units that better meet their needs, increasing renter mobility, at least in the short term. Conversely, a more efficient housing search may result in a better match between household and unit, reducing mobility over the long term. Efficiency could also mean a more efficient allocation of individuals into households. In other words online searches may facilitate the creation of non-family households composed of individuals who wish to live in a specific neighborhood, and are willing to share the same unit, regardless of whether they knew each other before.

In this chapter I will isolate the impact of the shift in the medium of the housing search by focusing on the 2000s when Craigslist expanded rapidly across the country. At the start of the decade Craigslist had only one page, its original San Francisco Bay Area site. By the end of the decade 702 metros across the world had Craigslist pages. From 2005 to 2007 alone the number of housing ads on Craigslist in the US ballooned from 2.8 million to over 3.8 million per month. This expansion represents a sharp break in time from rental listings dominated by traditional media to listings dominated by online media, particularly Craigslist.

I find that the entrance of Craigslist into metro markets either had no discernible impact or a very slight impact on various measures of efficiency in the rental market. There was no discernible change in renter mobility patterns or in non-family household formation. There appeared to be no improvement in the use of vacant units. Units that became vacant stayed vacant for the same duration pre-Craigslist as post-Craigslist. There was no indication that metro markets saw a reduction in the equilibrium vacancy rate, nor that Craigslist exerted any downward pressure on rents. To the contrary, the rise of Craigslist in the 2000s was associated with a slight increase in vacancy rates and slight increases in rents, raising the possibility that the service is more useful to suppliers of rental housing rather than renters themselves.

4.2   Literature Review

4.2.1   Housing search websites

Housing search websites emerged in the early years of the World Wide Web in the mid-1990s and became extremely popular by the end of the 2000s. Craigslist itself started in San Francisco in 1995 and rapidly grew in popularity in the Bay Area. In 2000 the company began establishing new local Craigslist pages across the US and by the end of the decade nearly all the US was served by a local Craigslist page. Figure 15 shows the rapid geographic expansion of Craigslist in the US during this period. Craigslist is one of the oldest housing search websites and remains dominant in many markets, but a number of other important housing search sites began in the 2000s as well. Realtor.com was established in 1996 featuring MLS listings and, by the mid-2000s, also provided rental housing services including listings and room-mate matching. Apartments.com (now a subsidiary of CoStar) was established in 1999, and Zillow began providing online rental services in the late 2000s. There are now dozens of housing search websites specializing in rentals. By the end of the decade the American Housing Survey showed that fully 10% of all renters who had recently moved found their new home through Craigslist, with an additional 9% finding their home through another website.

Housing search websites are attractive to housing searchers and providers because they are a low-cost means to broadcast a lot of information in a relatively easy-to-process form. Unlike traditional means of marketing, such as brokers, newspaper classifieds, or other print publications, Craigslist is free to both advertisers and searchers.[12] Owners marketing their units can provide detailed written descriptions and upload multiple pictures. Searchers can filter results by geography, price, characteristics of the unit, or other criteria. Having a single platform for rental housing marketing benefits both sellers and buyers by providing easy access to large pools of the group that wants what the other has. The benefit of being the largest platform is so powerful that it can overwhelm the advantages that come from innovation. Craigslist, for example, is still extremely popular, not because it provides a better user experience than other housing search websites, (Craigslist looks and works effectively the same way it did in the late 1990s), but because it is

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[12]The only exception for housing ads are whole-unit for-rent ads in New York City which cost $5 to post.

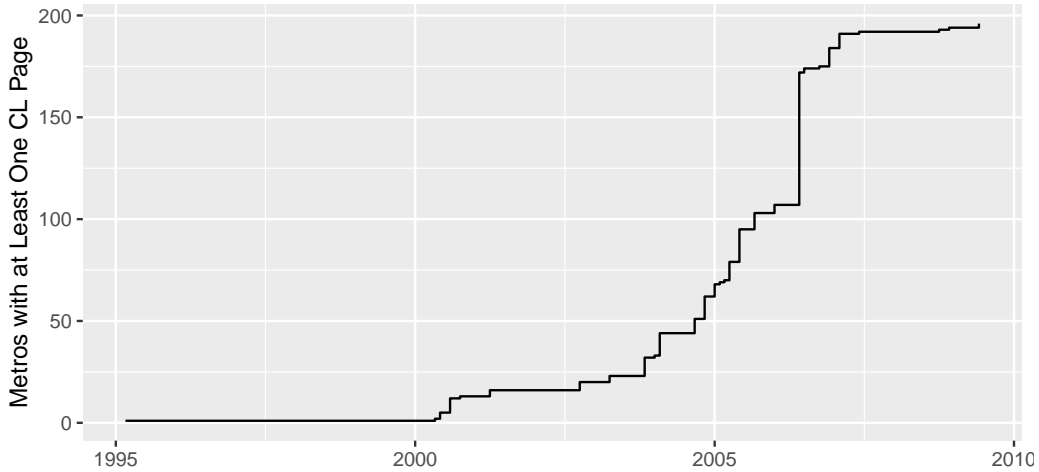**In the 2000s, Craigslist Rapidly Established Local Pages Across the US**

Figure 15: Number of Metros with a Craigslist Page

still often where the most listings are and where the most housing searchers are (Wolf, 2009).

Housing search websites effectively took the place of most other forms of formal rental advertising during the 2000s. Through the late 1990s and into the 2000s, the American Housing Survey (AHS) asked tenants who had moved in the past two years how they first heard about the home they ended up moving to. Responses were coded as "Advertisement (newspaper, booklet of homes available, internet, etc)," "broker," "sign on property," "Friend, relative, or acquaintance," or "other." From the late 1990s to 2009 the levels of these responses changed little. A plurality (about a third) first heard about their new home by word-of-mouth, while about a quarter first found their home through an advertisement. Throughout this period, housing search websites were gaining popularity as traditional sources, such as newspaper classifieds, declined. In 2011 the AHS changed the wording of their question to allow respondents to identify internet sources. By 2013 about the same proportion of recent movers found their home via the internet as found their home through any form of advertisement in the late 1990s. The wording of the question changed again in 2015 showing that about a third of all recent movers used housing search websites to find their new home (even if this was

not the first way their heard about the unit they ended up moving to).

Websites may be reshaping the search process in more profound ways as well. By creating a space for an enormous amount of information to be held and examined easily, the sites have provided a common forum for services that were previously done via word-of-mouth or physical bulletin boards, not through traditional marketing at all. From very early in their existence Craigslist had a section for "rooms / shared," facilitating roommate or house-mate matches. Craigslist now has ten sub-sections under "Housing" including "rooms / shared," "sublets / temporary," "housing wanted," and "vacation rentals." Craigslist may also exert some influence on rents. As we learned in Chapter 2, Craigslist also provides non-professional owners with a current dataset they can use to find comparable properties to estimate the market for their units. Making searching for units easier may also make it easier for tenants to find units that they can afford, potentially shifting market power to tenants.

4.2.2   Efficiency in the Housing Search

Scholars typically discuss the shift of housing ads from traditional media to online media as making information more available in the housing market thus improving market efficiency, though the tensions between a free flow of information and "efficiency" have been apparent from the start. There is no question that, in the context of housing ads, the internet has made housing searches a much more information-rich marketplace. Scholars have usually articulated this change as a reduction in "search frictions" (Kroft & Pope, 2014), "search costs" (Brown & Goolsbee, 2002), or simply as an improvement in "efficiency" (Zumpano, Johnson, & Anderson, 2003). The types of units that are advertised and the types of housing searchers that are conducting their search online, however, are not a cross-section of the whole market. Kroft & Pope (2014) found substantial heterogeneity between the increase in the number of housing ads in the mid-2000s by metro, driven, in part, by differences between metros in the age and education of the renters.

That different groups of Americans search for housing in different ways is nothing new, and differences in search methods, especially by race, are still prominent today. Before housing search websites became popular scholars found racial differences in the types of information sources used by black

and white renters (whites were more likely to use newspapers and social networks, while blacks were more likely to use brokers (Farley, 1996)) and in the number of units examined before moving (blacks tended to visit fewer units than whites, even though they spent more time searching (Cronin, 1983)). These differences may have been driven by the fact that information about housing in neighborhoods with more black residents was less available than information about homes in whiter neighborhoods (Newburger, 1995). Krysan (2008) found that even in the early years of housing search websites in the 1990s and early 2000s, blacks were about a third as likely than whites to use the internet in their search, controlling for numerous factors. More recently Desmond (2016) found that in Milwaukee from 2009 to 2011 fully 50% of white home searchers looked online while only 15% of black searchers did so. Boeing (2020) found that racial differences also manifest on the supply side. Vacant units in whiter, wealthier, and better educated communities were more likely to be marketed on Craigslist.

Furthermore the free flow of information made possible by the internet permitted types of discrimination that was prohibited in traditional media, and there are few signs that other kinds of discrimination abated as the housing searched moved online. Comparing housing classifieds in newspapers with online housing ads provides a stark contrast between the online housing search and searches with traditional media. Since the enactment of the Fair Housing Act in 1968 discriminatory newspaper housing classifieds effectively disappeared. Websites like Craigslist are not liable under the Act, however, and this led to a proliferation of discriminatory online ads. By some estimates over 5% of housing ads on Craigslist violate the Fair Housing Act (Oliveri, 2010). There has been a good deal of scholarship regarding the conflict between the Fair Housing Act, which made it illegal to "make, print, or publish, . . . any notice, statement, or advertisement, with respect to the sale or rental of a dwelling that indicates any preference, limitation, or discrimination based on" the federally protected classes and the Communications Decency Act, which holds harmless the housing search websites that might host discriminatory ads (Decker, 2010; Hanson & Hawley, 2011). It is still illegal for websites to actively facilitate housing discrimination in ads, though this has not prevented Facebook from allowing advertisers to exclude specific "ethnic affinities" from being shown housing ads from at least 2016 to today (Angwin & Parris Jr., 2016; Benner, Thrush, & Isaac, 2019). While online searches might have held the potential of reducing discrimination through

the anonymity that comes with online interactions, audit studies show that traditional methods of discrimination are still practiced on the basis of the protected classes (Hanson et al., 2011; Hogan & Berry, 2011). The results of these studies show levels of discrimination that do not differ substantially from those differences seen in brokerages (Urban Institute, 2013).

The consequences of the shift of the housing search to online media has been most thoroughly studied in the home purchase market where scholars have looked for reductions in the duration of the home search and an improvement in the match between household and unit. There is some evidence that home buyers who used their internet in their search spent a longer time searching and visited more homes (National Association of Realtors, 2015; Palm & Danis, 2001), though other studies have found that home searches conducted via the internet have the same duration as those conducted with traditional methods (Yuan, Lee, Kim, & Kim, 2013). Research on the geographic breadth of for-sale home searchers is similarly conflicting with some studies showing that home buyers that used the internet conducted geographically broader searches and moved longer distances (Qin, Zhen, & Zhu, 2016), and other studies showing little or no geographic effect on the search (Chen & Lin, 2012; Palm & Danis, 2001). There is some evidence that home buyers who found their home online end up paying more for their home (Ford, Rutherford, & Yavas, 2005; Palm & Danis, 2002), possibly the result of a better matching process between searcher and product (Zumpano et al., 2003). Measuring the impact of housing search methods on the "match" between a household's preferences and the home they choose is difficult in part because the housing search is inherently iterative: the search methods affect preferences, and the search is adjusted as preferences change (Rae, 2015).

The impact of the internet on the rental housing search has the potential to be greater than it is in the home-purchase market and a few studies point to substantial market impacts. Renters search for homes far more often than home-purchasers, so a change in the search might be expected to have a bigger and faster impact in this section of the market. The anticipated efficiency improvements that the internet could bring to the rental housing search have mostly focused on vacancy dynamics. Hagen & Hansen (2010) examined the Seattle metro and, using estimated levels of internet use, found evidence that rising internet use lowered the equilibrium rental vacancy rate. Kroft & Pope (2014), in the course of a larger examination of the effect of Craigslist on matching efficiency, found evidence that growth in Craigslist housing posts

of 1 post per 1,000 people in the metro decreased the rental vacancy rate by approximately 0.15 percentage points. Given that the average study metro examined saw an increase in listings of 6.1 per 1,000 people, they estimate an average 1% absolute decrease in rental vacancy rate, or a 10% relative decrease, given that the average rental vacancy rate of the studied metro areas was 10.3%. Das, Ziobrowski, & Coulson (2015) also found that Google apartment searches (measured through Google Trends) were associated with declining rental vacancy rates, though they found that the vacancies drove the searches, not vice versa. Specifically a 1 percentage point increase in vacancy rates was correlated with a 0.4 to 0.6% increase in online searches. These findings are intriguing and open up a range of questions given what is already known about rental vacancy rates.

Hagen & Hansen (2010) argue that online searches should improve market efficiency by causing a decline in equilibrium vacancy rates. Equilibrium (also called the "natural") vacancy rates, refer to the portion of the stock that will be vacant even when supply equals demand. In his review of the literature on the subject Belsky (1992) noted that, while policymakers often use vacancy rates as an absolute measure of the balance of supply and demand (often vacancy rates below 5% are taken as a sign of a tight market, while rates above 10% mean a loose market (US Department of Housing and Urban Development, 2016)), vacancy rates should only be interpreted in the context of a metro and time-specific equilibrium vacancy rate. Indeed, there are a number of signs that rental vacancy rates alone do not provide a good measure of the balance of supply and demand, such as the periods in US history where rental vacancy rates have increased alongside average rents (Belsky & Goodman, 1996). Equilibrium vacancy rates, first postulated by Blank & Winnick (1953) and empirically derived by Smith (1974), refer to the rental vacancy rate at which rents rise no faster than inflation, showing a balance of supply and demand. This rate is not equal to zero, in part, because of search costs. Lowering search costs should reduce this rate. Hagen & Hansen (2010) find that, in the apartment market in Seattle during a period of rising internet use (1989–2005) equilibrium vacancy rates did decline, though their study is hampered by the fact that they did not directly observe the movement of the housing search to online sources. Instead they applied a generic curve function that was meant to show the rise of internet use.

Kroft & Pope (2014) frame their findings as evidence that services like Craigslist reduce information barriers and thus result in more efficient

matches in the marketplace. They write,

> Our empirical analysis of matching efficiency focuses on the labor and the apartment and house rental markets. The average duration for the vacancy of a rental unit in the United States is approximately 4 months. Estimates of the average duration of a job vacancy are typically less than 1 month. An open empirical question facing both urban and labor economists is the extent to which "search frictions" underscore these lengthy durations.

To measure the extent to which Craigslist has improved match efficiency they examine unemployment and rental vacancy rates. Increasing the speed of hiring for unfilled positions would lower the unemployment rate, but increasing the speed of filling vacant units would not necessarily lower the vacancy rate. The unemployment rate measures the number of unemployed people in the labor market relative to all adults in the labor market. Fill unfilled positions faster and the numerator will drop while the denominator remains the same. The vacancy rate, however, measures the number of vacant housing units relative to all units, thus including both the total number of households (the occupied units, the numerator) *and* the total number of housing units (the occupied units plus the vacant units, the denominator). Filling vacancies faster in the housing market, ceteris paribus, would mean a faster churning of existing households as they moved from one unit to the next, and have no effect on the observed vacancy rate. This renders the findings of Kroft & Pope (2014) intriguing (they provide evidence of a relationship between the rise of Craigslist and a decline in observed vacancy rates), but opens the question of what could be driving this relationship.

This chapter analyzes three potential efficiency improvements that could be expected with the rise of the internet. The first are changes in renter mobility. By reducing search costs, renter households may at first move more frequently to use the rental housing stock more efficiently. Over the long term, though, better matches between renter households might reduce renter mobility, as renters have chosen units that were a better fit for their housing needs. It is possible that mobility changes may have driven the lowered vacancy rates observed by Kroft & Pope (2014). Rental vacancy rates are difficult to accurately measure (see Belsky (1992) and Cresce (2012)) and it is possible that more vacancies with shorter durations (which might result

from an initial increase in mobility) could appear as a reduction in the rental vacancy rate.

Secondly, online search media could induce new household formation by facilitating connections between members of existing households who band together to form a new household. Mawhorter (2018) shows that years of reduced rates of household formation (due to high housing costs, high unemployment and stagnant incomes among young people) have generated pent-up demand of approximately 3.3 million as-yet unformed households. This has led to an increase in households composed of room- or house-mates (Fry, 2015; Furman Center, 2016). Online housing search media should be expected to play a role in this dynamic, given that these sites (including Craigslist) have large roommate matching ad sections in addition to their whole-unit ad sections.

Thirdly, online search media could affect efficiency in rent-setting, specifically by lowering the equilibrium vacancy rate. An easier housing search, for both suppliers and demanders of housing, should reduce the waste that comes from the presence of vacant units. While Hagen & Hansen (2010) provide some evidence of this reduction, their lack of a direct measurement of the importance of online media is troubling. More online searches could also affect rent setting by pushing rents upward. "Waste" could take the form of rents that are below market because their owners do not know the market value of their units. Gilderbloom & Appelbaum (1988) show that non-professional owners (who collectively own about half the rental units in the US) had substantial difficulties estimating what the market rate for their unit before the housing search moved online. As I outline in chapter 2, non-professional owners now routinely use online search media in the rent-setting process. The widespread use of Craigslist as a method to estimate the market value of non-professional owners units suggest that online search media have substantially improved non-professional owners knowledge of the market.

Analyzing the impact of the shift of the housing search to online media has proved challenging because of the endogeneity of vacancies and ads. Measures of the impact of online search media by ad counts (Kroft & Pope, 2014) or housing searches (Das et al., 2015) are endogenous to rental supply and demand. The more vacant units are available, the more ads will be placed for those vacant units; the more people are in need of rental housing, the more they will go online to search for housing. Kroft & Pope (2014) avoided this

problem by instrumenting ad counts using levels of personal ads on Craigslist.

The wild gyrations in the housing market in the 2000s also complicate the study of online searches. While the biggest determinant of vacancy dynamics (including equilibrium vacancy rates) are the differences between metros (Gabriel & Nothaft, 2001), time varying factors also drive changes (Belsky & Goodman, 1996; Gabriel & Nothaft, 2001). It is possible that the findings of Hagen & Hansen (2010) and Kroft & Pope (2014) are the result of the chance alignment of dramatic shifts in the housing market in the mid-2000s and the rise of sites like Craigslist. A number of time-varying factors have been shown to affect vacancy rates, many of which changed rapidly in the mid-2000s. The literature is clearest on the impact of new rental housing construction, which is agreed to increase vacancies as the units are absorbed into the market (Belsky & Goodman, 1996; Deng et al., 2003; Gabriel & Nothaft, 2001). Population growth might be expected to depress vacancies, but has been shown to affect the mobility of renters within the metro as well (Belsky & Goodman, 1996; Deng et al., 2003; Gabriel & Nothaft, 2001). While the mobility of renters should, in theory, not affect vacancy rates (the same number of households moving to and from the same number of units will yield the same vacancy rate, regardless of how frequently the moves happen), the difficulty of measuring short vacancies may result in a change in observed rates (Deng et al., 2003; Gabriel & Nothaft, 2001). Changes in the home ownership rate should be expected to affect the rental vacancy rate, as households shift from renting to buying and back (England, 2016).

4.3   Analytical Approach

I use fixed effect models to examine differences between the pre-Craigslist and post-Craigslist trends in vacancy rates and the drivers of vacancy rates in US metros. Fixed effects models deal with many of the difficulties of isolating the impact of housing search websites. Craigslist expanded so quickly that there are only a few years where many metros had a Craigslist page while others did not, complicating a differences-in-differences approach. Fixed effects models avoid the problem of endogeneity between vacancies and online housing ads. The models exploit differences *within* metros over time, and measure the impact of Craigslist by looking solely at (i) whether the metro has a Craigslist page yet and, if so, (ii) how long it has had the page. I will show that the amount of time a page is active is a powerful determinant of its prevalence

in the market. Lastly, year fixed effects deal with many of the fluctuations that may have coincided with the entrance of Craigslist to metro markets. While there were variations among metros in, for example, the rise in home ownership during the first half of the 2000s, the biggest shifts in this time period were national changes.

The model design also exploits near-random timing of Craigslist entry to US metros. The timing of Craigslist expansion within the decade is not random - Craigslist first established new pages in large metros, especially in well-educated metros in the western US, then expanded to the rest of the country. The expansion of the site to all metros over the course of this particular decade, however, was not correlated to the housing or household dynamics of each metro market. From its establishment in 1995 to 2000 the site served only the San Francisco Bay Area. Craigslist expanded across the US in the 2000s because of a leadership change in 1999. In that year the founder of Craigslist, Craig Newmark, stepped down as CEO and Jim Buckmaster took control of the firm. Newmark has stated that while he led the company "I had trouble making tough decisions. . . . I didn't make major decisions that required some boldness, like adding new cities. I knew we needed to expand in that way, but I guess I didn't have the guts to do it" (Fine, 2016). From 2000 onward Buckmaster drove the geographic expansion of Craigslist, which had effectively provided a local page for the entire US by 2010 (Wolf, 2009).

To disentangle the drivers of changes in rental vacancy rates I will decompose rental vacancy rates into (i) the frequency of vacancy (the number of times a vacant unit enters the market in the course of a year relative to the total rental stock, sometimes also referred to as the incidence of vacancy) and (ii) the average duration of vacancy (the mean time rental units stand vacant and un-rented in a metro in a year). The product of these two statistics is the rental vacancy rate. Figure 16 shows the important stocks and flows of the rental market. The rental vacancy rate is the number of vacant, for-rent housing units divided by the total of the three stocks shown. The frequency of vacancy is the total flow into the vacant, for-rent housing unit stock over the course of a year (shown below as the red arrows) relative to the total number of rental units. The average duration of vacancy can be conceptualized as a measure of the flow of units out of vacancy (shown below as green arrows). I will also measure renter mobility and the formation of non-family renter households of two or more members.
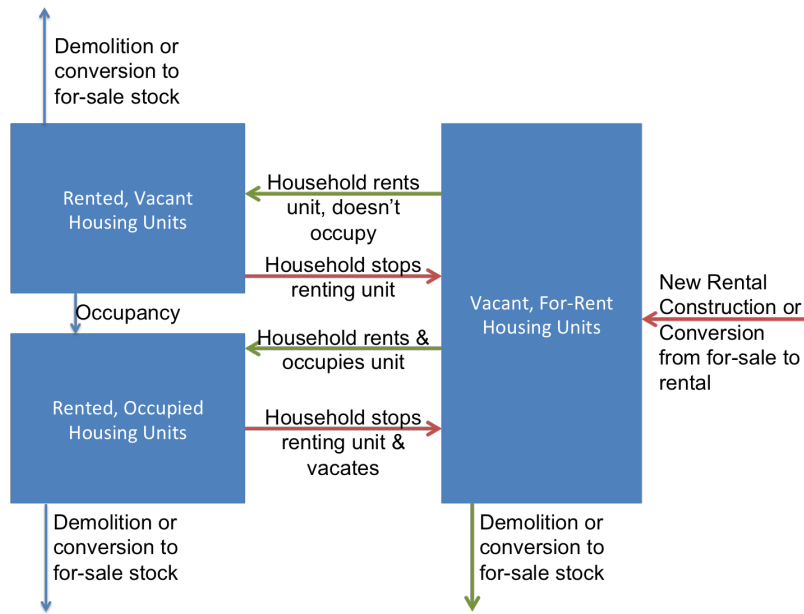
Figure 16: Conceptual Diagram of Vacancy Rates

4.3.1 Data

There is no single source that provides the rental vacancy data for all metros that got a Craigslist page from 2000 to 2010, so I combine three data sets. The first is the standard source of metro rental vacancy rates, the Census Bureau's Housing Vacancies and Homeownership Survey (HVS), which is compiled as part of the Current Population Survey. This survey collected data from about 72,000 housing units annually. The smallest geographic unit of analysis for this survey is the largest 75 metros in the US. From 1993 to 2004 the HVS reported data on metro rental vacancy rates using OMB-defined metros from the 1990 census. From 2005 to 2014 the HVS used the metros defined from the 2010 Census. Only 24 metros were present in both lists with unchanged borders. 9 metros in the HVS got Craigslist pages early the decade, providing a few years of "treated" observations before their borders shifted. 2 metros in the HVS got pages after 2005, providing at least a year of pre-treatment data after their borders had changed. San Francisco is excluded from the analysis because it was not part of the 2000 expansion of Craigslist. This leaves 34 metros with fixed boundaries over

time periods that include at least a year of pre-Craigslist observations and at least three years of post-Craigslist observations. Observations of metros that had Craigslist for over 6 years are dropped in order to isolate the impact of the entrance of Craigslist.

The second data source is the American Community Survey, which provides detailed annual housing data starting in 2005 for all US metros and is much larger than the HVS, covering about 3 million addresses annually. 93 metros of more than 200,000 residents got a Craigslist page after 2005.[13] Because the ACS only began fully in 2005 (pilot versions of the survey were run from 2000 to 2004, but had smaller sample sizes), metros where pages were established in 2005 are dropped to ensure at least one year of pre-Craigslist trends. Observations that extend more than a year past the number of pre-trend years for each metro are dropped, also to isolate the impact of the entrance of Craigslist.

The third data source provides the most detailed vacancy data: the Bureau of Labor Statistics Housing Survey. These data are collected as part of the calculation of the Consumer Price Index (CPI). A few scholarly papers have used these data to examine vacancy dynamics (Deng et al., 2003; Gabriel & Nothaft, 2001). The survey collects data from approximately the same number of rental units as the HVS (only a portion of the HVS units are rentals). The survey is well-suited to examining vacancy, as it is a panel survey that returns to the same units in each panel every 6 months, and thus can provide detailed data on the frequency and duration of vacancies (Bureau of Labor Statistics, 2007). The smallest unit of analysis for the BLS Housing Survey are "Primary Sampling Units." Many PSUs are either identical or very similar to OMB-defined metropolitan areas. The PSUs that are unlike metros are composed mostly of aggregations of counties (for example the New York City region is composed of the 5-borough PSU, the Connecticut suburbs PSU, and the New Jersey-Pennsylvania suburbs PSU). For covariate data I aggregate data for the counties that comprise each PSU. I use data on 32 PSUs from 2000 to 2010. In addition to providing data on rental vacancy rates, the BLS data also provide the frequency of vacancy, and the average duration of vacancy by PSU by year. Observations of PSUs taken more than four years after Craigslist established a page are dropped to isolate the

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[13]Four metros that received Craigslist pages after 2005 were also large enough to be included in the HVS. Because the HVS is specifically designed to measure rental vacancy rates, HVS data and not ACS data are used for these metros.

impact of the establishment of the page.

Non-family household formation and renter mobility data are from the ACS. Non-family household formation is measured as the logged number of non-family households of more than one person in the metro. Renter mobility is measured as the logged number of renter households who moved in the past year. Short term mobility effects are measured by dropping observations after the second year after the entry of Craigslist to the market, while medium-term effects are measured by dropping observations within the first two years of the entry of Craigslist to the market.

Rent data are primarily from the AHS with supplemental data from the ACS. I estimate median rents for each metro for each period of the biennial AHS. Inter-survey years are interpolated by averaging the median rents of the prior and next years. For metros that are not covered by the AHS, median rents from the ACS are used. Rent changes are measured as the annual percent change in the metro's median rent. Outliers are removed by winsorizing the data at the 3rd and 97th percentiles.

Data on the timing of establishment of Craigslist pages comes from Craigslist itself (Craigslist, 2020), supplemented with data from Kroft & Pope (2014) and data collected from the Internet Archive by me (The Internet Archive, n.d.).

4.3.1.1 How to model the influence of Craigslist?

The available data suggest that it is appropriate to model Craigslist as a time dummy in the fixed effects models. This would imply a linear increase in the impact of the website on each market for the years modeled. Kroft & Pope (2014) find that, despite large differences in the intensity of Craigslist by metro, the amount of time the local page had been operational was strongly correlated to how intensively it was used. I develop a measure of the saturation of Craigslist in rental markets and show that a linear time dummy is a justifiable approach for the models.

Raw housing ad counts are inappropriate as they vary primarily with the size of the rental stock in the geographic area served by the page. The ideal normalization of housing ad counts would be the frequency of vacancy in this area. The prevalence of a housing search website (or any medium of the housing search) is best measured by the number of de-duplicated advertisements

in that medium divided by the number of times units becomes vacant within a defined area and time. While this metric could be improved by incorporating a measure of how many housing searchers used the medium (which could also be measured for housing search websites), normalizing ads against the frequency of vacancy avoids the problems of reverse causality and provides a statistic that is relatively easy to understand: the closer the statistic is to 1, the more complete a catalog of all available units in a given time and place that medium is.

Because there is no consistent, large sample measure of the frequency of vacancy across US metros (the BLS data only provide this statistic for 32 PSUs), I choose the next best option: the non-de-duplicated number of rental ads normalized by the estimated number of vacant rental units in the metro. I refer to this statistic as level of "Craigslist saturation" of the rental housing search in a metro in a year. Because ad counts are for single months, while rental unit estimates are for the calendar year, I scale the vacancy estimates by 4/12, the average duration of vacancies in the mid-2000s (as shown in the CPI Housing Survey data).

Table 9: Impact of Page Age on Intensity of Use

	Dependent variable:
	Craigslist Saturation
Page Age	0.708***
	(0.078)
Constant	−0.436
	(0.668)
Observations	122
R^2	0.409
Adjusted R^2	0.404
Note:	*p<0.1; **p<0.05; ***p<0.01

The statistic measures how thoroughly Craigslist has saturated the rental housing market. I use data from Kroft & Pope (2014) on housing ad counts in 54 metros in 2007 and from the Urban Analytics Lab from 68 metros in 2014. Table 9 shows the results of regressing the number of years the local

Craigslist page has been in operation against the saturation level. The linear univariate model explains 41% of the variation in Craigslist saturation levels.

4.3.2 Model Form

I use fixed effects models to discern if and how the entrance and expansion of Craigslist to metro areas affected various measures of efficiency changes in the markets. The models for rental vacancy rates, duration, frequency, renter mobility, and non-family household formation use metro and year fixed effects. These two-way effects provide a measure of the impact of various other factors as they vary over time, but independent of nationwide trends (which are absorbed in year fixed effects). Standard errors are clustered at the metro level. The form of these models is:

$$y_{mt} = \alpha_m + \gamma_t + \sum_{k=1}^{K} \beta_k X_{kmt} + \rho CL_{mt} + \epsilon_{mt}$$

where

- y_{mt} is the dependent variable (e.g. the rental vacancy rate) of metro m in year t.
- α_m are metro fixed effects
- γ_t are year fixed effects
- X_{mt} are time-varying K covariates of the dependent variables (included for the vacancy rate model)
- CL_{mt} is a time dummy that switches on when Craigslist creates a page for the metro area

This analysis focuses on ρ, which can be interpreted as the impact of establishing a Craigslist page for the metro relative to the period before the page was established for the metro.

The time varying covariates for rental vacancy rates are as follows:

- Ln(Population): the logged population (Census Population Estimates Program).

- Homeownership: The home ownership rates (Census Housing Vacancies and Homeownership Survey or the ACS)
- Ln(Multifamily Construction): The logged number of units of 5+ unit housing permitted, lagged by two years (Census Building Permit Survey)

The equilibrium rental vacancy rate model is adapted from Hagen & Hansen (2010). Only metro fixed effects are included in this model.

$$r_{mt} = am(\frac{1}{v_{mt}}) - av_{mt} - bCL_{mt}v_{mt} - \alpha_m v_{mt} + bCL_{mt} + \epsilon_{mt}$$

Where:

- r_{mt} is the year-over-year percent change in metro median rent of metro m at time t
- v_{mt} is rental vacancy rate of metro m at time t lagged by one year.

Table 10: Summary Statistics for Craigslist Models

Variable	Mean	Std Dev
Rental Vacancy Rate	8.2	3.8
Rent Change	1.1	8.2
Population	1,949,609	2,025,675
Homeownership	68.7	6.3
Multifamily Construction	2,508	3,669
Average Duration of Vacancy	5.5	1.6
Frequency of Vacancy	11.4	5.3
Log Mobility	10.4	0.4
Log Nonfamily HH	8.4	0.8
Year CL Entry	2,004	2.2
Post-CL Years	3.4	1.6
Pre-CL Years	2.5	2
Metros	123	

Summary statistics for the models are presented in table 10. On average rents in the metros increased by 1.1% per year, though this was highly variable between metros. Among the metros measured by the BLS, approximately 11.4% of the rental stock turned over in the course of a year. Units that became vacant were vacant for about 5.5 months. The mean logged number of non-family households with more than one person was 8.4 or about 6.15% of all renter households. On average the log of renter households who moved in the past year was 10.4, or about 35.9% of renter households per year. There are at least three years of data for 123 metros. The data are focused on the short-term effects of the establishment of a Craigslist page, with metros having, on average, 2 years of pre-Craigslist trends and 3 years of data after the establishment of the local page.

4.4   Results

Figure 17 shows the averaged trends of rental vacancy rates in US metro areas generally (black line) in the modeled metros (blue line) and the timing of Craigslist entry in the modeled metros (yellow bars indicating the number of metros covered) from 1997 to 2011. Nationally, rental vacancy rates in metro areas generally rose in the 2000s. They increased sharply from 2000 to 2004, held steady from 2004 to around 2008, then rose to 2010. The trends of the metros included in the model roughly follow this pattern. The modeled metros show very low rental vacancy rates in the late 1990s and early 2000s because the metros included in the sample during this period are metros where Craigslist entered early, which happen to be tight markets like New York and Boston. Craigslist entered metro markets every year from 2000 to 2008, with a particularly large increase during 2006 (Craigslist established 53 new metro pages in May 2006 alone).

If Craigslist had a substantial impact on rental vacancy rates it should be discernible when comparing the vacancy trends in the years leading up to the page establishment, relative to the years after the page was up. Figure 18 shows the aggregated rental vacancy rate trends relative to the timing of the entry of Craigslist to the metro. If Craigslist had an impact on metro vacancy rates there should be an inflection point at or soon after the entrance of Craigslist to the metros. This does not appear to be the case, as the general trend of rising vacancy rates begun about two years before the entrance of Craigslist appears to continue at the same pace for the years after a page was

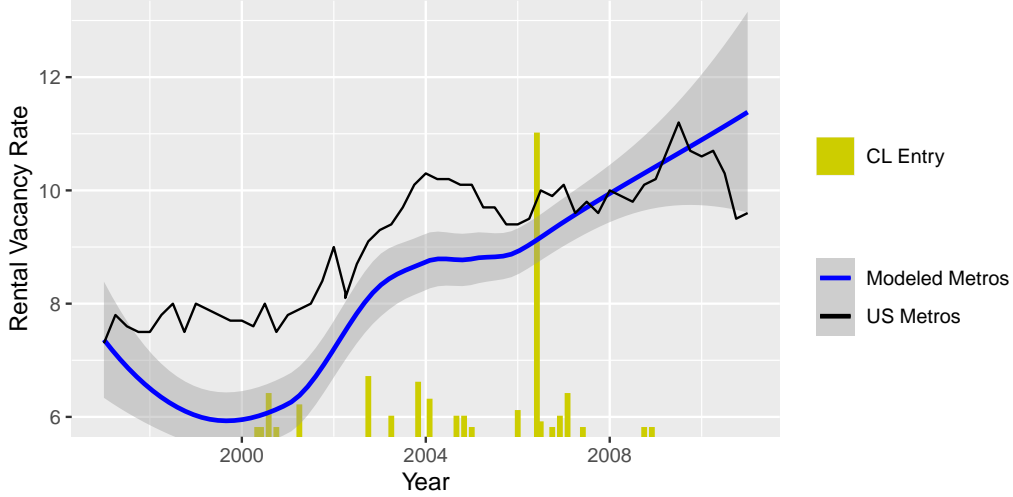## Modeled Metros Roughly Follow National Vacancy Trends

Figure 17: Vacancy Rate Trends and Craigslist Entry

established. However it is possible that other factors that influence vacancy rates may have coincided with Craigslist's entry in enough metros that it overwhelmed the impact the site had. The covariates of the fixed effects models should control for this possibility.

Table 11: Aggregated Metros Models

	Dependent variable:					
	Vacancy Rate	Vac Frequency	Vac Duration	Nonfamily HH	Mobility	
	(1)	(2)	(3)	(4)	(5)	(6)
Craigslist	0.486*	1.379	0.489	−0.048	−0.006	−0.044
	(0.264)	(0.864)	(0.424)	(0.160)	(0.038)	(0.062)
Population	−1.255	−28.570	1.767			
	(3.011)	(17.717)	(5.174)			
HO Rate	0.167**	−0.223*	−0.031			
	(0.083)	(0.119)	(0.043)			
MF Construction	0.123	−0.765	−0.280			
	(0.136)	(0.599)	(0.223)			
Metro FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	654	133	133	228	212	42
R^2	0.049	0.100	0.036	0.001	0.0001	0.012
F Statistic	6.688***	2.823**	0.963	0.129	0.012	0.277

Note: *p<0.1; **p<0.05; ***p<0.01

Table 11 shows the regression results from the fixed effects models examin-

The Entry of Craigslist Does Not Appear to Result in Deviation From Prior Vacancy Trends
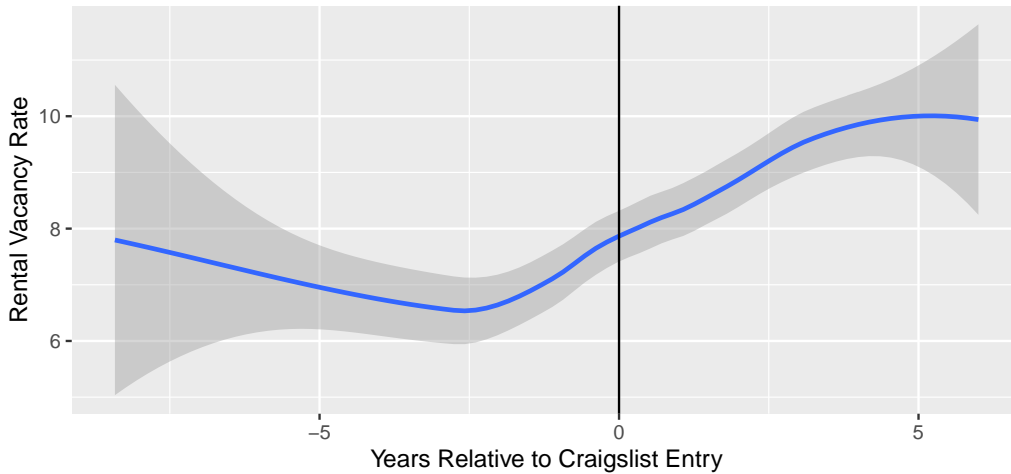

Figure 18: RVRs of Modeled Metros Relative to CL Entry

ing vacancy dynamics including rental vacancy rates (model 1), the frequency and duration of rental vacancy (models 2 & 3), non-family household formation (model 4) and short- and medium-term renter mobility (models 5 & 6). The models in general show that, while the metro and year are themselves strong predictors of the dependent variables, the additional covariates are, at best, weak predictors of vacancy dynamics within metros. Population growth lowers vacancy rates, rising home ownership increases rental vacancies, and multifamily construction increases vacancies. These factors are weak enough, however, that they are not statistically significant in the models. Only the impact of home ownership changes (which fluctuated dramatically in the 2000s) had a statistically significant impact and the full model only explains about 5% of the variation of rental vacancy rates within the metros over time. The impact of Craigslist is very weak in all models. The rental vacancy rate model suggests that Craigslist's entry into a metro actually *increased* observed rental vacancy rates by about 0.49 percentage points each of the first few years after the page was established. The effect, however, is quite weak and is only statistically distinguishable from 0 at the 10% confidence level.[14]

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[14]When the impact of Craigslist is modeled as a dummy variable the effect is even weaker and is not significant at the 10% level.

Given the very weak impact of Craigslist on rental vacancy rates it is not surprising that the models of the underlying drivers of vacancy rates are also unable to discern any impact from the entrance of the website. The models of the frequency of vacancy and duration of vacancy using BLS data show no statistically significant impact from the rise of the site. Likewise non-family household formation and renter mobility changes in the short and medium-term are not significantly associated with the entrance of Craigslist to the metros.

Table 12 shows the results of the equilibrium rental vacancy rate models. The models predict the annual change in the median rent of a metro. The most powerful effect is the lagged rental vacancy rate. A percentage point increase in the prior year's rental vacancy rate is associated with a 0.89 percentage point decline in median rents. This effect is in line with the literature on equilibrium vacancy rates. Craigslist is included in the model with two terms, the time dummy used in the prior models and an interaction with the lagged rental vacancy rate. The interaction term is not statistically significant at the 10% level, suggesting that the introduction of Craigslist had either no impact on equilibrium vacancy rates, or an impact so small that it was statistically indistinguishable from zero in this analysis. The uninteracted Craigslist term, however, is significant at the 10% level, suggesting that Craigslist may be associated with an inflationary pressure on rents. For each year after Craigslist entered the market rents increased by an additional 1.31 percentage points.

4.5 Discussion

Craigslist has often been discussed in scholarship as an innovation that might improve the efficiency of the rental market. Viewed in the context of how searchers actually find units, however, even a major improvement in advertising efficiency might have only a limited effect on the market. Craigslist and similar sites (particularly Zillow's rental listings) appear to have largely replaced newspaper classifieds and similar print media as a method to market rental properties. Prior to the 2000s, newspaper classifieds were a popular means of marketing rentals, but formal advertisements of any kind have never been the most common way that renters found their home. A plurality of tenants typically found their home in 2017 the same way they found their

Table 12: Equilibrium Vacancy Rate Models

	Dependent variable:	
	Annual Median Rent Change (%)	
	(1)	(2)
$1/v_{mt}$	−20.592	−17.773
	(14.321)	(14.565)
v_{mt}	−0.828*	−0.893**
	(0.445)	(0.451)
Craigslist		1.308*
		(0.671)
Craigslist * v_{mt}		0.109
		(0.070)
Metro FE	Yes	Yes
Observations	425	425
R^2	0.482	0.491
F Statistic	2.257***	2.276***
Note:	*p<0.1; **p<0.05; ***p<0.01	

home in 1980 - someone told them about it. Thus even if the practical difference between newspaper classifieds and Craigslist is substantial, the impact and insight that it can provide on the full market of rental units might be muted.

Nevertheless newspaper classifieds are no longer a standard means to advertise or search for housing while housing search sites (including Craigslist) are. Does the apparent non-effect of Craigslist in this analysis or in the analysis of Das et al. (2015) suggest that the efficiency improvements that might be expected to come from moving the housing search online are negligible or non-existent? An efficiency improvement that comes in the form of a better match between household and unit should appear in mobility patterns as households first move more because it is easier to find the home they're looking for, then move less because the home they found was a better match for their needs. In the above analysis mobility changes could appear in two ways, by Craigslist having an impact on both the frequency and duration of vacancy and by a change in the number of renter households moving over the past year. The entry of Craigslist into metro markets had no significant impact on any of these variables.

The impact of the entry of Craigslist on rents is more surprising. This analysis finds effects that may be contradictory to both Hagen & Hansen (2010) and Kroft & Pope (2014). I find that the entry of Craigslist into a market had no impact on the equilibrium vacancy rate and possibly even increased the rate of rent increases. I also find that the entry of Craigslist is possibly associated with a rise, not a decline, in observed vacancy rates. The analysis doesn't show the mechanism for this association, but it is plausible that the market information provided by Craigslist to owners diminishes the likelihood that owners set rent below market. This would align with the findings in chapter 2. The associated rise in rental vacancy rates is more surprising. It is possible that, by making the marketing of units easier, Craigslist had a supply effect in the market. Basement units, accessory dwelling units, and other informal or quasi-formal units are more likely to be marketed in Craigslist relative to other media (Wegmann & Chapple, 2014), so it is possible that vacant spaces were increasingly rented out as it became easier for property owners to do so.

Chapter 5: Conclusion

In their book *Rethinking Rental Housing* Gilderbloom & Appelbaum (1988) describe how difficult it was for amateur landlords in the 1980s to figure out the market rate for their property. These owners often had long term tenants, so this question might have only arisen once every five years, or even less frequently, when their tenants moved out. Owners could advertise their unit for the same price, but knew that the market had likely changed, and that their expenses have likely increased. Rental listings were available in the newspaper classifieds, but these ads provided only the most bare-bones description of the units and often did not specify the address of the units. Owners often had to call other owners and real estate agents to get a sense of current market levels, or attend a meeting of the local landlords association, if there was one. All of this took time, which was particularly frustrating if their tenant moved without months of notice and rental was already vacant. Even after calling up and talking to other landlords and agents, owners might still not be able to find a recent rental that was really comparable to their own property, leaving them to guess at the rent they would list in the classified that they would run.

Landlords no longer need to go through this laborious process to arrive at a decent estimate of the market rent for their property. Owners typically go online, find reasonably good market comps, and set their rent with this real-time market information in mind. Does this substantial change in the process by which landlords set rents matter? Even back in the 1980s - was there really a substantial difference in how an investor with a portfolio of twenty units, mostly acquired from distressed sales, set rents relative to an owner who has a portfolio of one unit that they inherited?

The extant scholarly work on these topics is scarce but suggests that these differences do matter and that they can be understood through the lens of professionalism. A professional landlord looks and acts much like the owners of multifamily properties. They are literally professional in that the properties are held and controlled by people whose full-time paid job it is to invest in and manage real estate. They seek to maximize risk-adjusted returns, have adequate capacity to do so and are active in the market. Amateur owners are a more motley group, who set rents based on many factors that have nothing to do with maximizing risk-adjusted returns. Who their tenant is and the landlord's relationship with the tenant may factor in, as might the

landlords' personal financial condition.

The advances in technologies like Craigslist, Zillow, and even basic spreadsheet software like Excel might professionalize landlords. The wealth of market information easily available online is a step toward to the level market information available to professional owners, particularly professional owners in the 1980s. Property management software like AppFolio can now be easily accessed by small landlords and Excel is standard on many personal computers, again providing the amateur landlord with tools that are closer to the kinds of tools used my professional owners in the 1980s. It would be reasonable to expect that this shrinking of the capacity gap between professionals and amateurs might result in a change in rent-setting. Across the entire market, technology might improve the economic efficiency of rental housing.

My research suggests that this hypothesis holds up by some measures, but that the standard definitions of professionalism are too rough, and likely have been too rough for decades, and that technological changes in the rental market may not appear to improve market efficiency. Owners who go online to analyze the market when setting rents are less likely to set rents below market, as are owners who use spreadsheet software to help manage their properties. The rise of Craigslist was concurrent with a rise in rents that appears to be driven by this increase in market information. However the portfolio size of the owner (the standard measure of an owner's professionalism) explained little to nothing about owner's decisions to hold rents below market and their propensity to hold rents flat or sharply increase rents.

More study is necessary to draw broader conclusions, but these findings hint that some of the standard concerns over who owns rental housing may be misplaced. This analysis suggests that consolidation of ownership among small rental properties (which is a common concern among policymakers and communities) may *not* lead to substantial changes in rent levels and rent changes relative to the typical fragmented patterns of ownership. What appears to be a bigger concern is something that, to my knowledge, is rarely if ever remarked on in discussions of naturally occurring affordable housing. As technological advances make it easier to be a landlord the entire stock of small rental properties may see changes in rent levels and how rents are set that make rent-setting more similar to how rents are set in multifamily properties. This change could happen without any substantial shift in who

owns the units, but instead a shift in how they manage the units.

For planners, my findings suggest that small rental properties deserve to be seen, in part, as an affordable housing asset to communities. Recently, thanks in large part to the pioneering work of Matt Desmond, small rental properties, especially those at the low end of the market, are discussed in the context of exploitation and artificially *high* rents. I do not cast any doubt on the validity of those findings, but I show that there's more to this very large and diverse stock of housing. About half of the units in small rental properties are like traditional affordable housing in that their rents are purposefully set substantially below market rate. This fact opens the door to thinking about whether planners should consider policies to preserve and generate unsubsidized, not-rent-regulated below-market small rental properties. Such policies would need to be constructed with the recognition that these low-cost units are also very *unlike* traditional affordable housing in many important regards. Owners routinely engage in tenant selection practices that would be impermissible in the subsidized stock. While I detect no signs that below market units are of lower quality than market-rate units, there are no special systems (such as inspections for the properties where voucher-holders live) in place to guarantee that housing is kept in adequate condition, particularly regarding health and safety.

My findings also suggest that the impact of technological advances in the housing market may differ from the theoretical and empirical impacts of similar technologies in other markets. The market for homes is not like the markets for widgets, copper, and tax preparation. The often-remarked on heterogeneity of housing might be a culprit here, as this at least partially explains the challenge of determining the market rate for a given unit. However the slippery distinctions of professionalism between owners may also play a role. It may be that Craigslist allowed amateur owners to gain a level market knowledge that was previously only to professionals. Some amateur owners may have then raised rents closer to the real market rates for their units. A more detailed examination of how owners have changed over time, possibly by comparing the results of the POMS with the results of my survey, could illuminate the extent to which tech has changed how "amateur" landlords behave.

References

Allen, M., Rutherford, R., & Thomson, T. (2009). Residential Asking Rents and Time on the Market. *Journal of Real Estate Finance & Economics*, *38*(4), 351–365. https://doi.org/10.1007/s11146-007-9092-0

Anenberg, E., & Kung, E. (2018). Can more housing supply solve the affordability crisis? Evidence from a neighborhood choice model. *Regional Science and Urban Economics*. https://doi.org/10.1016/j.regsciurbeco.2018.04.012

Angwin, J., & Parris Jr., T. (2016, October). Facebook Lets Advertisers Exclude Users by Race. *ProPublica*. https://www.propublica.org/article/facebook-lets-advertisers-exclude-users-by-race.

Barta, C. (2020, January). Updates on California Rent Control Laws. *www.nolo.com*. https://www.nolo.com/legal-encyclopedia/california-rent-control-law.html.

Belsky, E. S. (1992). Rental vacancy rates: A policy primer. *Housing Policy Debate*, *3*(3), 793.

Belsky, E. S., & Goodman, J. L., Jr. (1996). Explaining the Vacancy Rate-Rent Paradox of the 1980s. *Journal of Real Estate Research*, *11*(3), 309.

Benner, K., Thrush, G., & Isaac, M. (2019). Facebook Engages in Housing Discrimination With Its Ad Practices, U.S. Says. *The New York Times*.

Blank, D. M., & Winnick, L. (1953). The Structure of the Housing Market. *Quarterly Journal of Economics*, *67*(2), 181–208.

Boeing, G. (2020). Online rental housing market representation and the digital reproduction of urban inequality. *Environment and Planning A: Economy and Space*, *52*(2), 449–468. https://doi.org/10.1177/0308518X19869678

Bogdon, A., & Ling, D. (1998). The Effects of Property, Owner, Location, and Tenant Characteristics on Multifamily Profitability. *Journal of Housing Research*, *9*(2), 285–316.

Brown, J. R., & Goolsbee, A. (2002). Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry. *Journal of Political Economy*, *110*(3), 481–507.

Bun, Y. (2012, March). Zillow Rent Index: Methodology. *Zillow Research*.

Bureau of Labor Statistics. (2007, February). Consumer Price Indexes for Rent and Rental Equivalence. *Consumer Price Index.* https://www.bls.gov/cpi/cpifact6.htm.

Chen, C., & Lin, H. (2012). How Far Do People Search for Housing? Analyzing the Roles of Housing Supply, Intra-household Dynamics, and the Use of Information Channels. *Housing Studies*, *27*(7), 898–914. https://doi.org/10.1080/02673037.2012.725827

Clark, W. A. V., & Heskin, A. D. (1982). The Impact of Rent Control on Tenure Discounts and Residential Mobility. *Land Economics*, *58*(1), 109–117. https://doi.org/10.2307/3146080

Clark, W., & Onaka, J. L. (1983). Life Cycle and Housing Adjustment as Explanations of Residential Mobility. *Urban Studies*, *20*(1), 47–57. https://doi.org/10.1080/713703176

Clayton, J. (1998). Further Evidence on Real Estate Market Efficiency. *Journal of Real Estate Research*, *15*(1), 41–57. https://doi.org/10.5555/rees.15.1.l4745676513k672u

Coles, P. A., Egesdal, M., Ellen, I. G., Li, X., & Sundararajan, A. (2017). *Airbnb Usage Across New York City Neighborhoods: Geographic Patterns and Regulatory Implications* (SSRN Scholarly Paper No. ID 3048397). Rochester, NY: Social Science Research Network.

Craigslist. (2020, April). Craigslist | about | expansion. *Craigslist.org.* https://www.craigslist.org/about/expansion.

Cresce, A. R. (2012). *Evaluation of Gross Vacancy Rates From the 2010 Census Versus Current Surveys: Early Findings from Comparisons with the 2010 Census and the 2010 ACS 1-Year Estimates - SEHSD-WP2012-07.Pdf* (No. 2012 - 07). Washington, D.C.

Cronin, F. J. (1983). Market Structure and the Price of Housing Services. *Urban Studies*, *20*(3), 365–375. https://doi.org/10.1080/00420988320080601

Das, P., Ziobrowski, A., & Coulson, N. (2015). Online Information Search, Market Fundamentals and Apartment Real Estate. *Journal of Real Estate Finance & Economics*, *51*(4), 480–502. https://doi.org/10.1007/s11146-015-9496-1

Dawkins, C. J. (2004). Recent Evidence on the Continuing Causes of Black-White Residential Segregation. *Journal of Urban Affairs*, *26*(3), 379–400.

https://doi.org/10.1111/j.0735-2166.2004.00205.x

Decker, N. (2010). Housing Discrimination and Craigslist. *The Current: The Public Policy Journal of the Cornell Institute for Public Affairs*, *14*(1), 43–57.

Deng, Y., Gabriel, S. A., & Nothaft, F. E. (2003). Duration of Residence in the Rental Housing Market. *Journal of Real Estate Finance & Economics*, *26*(2/3), 267.

Desmond, M. (2016). *Evicted : Poverty and profit in the American city.* New York : Crown Publishers.

Downs, A. (1983). *Rental Housing in the 1980s.* Washington, D.C: Brookings Institution.

Ellen, I. G., Been, V., & Gross, B. (2013). *Maintenance and Investments in Small Rental Properties: Findings from New York City and Baltimore.* Furman Center for Real Estate and Urban Policy & Johns Hopkins Institute for Policy Studies.

England, R. W. (2016). Tax Incidence and Rental Housing: A Survey and Critique of Research. *National Tax Journal*, *69*(2), 435–460. https://doi.org/10.17310/ntj.2016.2.07

Farley, R. (1996). Racial differences in the search for housing: Do whites and blacks use the same techniques to find housing? *Housing Policy Debate*, *7*(2), 367–385.

Fine, J. (2016, August). How Craigslist's Founder Realized He Sucked as a Manager. *Inc.com.* https://www.inc.com/magazine/201609/jon-fine/inc-interview-craigslist.html.

Ford, J. S., Rutherford, R. C., & Yavas, A. (2005). The effects of the internet on marketing residential real estate. *Journal of Housing Economics*, *14*, 92–108. https://doi.org/10.1016/j.jhe.2005.06.003

Freddie Mac. (2018). *Single Family Rental: An Evolving Market.* McLean, VA: Freddie Mac Multifamily.

Fry, R. (2015, July). More Millennials Living With Family Despite Improved Job Market. *Pew Research Center's Social & Demographic Trends Project.*

Furman Center. (2016). *State of New York City's Housing & Neighborhoods 2015 Report.* New York, NY: Furman Center for Real Estate and Urban

Policy.

Gabriel, S. A., & Nothaft, F. E. (2001). Rental Housing Markets, the Incidence and Duration of Vacancy, and the Natural Vacancy Rate. *Journal of Urban Economics*, *49*, 121–149. https://doi.org/10.1006/juec.2000.2187

Garboden, P. M., & Newman, S. J. (2012). Is preserving small, low-end rental housing feasible? *Housing Policy Debate*, *22*(4), 507–526. https://doi.org/10.1080/10511482.2012.697909

Genesove, D. (2003). The Nominal Rigidity of Apartment Rents. *The Review of Economics and Statistics*, *85*(4), 844–853. https://doi.org/10.1162/003465303772815763

Gilderbloom, J. I. (1985). Social Factors Affecting Landlords in the Determination of Rent. *Urban Life*, *14*(2), 155–179. https://doi.org/10.1177/089124168501400202

Gilderbloom, J. I., & Appelbaum, R. P. (1987). Toward a Sociology of Rent: Are Rental Housing Markets Competitive? *Social Problems*, *34*(3), 261–276. https://doi.org/10.2307/800766

Gilderbloom, J. I., & Appelbaum, R. P. (1988). *Rethinking rental housing.* Philadelphia: Temple University Press.

Gilderbloom, J. I., Pan, Z., Lehman, T., & Appelbaum, R. P. (2008). Why Rents Rise. In J. I. Gilderbloom (Ed.), *Invisible city: Poverty, housing, and new urbanism* (1st ed). Austin, TX: University of Texas Press.

Goodman, A. C., & Kawai, M. (1985). Length of Residence Discounts and Rental Housing Demand: Theory and Evidence. *Land Economics*, *61*(2), 93–105. https://doi.org/10.2307/3145802

Goodman, J. (2005). *Constant Quality Rent Indexes for Affordable Housing* (No. W05-4). Cambridge, MA: Joint Center for Housing Studies of Harvard University.

Guasch, J. L., & Marshall, R. C. (1987). A theoretical and empirical analysis of the length of residency discount in the rental housing market. *Journal of Urban Economics*, *22*(3), 291–311. https://doi.org/10.1016/0094-1190(87)90029-5

Hagen, D. A., & Hansen, J. L. (2010). Rental Housing and the Natural Vacancy Rate. *Journal of Real Estate Research*, *32*(4), 413–433.

Hanson, A., & Hawley, Z. (2011). Do landlords discriminate in the rental housing market? Evidence from an internet field experiment in US cities. *Journal of Urban Economics*, *70*, 99–114. https://doi.org/10.1016/j.jue.2011.02.003

Hanson, A., Hawley, Z., & Taylor, A. (2011). Subtle discrimination in the rental housing market: Evidence from e-mail correspondence with landlords. *Journal of Housing Economics*, *20*, 276–284. https://doi.org/10.1016/j.jhe.2011.09.003

Hatch, M. E. (2017). Statutory Protection for Renters: Classification of State LandlordTenant Policy Approaches. *Housing Policy Debate*, *27*(1), 98–119. https://doi.org/10.1080/10511482.2016.1155073

Hogan, B., & Berry, B. (2011). Racial and Ethnic Biases in Rental Housing: An Audit Study of Online Apartment Listings. *City & Community*, *10*(4), 351–372. https://doi.org/10.1111/j.1540-6040.2011.01376.x

Howell, K. L., Mueller, E. J., & Wilson, B. B. (2019). One Size Fits None: Local Context and Planning for the Preservation of Affordable Housing. *Housing Policy Debate*, *29*(1), 148–165. https://doi.org/10.1080/10511482.2018.1476896

Hubert, F. (1995). Contracting with costly tenants. *Regional Science and Urban Economics*, *25*(5), 631–654. https://doi.org/10.1016/0166-0462(95)02102-Z

Immergluck, D. (2018). Renting the Dream: The Rise of Single-Family Rentership in the Sunbelt Metropolis. *Housing Policy Debate*, *28*(5), 814–829. https://doi.org/10.1080/10511482.2018.1460385

Krause, A., & Lipscomb, C. A. (2016). The Data Preparation Process in Real Estate: Guidance and Review. *Journal of Real Estate Practice and Education*, *19*(1), 15–42. https://doi.org/10.5555/1521-4842.19.1.15

Kroft, K., & Pope, D. G. (2014). Does Online Search Crowd Out Traditional Search and Improve Matching Efficiency? Evidence from Craigslist. *Journal of Labor Economics*, *32*(2), 259–303.

Krohn, R. G., Fleming, B., & Manzer, M. (1977). *The other economy: The internal logic of local rental housing*. Toronto: P. Martin Associates.

Krysan, M. (2008). Does race matter in the search for housing? An exploratory study of search strategies, experiences, and locations. *Social Sci-*

ence Research, *37*(2), 581–603. https://doi.org/10.1016/j.ssresearch.2007.06.001

Landis, J. D., Hood, H., Li, G., Rogers, T., & Warren, C. (2006). The future of infill housing in California: Opportunities, potential, and feasibility. *Housing Policy Debate*, (4), 681.

Larsen, E. R., & Sommervoll, D. E. (2009). The impact on rent from tenant and landlord characteristics and interaction. *Regional Science and Urban Economics*, *39*(3), 316–322. https://doi.org/10.1016/j.regsciurbeco.2008.10.004

Lee, H. (2017, August). Who Owns Rental Properties, and is it Changing? *Housing Perspectives (from the Harvard Joint Center for Housing Studies)*.

Mallach, A. (2007). Landlords at the Margins: Exploring the Dynamics of the One To Four Unit Rental Housing Industry. In *Revisiting Rental Housing: A National Policy Summit*.

Mallach, A. (2010). *Meeting The Challenge Of Distressed Property Investors In America's Neighborhoods*. New York, NY: Local Initiatives Support Corporation.

Malpezzi, S. (1999). Economic Analysis Of Housing Markets In Developing And Transition Economies. In E. S. Mills & P. C. Cheshire (Eds.), *Handbook of regional and urban economics* (Vol. 3, pp. 1791–1864). Amsterdam ; New York : New York, N.Y., U.S.A: North-Holland.

Malpezzi, S., Ozanne, L. J., & Thibodeau, T. G. (1980). *Characteristic Prices of Housing in Fifty-Nine Metropolitan Areas*. Washington, DC: Urban Institute.

Marshall, R. C., & Guasch, J. L. (1983). Occupancy Discounts in the U.S. Rental Housing Market. *Oxford Bulletin of Economics and Statistics*, *45*(4), 357–378. https://doi.org/10.1111/j.1468-0084.1983.mp45004003.x

Mawhorter, S. (2018). Boomers and their Boomerang Kids. In M. Moos, D. Pfeiffer, & T. Vinodrai (Eds.), *The Millennial city : Trends, implications, and prospects for urban planning and policy* (pp. 143–152). New York, NY: Routledge, Taylor and Francis Group.

Miceli, T. J., & Sirmans, C. F. (1999). Tenant Turnover, Rental Contracts, and Self-Selection. *Journal of Housing Economics*, *8*(4), 301–311. https://doi.org/10.1006/jhec.1999.0253

Miron, J. (1990). Security of Tenure, Costly Tenants and Rent Regulation. *Urban Studies*, *27*(2), 167–183. https://doi.org/10.1080/00420989020080151

National Association of Realtors. (2015). *2015 Profile of Home Buyers and Sellers.*

Newburger, H. (1995). Sources of Difference in Information Used by Black and White Housing Seekers: An Exploratory Analysis. *Urban Studies*, *32*(3), 445–470. https://doi.org/10.1080/00420989550012915

New Jersey Department of Community Affairs. (2009). *2009 Rent Control Survey.*

Newman, S. J. (2005). *Low-End Rental Housing.* Washington, D.C.: Urban Institute.

Noland, C. W. (1979). Assessing Hedonic Indexes for Housing. *Journal of Financial & Quantitative Analysis*, *14*(4), 783–800. https://doi.org/10.2307/2330452

NYC Rent Guidelines Board. (2020). Apartment/Loft Orders & Explanatory Statements. https://rentguidelinesboard.cityofnewyork.us/rent-guidelines/apartment-loft-orders-explanatory-statements/.

O'Flaherty, B. (2009). *What Shocks Precipitate Homelessness?* (Discussion Paper No. 0809-14). New York, NY: Columbia University.

Oliveri, R. C. (2010). Discriminatory Housing Advertisements on-Line: Lessons from Craigslist. *Indiana Law Review*, *44*(1), 1125–1183.

Palm, R., & Danis, M. (2001). Residential mobility: The impacts of Web-based information on the search process and spatial housing choice patterns. *Urban Geography*, *22*(7), 641–655.

Palm, R., & Danis, M. (2002). The Internet and Home Purchase. *Tijdschrift Voor Economische En Sociale Geografie*, *93*(5), 537–547. https://doi.org/10.1111/1467-9663.00224

Pendall, R., Theodos, B., & Hildner, K. (2016). Why High-Poverty Neighborhoods Persist The Role of Precarious Housing. *Urban Affairs Review*, *52*(1), 33–65. https://doi.org/10.1177/1078087414563178

Pfeiffer, D., & Lucio, J. (2015). An unexpected geography of opportunity in the wake of the foreclosure crisis: Low-income renters in investor-purchased

foreclosures in Phoenix, Arizona. *Urban Geography*, *36*(8), 1197–1220. https://doi.org/10.1080/02723638.2015.1053201

Porell, F. W. (1985). One Man's Ceiling Is Another Man's Floor: Landlord/Manager Residency and Housing Condition. *Land Economics*, *61*(2), 106–118. https://doi.org/10.2307/3145803

Qin, X., Zhen, F., & Zhu, S.-J. (2016). Centralisation or decentralisation? Impacts of information channels on residential mobility in the information era. *Habitat International*, *53*, 360–368. https://doi.org/10.1016/j.habitatint.2015.12.006

Rae, A. (2015). Online Housing Search and the Geography of Submarkets. *Housing Studies*, *30*(3), 453–472.

Savage, H. A. (1998). *What we have learned about properties, owners, and tenants from the 1995 Property Owners and Managers Survey*. Washington, D.C.: Census Bureau.

Schuetz, J., Meltzer, R., & Been, V. (2009). 31 Flavors of Inclusionary Zoning: Comparing Policies From San Francisco, Washington, DC, and Suburban Boston. *Journal of the American Planning Association*, *75*(4), 441–456. https://doi.org/10.1080/01944360903146806

Schwartz, A. F. (1999). New York city and subsidized housing: Impacts and lessons of the city's $5 billion capital budget housing plan. *Housing Policy Debate*, *10*(4), 839–877. https://doi.org/10.1080/10511482.1999.9521353

Seidman, E., & Pardo, S. (2019, August). The Surge of Investors in Single-Family Homes Raises Three Concerns. *Urban Institute*.

Smith, L. B. (1974). A Note on the Price Adjustment Mechanism for Rental Housing. *The American Economic Review*, (3), 478.

Stegman, M. A. (1967). Slumlords and public policy. *Journal of the American Institute of Planners*, *33*, 419–424. https://doi.org/10.1080/01944366708977208

Stegman, M. A. (1972). *Housing Investment in the Inner City: The dynamics of decline; a study of Baltimore, Maryland, 1968-1970*. Cambridge, Mass: M.I.T. Press.

Stegman, M. A. (2017). Toward a Scalable Capital Markets Funded LeasePurchase Strategy for Low- and Moderate-Income Families. *The*

Journal of Structured Finance, *23*(3), 70–81. https://doi.org/10.3905/jsf.2017.23.3.070

Stegman, M. A., & Sumka, H. J. (1976). *Nonmetropolitan urban housing: An economic analysis of problems and policies.* Cambridge, Mass.: Ballinger Pub. Co.

Sternlieb, G. (1966). *The Tenement Landlord.* New Brunswick, N.J: Urban Studies Center, Rutgers, The State University.

Sternlieb, G. (1972). *The urban housing dilemma: The dynamics of New York City's rent controlled housing.* New York: Housing and Development Administration, Dept.of Rent and Housing Maintenance, Office of Rent Control.

Sternlieb, G., & Burchell, R. W. (1973). *Residential abandonment: The tenement landlord revisited.* New Brunswick, N.J: Center for Urban Policy Research, Rutgers University.

Strochak, S. (2017, October). Five things that might surprise you about the fastest-growing segment of the housing market. *Urban Institute.* https://www.urban.org/urban-wire/five-things-might-surprise-you-about-fastest-growing-segment-housing-market.

The Internet Archive. (n.d.). Internet Archive: Digital Library of Free & Borrowable Books, Movies, Music & Wayback Machine. https://archive.org/.

Travis, A. (2019). The Organization of Neglect: Limited Liability Companies and Housing Disinvestment. *American Sociological Review*, *84*(1), 142–170. https://doi.org/10.1177/0003122418821339

Urban Institute. (2013). *Housing Discrimination Against Racial and Ethnic Minorities 2012.* U.S. Department of Housing and Urban Development | Office of Policy Development and Research.

US Department of Housing and Urban Development. (2016). Frequently Asked Questions. HUD - Comprehensive Housing Affordability Strategy, https://socds.huduser.gov/CHAS/Frequently%20Asked%20Questions.htm.

Verbrugge, R., Dorfman, A., Johnson, W., Marsh, F., Poole, R., & Shoemaker, O. (2016). Determinants of Differential Rent Changes: Mean Reversion versus the Usual Suspects. *Real Estate Economics*, *45*(3), 591–627. https://doi.org/10.1111/1540-6229.12145

Verbrugge, R., & Gallin, J. (2017). *A Theory of Sticky Rents: Search and Bargaining with Incomplete Information* (SSRN Scholarly Paper No. ID 2973964). Rochester, NY: Social Science Research Network.

Wegmann, J., & Chapple, K. (2014). Hidden density in single-family neighborhoods: Backyard cottages as an equitable smart growth strategy. *Journal of Urbanism*, *7*(3), 307–329. https://doi.org/10.1080/17549175.2013.879453

Weicher, J. C., Eggers, F. J., & Moumen, F. (2016). *The Long-Term Dynamics of Affordable Rental Housing*. Washington, DC: Hudson Institute.

Wolf, G. (2009). Why Craigslist Is Such a Mess. *Wired*.

Yuan, X., Lee, J.-H., Kim, S.-J., & Kim, Y.-H. (2013). Toward a user-oriented recommendation system for real estate websites. *Information Systems*, *38*(2), 231–243. https://doi.org/10.1016/j.is.2012.08.004

Zumpano, L. V., Johnson, K. H., & Anderson, R. I. (2003). Internet use and real estate brokerage market intermediation. *Journal of Housing Economics*, *12*, 134–150. https://doi.org/10.1016/S1051-1377(03)00018-4