Zoned Out?
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Charles Becker   Timothy Rickert

Duke University   Duke University

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Charles Becker
Department of Economics, Duke University

Timothy Rickert
Department of Economics, Duke University

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Abstract: This paper explores determinants of manufactured housing park (MHP) plot rents in North Carolina, with particular focus on the distinction among urban, rural, and periurban and small town parks, and on the possible role played by zoning restrictiveness. Little is known about how MHP rents are determined, even though it is estimated that more than 10 million Americans live in MHPs. We find that, contrary to our expectations, zoning appears to be an unimportant factor in determining park rents, while location, adjacent home prices, and nearby HUD "fair market rent" values are all important – though not uniformly so.

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1. Introduction.

It is estimated that roughly 10.5 million –over 3 percent – of Americans live in manufactured housing parks (MHPs; Becker and Yea, 2015). For North Carolina and many other states with a dispersed population and mild climate, the proportion is higher still: a plausible guess is that about 8 percent of the state's more than 10 million residents live in parks. Surprisingly little is known about this important component of the housing market, even though it is a key element of affordable housing.

The distinctive feature of MHPs – more commonly referred to as "trailer parks" – is that ownership is typically divided. Most residents own the structure in which they live (or occupy it on a rent-to-own basis) and rent the land, pad, and infrastructure provided by the park owner. This arrangement has many advantages, including shared risk and improved upkeep incentives, as well as policing of neighbors, since those in violation of park rules can be evicted. However, threat of eviction also creates an essentially uninsurable risk for the homeowner, since moving manufactured homes is costly and often infeasible, leading to fire sales or abandonment.

This unusual institutional arrangement invites questions as to how park rents are determined – do they reflect implicit long-term contracts that vary little if at all with fluctuations in general housing markets nearby? Do restrictions on park entry and expansion caused by NIMBY-ist sentiments create local monopolies for incumbents and drive prices up? What park features are most important?

To our knowledge, careful analysis of park rents is virtually nonexistent. Median values across regions are available, but linking them in any sort of causal sense to underlying economic conditions and park characteristics does not appear in the literature. This absence does not reflect lack of interest: on the contrary, a primary motivation in writing this paper is to respond to inquiries from park owners.

In the pages that follow, we present detailed information on patterns of MHP lot rents across North Carolina. The picture itself is novel, but we go further in seeking to describe the market and take first steps at establishing causal links within sub-markets. However, an important caveat is in order: the findings below are only first steps, and truly establishing causality would require information on repeat events. These data do not exist in sufficient number. The values we use are taken from Datacomp's database of manufactured home sales; the information provided includes reported park rents paid. However, repeated sales are fairly infrequent, making it impractical to control for unit or park fixed effects that are otherwise unobservable, and which may be correlated with included variables.

This caveat notwithstanding, the data are highly informative, and yield several findings of interest to policymakers and those in the industry, as well as to academics interested in the US housing market. First, the stereotype of an industry run by a mix of blood-sucking extortionists and amiable, patrician small park owners seems wildly inaccurate. Park rents move with economic conditions in a way that is inconsistent with either of these characterizations. Second, the MHP market is spatially segmented, and empirical work that treats it as unified will give wildly misleading results. In particular, to put it somewhat simply, access to major highways is the most important factor in determining lot rents in rural parks, while local housing market conditions drive rents in higher density towns and periurban areas.

This paper is written largely in response to two questions posed by Frank Rolfe: *What is fair market rent for manufactured housing parks and how can one determine it?* And, with North Carolina specifically in mind: *Why would any major industry player buy parks in a market where entry is not restricted?*

This second question helps explain our focus on North Carolina. Manufactured housing parks and characteristics of park owners in the United States vary immensely. While there is disagreement as to which firm is the largest site owner, it appears that Sam Zell's Equity Lifestyle Communities and Sun Communities have between 70,000 and 140,000 sites each, typically in parks with several hundred units each, and with RHP Properties and Yes! Communities close at their heels.[1] In contrast, many small "mom n' pop" operators own only a single park; many of these have fewer than 25 units, and in North Carolina one commonly encounters tiny parks with fewer than a dozen units. MHI information on the headquarters of the largest 50 park owners indicates that none is in North Carolina, or indeed elsewhere in the south outside of Florida, save for one in Kentucky.

In short, although the prevalence of manufactured housing is greatest in the Southeastern United States, there can be no doubt that major "corporate" park owners avoid the region, save for retirement communities along the Gulf Coast. The obvious reason is that suggested by Frank Rolfe: the region is not land scarce, nor is it strictly zoned, so that rising demand for moderate-income housing is likely to be met by construction of new

[1] The reason for the disagreement is unclear. Links to Manufactured Housing Institute (MHI) estimates can be found at www.manufacturedhousing.org/wp-content/uploads/2017/04/2017-Largest-50-List-Final-042617.pdf while Mobile Home University estimates are given at https://www.mobilehomeuniversity.com/articles/mhu-top-100-community-owners.php. Estimates of the number of parks in the US also vary considerably, with the MHI figure of 38,000 representing a lower bound.

units (including apartment buildings, stick-built homes, and MHP expansion) rather than generating rising rents and hence profits for park owners.

A focus on North Carolina allows us to explore the validity of this claim. For reasons detailed below, it appears that this stereotype is dated. Although the American South is land-abundant and less regulated than elsewhere, the highly concentrated nature of its economic growth has resulted in rising park rents in prospering regions, which also discourage park construction or expansion, and, indeed, low-income housing more generally. Economic growth in the state's leading metro areas also leads to a high and likely rising risk of park closure in the coming decade – though even in smaller towns and rural areas, park closure remains a risk.[2]

2. DATA.

2.1 Datacomp dataset. For the observation of individual park rents, we rely on a Datacomp dataset of accumulated data from 2009 to 2013. This dataset contains around 312,000 observations at the national level, of which 3,100 come from North Carolina. It contains data on a number of characteristics of a MH unit at the time of transaction: sales price, rent, age of the model, and its size. We generate a variable of average rent per park, and weight these data to provide unit-level observations. We also trim average rents between 5% and 95%, to control for large outliers.

2.2 ACS, NHPN, and other external data. We take advantage of a variety of Census datasets for our controls, as well as to generate the urban, rural, and periurban breakdowns that we explore in the regression analyses.

For local economic and demographic controls, namely, educational attainment, proportion of racial and ethnic minorities, poverty status, Gini coefficient, proportion of the housing stock that is manufactured, and per capita income, we use a dataset of TIGER/Line Census block group shapefiles combined with ACS Five-Year estimates: https://www.census.gov/geo/maps-data/data/tiger-data.html. These data give us simple counts for each of the aforementioned variables at the block group level, which enabled us to match each MH unit in the Datacomp data to a respective block group.

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[2] For example, see the WRAL.com story from March 5, 2018, concerning a planned park closure in Siler City in response to a planned new poultry processing plant: http://www.wral.com/siler-city-residents-seek-compensation-after-being-evicted-from-homes-/17395474/. Since then, the saga has been front page news for several days in North Carolina's largest daily newspapers – for example, see the *News & Observer*: http://www.newsobserver.com/news/local/article206952179.html -- and also a major weekly: https://www.indyweek.com/news/archives/2018/03/26/siler-city-mobile-home-park-residents-being-evicted-by-mountaire-farms-reach-compensation-deal

With regard to distance from a major highway, we use a dataset from the National Highway Planning Network (NHPN), which includes the National Highway System, the Strategic Highway Network, and rural minor arterial highways: https://catalog.data.gov/dataset/national-highway-planning-network-nhpn. Using GIS, we calculate the distance in miles from the centroid of the highest-density Census-defined place (CDP) in each block group to the nearest highway; for those block groups in which no CDP resides, we simply use the geometric centroid. We used a similar method for the distance to an urban area, in which we calculated the distance from the centroid of a block group to the centroid of a CDP with a population over 50,000.

We calculate the rural, urban, and periurban classifications of a block group using both Census block group and CDP shapefiles in GIS. We categorize the block groups that do not intersect with or contain a CDP as rural, shown in white in Figure 1 below. The distinction between urban, shown in black, and periurban, in grey, hinges on whether the CDP that exists within that block group has a population density above or below the median. While we acknowledge that these classifications are fairly rudimentary, the drastic disparities in both our OLS and 2SLS regression results emphasize their importance.

2.3 Zoning. To measure zoning permissiveness for MHP, we create indicator variables based on an evaluation of zoning ordinances of each county and metropolitan area. We gauge permissiveness across several different categories of zoning: agricultural or agricultural/residential, residential (broken down by lot size), business/commercial, industrial, and specific MHP zones (by lot size). The scale of permissiveness we use here is as follows: 0 = no mobile home parks are allowed by right, 1 = mobile home parks are allowed by special permit, and 2 = mobile home parks are allowed by right. We reduce dimensionality across these indicator variables for the OLS regression through a principal components analysis, a process of which we go into further detail in the appendix. For our IV regression, we use a simple summation of all these zoning indicators within a specific zoning area. Thus, for a zoning area in which MHPs are allowed by right in all of the 11 zoning districts we control for, its Total Zoning Score would be 22.

For our regressions, we place each MH unit reported by Datacomp within a zoning area using GIS. We overlay block groups on CDPs and counties, and designate a block group as "within" a zone if 75% of its land area intersects with that zone. From this merge, we lose about 300 observations from the Datacomp data, because we could not define MHP zoning measures for the county or CDP of that particular block group. This brings the final number of observations in our regression to around 2,800 statewide.

3. Descriptive Statistics

Table 1 provides descriptive statistics for each of the variables in the regression models that follow. The first point to note is that mean lot rents in North Carolina MH parks are not high – only $193 – and median rents ($180) are lower still. Not surprisingly, mean lot rents in urban areas ($201) are greater than in rural areas ($180) and in smaller cities and the periurban fringe of larger metro areas ($186); more striking is how small the differences are. At the state level, the cut-off line for the bottom 10% percentile is a lot rent of $135; the top 10% starts at a lot rent of $300. These modest differences reflect land abundance throughout North Carolina, even in its (sprawling) cities and suburban areas.

Indeed, stick built housing in North Carolina is not particularly expensive in North Carolina: the median home value is just under $139,000. Rather more surprising to us is that the standard deviation of ln MH lot rents (0.317) is consistently greater than the standard deviation of home prices (0.254). Both are larger than the standard deviation of fair market rents, which may reflect at least in part HUD's methodology rather than just an actual bunching of rental housing costs across the state.

A second noteworthy point is that the manufactured housing appears to be a bit younger than might be expected, especially given the sharp decline in production and purchases of these units over the past 20 years. However, we suspect that this is something of a mirage: manufactured housing that is sold from one party to another likely differs from the entire stock of manufactured housing. In particular, it is likely to be considerably younger and in better shape. Nonetheless, even those MH units on the market are not particularly new, and years of limited purchases of new units virtually guarantees that the stock will continue to age in the years to come.

Table 1
Variable characteristics

Statewide					
Variable	**Mean**	**Sd.**	**Median**	**10%**	**90%**
Average Rent Trimmed	203.69	75.72	180	135	300
Home Price	149034.40	38941.36	138750	104950	206050
FMR 2BR	716.96	89.50	694	609	849
Age of model	22.617	7.663	21	15	33
Distance from highway	1.828	2.879	.711	.157	5.196
Prop. that have college degrees	.237	.144	.203	.084	.457
Prop. that are racial minorities	.313	.266	.238	.026	.728
Prop. of housing that is manufactured	.149	.17	.081	0	.406

Total zoning score	2.706	2.569	2	1	5

Urban Areas					
Variable	**Mean**	**Sd.**	**Median**	**10%**	**90%**
Average Rent Trimmed	212.40	78.02	185	140	305
Home Price	156963.3	39914.68	143750	116700	206050
FMR 2BR	743.65	87.51	716	634	856
Age of model	22.121	7.172	20.722	15	32
Distance from highway	.756	1.164	.483	.144	1.524
Prop. that have college degrees	.275	.17	.243	.076	.522
Prop. that are racial minorities	.393	.285	.343	.056	.833
Prop. of housing that is manufactured	.066	.125	0	0	.237
Total zoning score	3.03	2.65	2	1	5

Rural Areas					
Variable	**Mean**	**Sd.**	**Median**	**10%**	**90%**
Average Rent Trimmed	188.53	61.37	172.5	125	285
Home Price	143829.1	40255.78	132075	102350	198900
FMR 2BR	691.03	83.64	678	596	841
Age of model	23.288	8.271	22	15.75	35.5
Distance from highway	4.591	3.686	3.589	1.021	9.429
Prop. that have college degrees	.201	.1	.179	.099	.32
Prop. that are racial minorities	.181	.193	.115	.003	.479
Prop. of housing that is manufactured	.289	.154	.274	.088	.495
Total zoning score	1.988	1.944	1	0	4

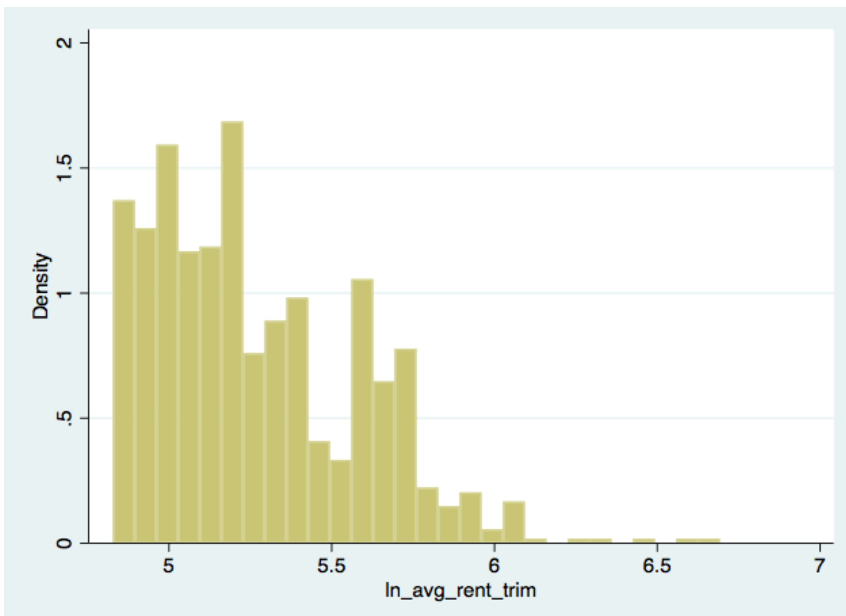
Small Cities and Periurban Fringe Areas					
Variable	**Mean**	**Sd.**	**Median**	**10%**	**90%**
Average Rent Trimmed	196.35	74.68	175	130	295
Home Price	139912.6	34907.41	129500	99000	187400
FMR 2BR	694.30	84.96	672	596	819
Age of model	22.991	8.001	21.857	15	34
Distance from highway	2.083	3.195	.79	.138	6.018
Prop. that have college degrees	.209	.114	.188	.086	.364
Prop. that are racial minorities	.27	.238	.206	.02	.627
Prop. of housing that is manufactured	.192	.172	.153	0	.44
Total zoning score	2.541	2.569	2	0	5

The importance of manufactured housing in North Carolina also emerges. Across the state, about 15% of all housing is manufactured, though only a fraction – roughly half, though no exact estimate exists – in in MH parks. Nonetheless, that is a sizeable number, as it implies that roughly 800,000 North Carolinians live in MH parks. Not surprisingly, the proportion living in manufactured housing is smaller in cities (7.7%) than in rural areas (18.1%) or in small cities and the periurban fringe in metro areas (19.2%). Outside of large cities, at the 90th percentile of the Census block group distribution, nearly half of all housing is manufactured.

Figure 1 presents a histogram of North Carolina MH park lot rents. It is apparent that the distribution does not follow a smooth curve. Rather, there are some fairly discrete clumps. This leads us to look at histograms for 11 major (or usefully illustrative) counties. These counties include Alamance (major city: Burlington), Buncombe (Asheville), Carteret (Beaufort), Forsyth (Winston-Salem), Guilford (Greensboro), Johnston (Smithfield), New Hanover (Wilmington), Onslow (Jacksonville), Orange (Chapel Hill), Pitt (Greenville), and Wake (Raleigh); the graphs appear in Appendix 1.

Figure 1

Manufactured Housing Park Lot Rent Histogram



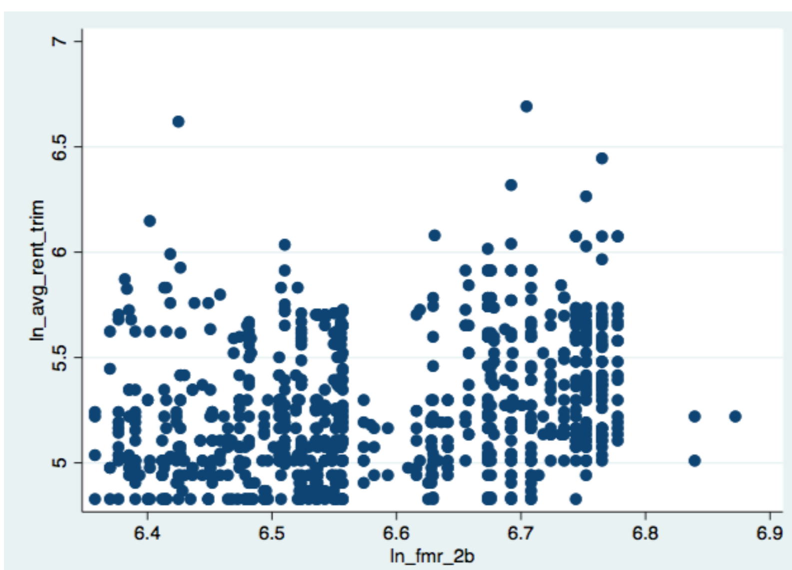
Even though this group contains many are fairly large counties, in several cases there is very little variation. For example, while Pitt County include a major university and medical center (East Carolina University) in Greenville, there is virtually no variation in park rents within the county. The same is true of Johnston County, a mainly agricultural area that nonetheless includes Raleigh commuters; Forsyth County, which has a fairly large city; and Onslow County, whose economy is dominated by Camp Lejeune. In these cases, local conditions determine what amounts to being a single local price. Even New Hanover's lot rents vary little, though there are a few exceptions.

One does see more substantial variation especially in heterogeneous, periurban counties like Alamance and Orange; in Carteret County, which has both a coastal retiree population and a low-income population nearby and further inland; and in Buncombe County, which has a prospering city, resorts, and low income rural areas. Finally, Guilford and Wake Counties have a more dispersed distribution of rents that in part reflects variation in quality and the presence of both large corporate and small mom-n-pop parks.

This regional heterogeneity motivates our decision to consider the market both as a unified entity and as being segmented into three groups. The high end parks (and expensive rents) that one finds in part of Guilford, New Hanover, and Wake Counties simply do not exist in rural North Carolina: there are likely no analogs of Parrish Manor or the Yes! Communities sites there; we describe these below. At the same time, highway access is not an issue in densely populated urban areas: 90% of the homes for which we have lot rent data are within 1.5 miles of a major highway, which is less than the mean distance for parks in small towns and urban fringes, and only one-third of the mean distance for parks in rural areas. That is, access should be critical in some cases but not others, and so combining different areas would likely lead to coefficient estimates that reflected none of the distinct markets. Variation in park rents has a similar effect: middle-income residents on the edge of Raleigh or Greensboro may be considering substitutes for their MH parks that cannot be found in small towns and rural areas. As is shown below, large differences in estimated coefficients validate our decision to divide the state into a number of distinct MH markets.

Figure 2

Scatter plot of ln(FMRs) and ln(Average Rents)



Finally, Figure 2 provides a scatter plot of the natural logarithms of HUD fair market rents and average park rents (aggregated to the Census block group level; unweighted averages). The simple point is that rental housing and park lot rents do not appear to be closely correlated, at least without controlling for other relevant factors. We believe this is likely due to the fairly simple way in which FMRs are calculated. FMRs are the 40% rental value for each Metropolitan Statistical Area (MSA) as outlined by the Office of Management and Budget; for areas outside an MSA, they are generated at the county level. Because these classifications extend over large land areas, they factor in portions of the housing market that have little effect on the market for mobile home parks. However, these HUD guidelines seem likely to affect lot rents regardless of how they are calculated, since subsidized housing is an obvious substitute for MH park housing, at least for some people.

4. REGRESSION MODEL AND ECONOMETRIC ISSUES.

4.1 Hedonic models of manufactured housing unit resale value. The conventional hedonic model of housing value is that a piece of property is the sum of its structure and land values. In the case of MHP site rents, payment is being made exclusively for the land value, thereby enabling us to ignore unobserved differences in the quality of particular units. Land value to the user, in turn, depends on (a) park amenities, (b) local amenities, such as quality of schools, crime risk, local environmental quality, and quality of nearby shopping, and (c) access to highways, city centers, schools, hospitals, shopping, and other services. Land value to the park owner also depends on local real estate taxes, but these are low for manufactured home owners, since they directly pay tax only the value of their structures – which in North Carolina are usually quite modest. These tax rates depend on the amorphous statutory definition of personal property versus real property; for those trailers classified as personal property, average county tax rates are around 0.6%. Finally, land value will depend on (d) availability of substitutes, which includes housing in other parks and certain types of non-park housing.

As anyone who has traveled up and down North Carolina's highways and back roads can attest, amenities tend to be modest in most parks: those with substantial amenities, such as Parrish Manor https://www.parrishmanor.com/, are fairly rare. Equally scarce are large-scale parks owned by national chains and with both rental and owner-occupancy options, like https://www.yescommunities.com/community/oakwood-forest. But, they do exist (and Yes! Communities alone has nine parks in the Greensboro and Raleigh areas). Many require background checks, which should be valued by others seeking a low-crime environment. Many also have minimum maintenance standards, which raise the attractiveness of the community, and therefore should be valued by residents. Quality of roads, water and sewerage services, internet availability, lighting, and laundry facilities all matter, as does the view – people value waterfront property over highway-front land, though flood risk is a disamenity.[3] [4]

In short, these features should matter for pricing – and the site rents quoted for the units offered in Oakwood Forest suggest that they do. However, a simple glance at the units and amenities offered in Oakwood Village or Parrish Manor compared with less glamorous options nearby on mhbay.com indicates an obvious problem: unit quality, locational desirability, and amenities are all likely to be (highly) correlated, thereby obscuring any causal inference. We cannot address this perfectly: the best we can do without a complete list of amenities or of repeated sales (and hence repeat observations on rent for the same site) is to control for as many features as possible, and note likely omitted variable biases. Furthermore, when obvious endogeneity problems emerge, we can and do use instrumental variables' techniques.

4.2. Substitutes for manufactured housing parks. One of our two foci is to explore whether MHP unit site rents are correlated with nearby housing market conditions and, if so, with which particular submarket. We focus on two particular components: the rental market, and the resale market for owner-occupied housing. For the former, we use US HUD "fair market rates" (https://www.huduser.gov/portal/datasets/fmr.html), which they define as *a percentile point within the rent distribution of standard-quality rental housing units. The current definition used is the 40th percentile rent, the dollar amount below which 40 percent of the standard-quality rental housing units are rented.* This housing includes both apartment and independent house rentals. For the latter, we use a variety of alternate indices, settling on Zillow's entry level housing price index (https://www.zillow.com/research/data). This is smoothed, seasonally-adjusted dataset that outlines median home price within a certain ZIP code.

4.3. Zoning. Our second major point of interest concerns the extent to which zoning matters. If zoning were randomly imposed, then making entry more difficult serves to protect incumbent park owners,

[3] In reality, amenities such as background checks and restrictions on structure additions are also ambiguous. Families with young children are likely to value safety-related measures. But, other types of residents will value lack of oversight. Those without legal status, or who are raising fighting animals, or producing and selling illegal substances, will pay a premium ***not*** to be supervised. Similarly, those who wish to build porches or ancillary units will value lack of supervision. A formal mathematical model of park residence predicts that households will sort themselves into different parks according to differing preferences, but cannot predict whether site rents will be greater in more or less restrictive parks.

[4] An excellent example of the sort of amenities that might be provided, along with clear MH park rules, and a variety of housing options can be found on the website of Pelican Estates http://pelicanestatesmonroe.com/ (though it is located in Louisiana rather than North Carolina).

allowing them to drive up rents, which ultimately should be capitalized into park values (Becker and Yea, 2015). However, it is also possible that zoning is non-random, and is determined by forces related to park rents. Most obviously, pressure on land may drive up park rents (and the costs of land used for other forms of housing), and concern over uncontrolled growth may lead to restrictions on construction of all sorts, and especially of "low value added" uses.

But, zoning is complex. The most basic impetus for zoning that one hears from virtually every park owner and prospective tenant is that of NIMBYism: local governments wish to discourage those whose property taxes do not cover the costs of public services they consume. MHP owners provide dense, relatively inexpensive housing occupied by low-income residents who contribute relatively little to local government coffers on their own. Not surprisingly, cities like Asheville zone out new MHP developments, but existing developments are grandfathered in (Patrick, 2017). Since virtually no local government is enthusiastic about attracting poor residents, it is not clear which bodies would be most aggressive in restricting parks. A simple Tiebout (1956; also Davis and Bali, 2008; Fischel, 1992) model implies that highest income jurisdictions would be most hostile to MHPs.

We explore the possibility of endogeneity by using an IV estimator for zoning restrictiveness, the results of which are depicted in Appendix 2. Our preferred candidates are (a) the rate of population growth in a county over the past two decades, and (b) per capita property tax revenues at the county level. The former measure reflects general land use pressure; the latter captures expenditure benefits likely to be gained by low income MHP residents. We estimate these measures at the county level, since county commissioners and planning boards are the major players in determining local policy.

4.4 Lack of panel data and instrumental variable options. As mentioned, our strong preference would be to have panel data – multiple observations of park rents paid at different times by the same housing unit. Unfortunately, multiple observations are available for far too few units. Absent this information (and even in its presence, to some extent), we run the risk of unobserved heterogeneity – in essence, we do not control for all relevant factors, and these omitted variables may themselves be correlated with other explanatory variables, thereby leading to biased coefficient estimates.

The best response possible is to hunt for instrumental variables that are correlated with the suspect exogenous variables, but not other endogenous or exogenous variables, and then to estimate a first stage IV regression, which then sets the stage for a second regression with the instrumented term included. We focus on doing this two-stage process for the housing price and HUD 40% rental rate variables, hypothesizing that they will be driven by population growth and construction starts, again at the county level. As the results below indicate, endogeneity is an important concern for these variables, and the IV estimates differ markedly from conventional OLS estimates.

Endogeneity of zoning is less clear-cut. While there are theoretical arguments that point to endogeneity, those familiar with actual political processes will recognize that changes occur very slowly, and are unlikely to respond rapidly to changing economic conditions the way that rents or housing prices will. Furthermore, there appear to be distinct differences across counties in preferences for economic growth – and, moreover, these preferences in North Carolina do not seem to be tied to political allegiances.[5] From our perspective, many of these differences are effectively exogenous. This random variation appears stronger still in light of our decision to break the state up into three markets; urban, rural, and periurban and small city. This distinction further reduces variation in economic incentives to institute zoning restrictions, thereby making local variation more a function of idiosyncratic local preferences.

5. OLS RESULTS.

Problems of endogeneity and omitted variables' bias limit the credibility of OLS regression results, and we report them here with only a brief discussion, emphasizing the coefficients on variables unlikely to be problematic.

5.1 Statewide results Regression results for the entire state of North Carolina in Table 2 demonstrate the highly unusual relationship between MHP rents and the conventional economic indicators for housing. We find the natural logarithm of local FMRs, which we interpret to represent general low-income rental housing demand, to be only marginally significant in predicting MHP rents, and it enters with a negative sign. However, the regional owner-occupied starter housing price index is positive and significant with a coefficient that roughly offsets the FMR effect. The various zoning measures are all insignificantly different from zero. MH home age – which is likely strongly positively correlated with MH park age – has a strong negative effect that declines in absolute value over time (positive quadratic term). These results underscore a

[5] This point stems from a conversation with Richard Ericsson of East Carolina University. Briefly, Durham County has a strongly pro-growth commitment; Pitt County (where ECU is located) is reluctant to encourage growth. As best we can figure, these attitudes completely dominate political party affiliation. In another example, while both Durham and neighboring Orange Counties are strongly Democratic, attitudes toward growth are completely different – Orange is even more anti-growth (until recently) than Republican-leaning Pitt.

point mentioned above, namely that conventional economic indicators for most of the housing stock often struggle to fully explain the variation in MHP rents.

What emerges, in fact, are importance of demographic composition of a park's block group. A 1% increase in a block group's poverty rate implies to a 1.17% decrease in average park rent. However, an increase of 1% in the proportion of block group with above an associates' degree is linked to a 1.2% decrease in rents. We also observe a strong negative relationship between proportion of racial and ethnic minorities (Black, Native American, and Hispanic) and park rents when we interact race with log county population, which controls for the varying densities of minorities at different population levels. However, this negative effect for minorities is offset by a strongly positive *MINORITY*POPULATION* interaction term. Finally, lot rents are positively associated with income, negatively associated with the distance to the nearest highway, negatively associated with distance to the nearest major metro area, and negatively associated with the proportion of housing that is manufactured.

It is not difficult to tell what is driving these results: lot rents are lower in remote, depressed areas. The signs on demographic terms are correlated with location, and are not themselves causal. At mean housing unit age value, the marginal effect from the quadratic expression implies that lot rents decline about 1% per year, which is a plausible figure for park quality depreciation.

5.2 Urban, rural, and periurban results The coefficients from the statewide model strongly suggest that coefficients in the aggregate model will be biased, as they will be correlated with locational characteristics. In order to analyze MHPs' differing roles in urban, rural, and smaller town/periurban environments, we separate the statewide model into three separate regressions. The unconventional results from our statewide regression justify this distinction, and we anticipate that the division will lead to drastically different regression results for the specific regions. In particular, we expect that distance variables will be most important on urban outskirts and in small towns, and that many of the demographic and income terms will become less important when they no longer pick up regional effects.

The output, also in Table 2, confirms these suspicions. We see vastly different results for most variables. Overall, we observe that race remains a significant predictor across all three distinctions. However, its interaction with log county population is most relevant to in determining urban and suburban/small town rents. We also see an increasing relevance of FMR as one moves to more rural settings, as well as a flip from being insignificantly different from zero in urban areas (likely reflecting measurement error) and strongly negative in small towns and periurban areas, to being significantly positive in rural areas – a likely reflection of higher rents in coastal retirement areas.

The positive FMR sign implies that manufactured housing serves as a substitute for those households that get priced out of low-income rural housing. In contrast, the overall home price index is positively correlated with MH lot rents in urban areas but not in rural or small town/periurban housing. The urban regression also accounts for nearly all of the explanatory power of model age and model age squared. This likely reflects the fact that North Carolina's urban areas see the most housing development and allow consumers to express a preference for newer models. In contrast, much of small town and rural North Carolina is in decline, and stick-built housing turnover is less frequent, so that the indices are less accurate.

Rural MHPs, however, operate distinctly from their urban counterparts, with the strongest indicator of rents being the distance from a major highway. In contrast, distance to the central business district (CBD) matters only in urban settings. We also observe significance on the part of educational attainment, which we believe captures the residual effect of small, high-income communities in the same block group as MHPs; the presence of such neighborhoods imposes a premium on rents in the surrounding parks. Rural areas also are the only category in which park rents move positively with FMRs, indicating that rural manufacturing housing markets move in conjunction with the housing market. This can be partially ascribed to a lack of other available housing – especially rental housing – in this region. It is also worth noting that the first principal component of zoning (which captures the variability of overall zoning restrictiveness) is moderately significant in rural areas, the only such instance in which we find zoning to be have an impact in OLS regressions.

Small town and periurban areas also deviate from urban and rural in interesting ways. Here, FMR becomes most significant, carrying a slight negative effect. Race, once again, plays an important factor, more so in highly populous counties. We also observe a significant positive effect of per capita income of the block group, which indicates strong income effects in the MHP market.

Finally, we turn to the different marginal effects of housing unit (and hence park) aging. Calculating these marginal effects at mean values, we find that lot rent declines are smallest in urban areas (0.38% per annum) compared with small town/periurban (0.62%) and rural (0.72%) areas. These patterns are consistent with economic theory: scarcity land rents in cities do not decline with unit age, so that the proportionate effect of deteriorating infrastructure is weakest in cities and strongest in rural areas with low intrinsic land value. Note, too, that all of the estimates are smaller than the statewide coefficient, implying that rural units are older on average than those in cities.

Table 2
Manufactured Housing Park Lot Rent regressions (OLS)

Statewide (n = 2854; R^2 = .486)				Urban (n = 1881; R^2 = .523)			
ln(Avg. Rent)	**Coeff.**	**St. Err.**	**t**	**ln(Avg. Rent)**	**Coeff.**	**St. Err.**	**t**
ln(FMR 2B)	-0.2740	0.1453	-1.89	ln(FMR 2B)	-0.2747	0.25479	-1.08
Age of model	-0.0650	0.0069	-9.48	Age of model	-0.0728	0.00893	-8.15
Age Squared	0.0012	0.0001	8.48	Age Squared	0.0015	0.00019	7.76
Highway dist.	-0.0197	0.0105	-1.87	Highway dist.	-0.0810	0.02568	-3.15
Prop. of educ.	-1.2028	0.1743	-6.9	Prop. of educ.	-1.1306	0.26002	-4.35
Gini coeff.	0.4025	0.2597	1.55	Gini coeff.	0.5740	0.36076	1.59
Poverty	-1.1755	0.1827	-6.44	Poverty	-1.6812	0.23699	-7.09
Race	-3.5970	0.4016	-8.96	Race	-2.1758	0.61345	-3.55
Urban Dist.	-0.0031	0.0016	-1.94	Urban Dist.	-0.0086	0.00324	-2.67
Comp1	0.3344	1.0542	0.32	Comp1	-0.9360	1.79197	-0.52
Comp2	0.0045	0.3804	0.01	Comp2	-2.4931	1.90180	-1.31
Comp3	-1.1171	1.1543	-0.97	Comp3	19.4932	17.18678	1.13
Comp4	0.3518	0.5337	0.66	Comp4	3.7974	3.20025	1.19
ln(Home Price)	0.2248	0.0716	3.14	ln(Home Price)	0.3392	0.12088	2.81
ln(PC Income)	0.1297	0.0569	2.28	ln(PC Income)	0.0257	0.08507	0.3
MH Rate	-0.3185	0.0552	-5.77	MH Rate	-0.3907	0.06976	-5.6
Race * ln(Pop.)	0.3018	0.0313	9.64	Race * ln(Pop.)	0.1981	0.04741	4.18
Comp1 * ln(Pop.)	-0.0343	0.1110	-0.31	Comp1 * ln(Pop.)	0.0997	0.18866	0.53
Comp2 * ln(Pop.)	0.0001	0.0397	0	Comp2 * ln(Pop.)	0.2597	0.19985	1.3
Comp3 * ln(Pop.)	0.1191	0.1214	0.98	Comp3 * ln(Pop.)	-2.0515	1.81024	-1.13
Comp4 * ln(Pop.)	-0.0343	0.0560	-0.61	Comp4 * ln(Pop.)	-0.4010	0.33711	-1.19
_cons	4.2969	0.8359	5.14	_cons	4.03713	1.23576	3.27

Rural (n = 112; R^2 = .585)				Small Cities and Periurban Areas (n = 861; R^2 = .629)			
ln(Avg. Rent)	**Coeff.**	**St. Err.**	**t**	**ln(Avg. Rent)**	**Coeff.**	**St. Err.**	**t**
ln(FMR 2B)	0.9738	0.48755	2	ln(FMR 2B)	-0.5462	0.19956	-2.74
Age of model	-0.0532	0.02415	-2.2	Age of model	-0.0200	0.01264	-1.58
Age Squared	0.0010	0.00048	2	Age Squared	0.0003	0.00026	1.07
Highway dist.	-0.1423	0.02596	-5.48	Highway dist.	-0.0051	0.01414	-0.36
Prop. of educ.	3.0359	0.81314	3.73	Prop. of educ.	-0.6843	0.28516	-2.4
Gini coeff.	0.6869	1.33056	0.52	Gini coeff.	-0.0635	0.45765	-0.14
Poverty	0.3015	1.04808	0.29	Poverty	-0.2828	0.32322	-0.88
Race	-9.6181	3.71792	-2.59	Race	-7.5703	0.92121	-8.22
Urban Dist.	-0.0043	0.00388	-1.1	Urban Dist.	0.0004	0.00191	0.22
Comp1	0.1266	0.06512	1.94	Comp1	0.3989	1.66224	0.24
Comp2	-0.0497	0.06605	-0.75	Comp2	-0.0421	0.60382	-0.07
Comp3	-0.0042	0.05191	-0.08	Comp3	-1.4695	1.96651	-0.75
Comp4	0.0973	0.08492	1.15	Comp4	-0.5529	1.54211	-0.36
ln(Home Price)	-0.3490	0.23245	-1.5	ln(Home Price)	0.0013	0.10711	0.01

ln(PC Income)	-0.3870	0.23654	-1.64	ln(PC Income)	0.4427	0.09124	4.85
MH Rate	0.0576	0.45839	0.13	MH Rate	0.1869	0.11993	1.56
Race * ln(Pop.)	0.7072	0.29726	2.38	Race * ln(Pop.)	0.5993	0.07099	8.44
Comp1 * ln(Pop.)	n/a	n/a	n/a	Comp1 * ln(Pop.)	-0.0423	0.17507	-0.24
Comp2 * ln(Pop.)	n/a	n/a	n/a	Comp2 * ln(Pop.)	0.0049	0.06340	0.08
Comp3 * ln(Pop.)	n/a	n/a	n/a	Comp3 * ln(Pop.)	0.1558	0.20692	0.75
Comp4 * ln(Pop.)	n/a	n/a	n/a	Comp4 * ln(Pop.)	0.0634115	0.16211	0.39
_cons	7.1906	2.85503	2.52	_cons	4.961112	1.42452	3.48

6. IV RESULTS.

Although some results in the OLS regressions are plausible, we have a reason to suspect endogeneity for several of key variables, including home prices, HUD fair-market rents (FMRs), and local zoning measures. The concern is that these variables are affected by unobserved forces that also affect park rents, thereby causing spurious correlation and hence biased coefficients in a simple ordinary least squares model. Thus, we impose a two-stage least-squares (2SLS) model, using annual county tax revenues, annual county population growth, long-term county population growth, and single and multifamily unit construction starts as instruments.

6.1 The problem of endogeneity The necessity for a 2SLS model stems from endogeneity in our market controls. We use home prices and FMRs as indicators of local housing demand. However, these variables fluctuate based on a confluence of unobserved factors which themselves could affect average park rents. To mitigate this problem, we select instruments that restrict the effects of home prices and FMRs to their correlations with local development factors; that is, the construction of single and multifamily units at the county level and annual county population growth. These instruments meet the tests for relevance and exclusion; they are strong predictors of local housing measures, and are uncorrelated with average park rents outside of their effects on home prices and rents.

Similarly, we control for the endogeneity of zoning measures for the same reasons. A political locality that adopts less restrictive zoning measures for parks likely has other significant characteristics that drive park rents, most notably, valuable public goods like strong schools. Therefore, we instrument our total zoning score with per capita county tax revenue collection and county population growth from 1990 to 2010. Tax revenue collection serves as an indicator of county public services that contribute to zoning decisions, and long-term population growth demonstrates overall county development. The effect of zoning in the 2SLS regression emerges from its correlation with these instruments, as outlined in the first stage regressions in Appendix 2.

6.2 Statewide results The distinct results apparent in Table 3 from 2SLS regressions justify our hypotheses of endogeneity. When we restrict home prices and FMRs to their correlations with the instruments, they fade to statistical insignificance at the state-level. Zoning permissiveness, however, becomes strongly negative and significant when instrumented, with a 1-unit increase (about 37% of the mean; see Table 1) in our overall zoning score implies a 52% decrease in MHP rents. This effect implies that parks whose prospective competitors have been "zoned-out" collect higher rents, drawing premiums for local public goods, like better public schooling.

Model age remains a strong predictor across regressions at the state level. The large race effect observed in the OLS model, however, becomes far less significant in 2SLS model. In the OLS model, race and its interaction effect with ln(population) are likely to be correlated with omitted but important indicators of poverty and population density that are not captured by other measures, and that are related to the likely endogenous housing value and zoning variables. Thus, using instruments not only removes the bias on the housing coefficients, it also reduces the effect of race variables intended to sop up omitted variables' effects. In contrast, the county-wide Gini coefficient, which measures local inequality (with high values reflecting greater inequality), becomes positively associated with park rents in the 2SLS model. We suspect that this coefficient is actually capturing a regional dynamism effect: counties with rapid growth are more likely to see surging inequality in North Carolina – and, of course, these areas are also likely to experience rising rents.

At the statewide level, neither home prices nor fair market rents are statistically significant in the 2SLS model, while they were in the (biased) OLS model. In contrast, our aggregate measure of zoning permissiveness, which we generate through a summation of our 11 zoning indicators (outlined in section 2.3), we find to be highly significant. We thus find strong support for Frank Rolfe's hunch that zoning restrictions drive up park rents: a one standard deviation in zoning permissiveness is associated with a 124% percent greater park rents. This functionally equates to the effect of MHPs being allowed by right in 1.25 more zoning districts within a zoning area.

Conventional location (distance to highway, distance to nearest central business district [CBD]) and quality (a quadratic housing unit age term, itself correlated with park age and hence infrastructure) variables are not terribly sensitive to OLS vs. 2SLS specification. However, coefficient estimates do vary, as they did in the OLS model, when we break them down into urban, rural, and small town/periurban subsections.

6.3 Urban, rural, and periurban results Once again, our models indicate vastly different economic models for urban, rural, and periurban trailer parks. For urban parks, zoning becomes irrelevant, and local housing market indicators of home price and FMR become significant in negative and positive directions, respectively, an effect unobserved by the OLS model. The marginally significant but strongly negative effect of home price, with a 1 standard deviation (25%) change in prices generating nearly a 21% decrease in park rents, suggests little connection between the two markets, as it is implausible that they are complements. In contrast, we observe a larger effect as a result of FMRs, in which a 1 standard deviation (11%) increase in the market rate driving a 26% increase in park rents. The signs of these effects hold true in the rural regression as well, implying that MHPs move with the housing market in fairly similar ways across urban and rural divides. Home prices and FMRs are insignificant in the periurban regression, however, where MHP rents seem largely determined by how permissive the locality is in their zoning measures.

While FMR is an important driver of park rents both in major urban areas and in rural areas, in both cases the sign on home prices is reversed and significant (and is insignificant in small cities and periurban areas). We believe this anomalous finding reflects strong social segregation. Along the coast and inner banks of eastern North Carolina, tourism and retirement communities drive up average home prices. These communities have little or nothing in common with poor areas further inland; as farmland without a coastal view is plentiful and declining population has given rise to surplus housing stock, rents in these communities tend to be very low. In thriving, high real estate value metro areas, remaining parks tend to be clustered in areas with negative environmental amenities (for example, immediately adjacent to major highways). Thus, the negative signs likely reflect omitted variables' bias – though confirming this is a matter for further investigation.

Most of the significance of zoning at the state level hinges on its significance within small city and periurban fringe areas, in which a standard deviation decrease (the equivalent of 2.5 zoning areas allowing MHPs by right) in zoning equates to more than a tripling of park rents, when evaluated at the mean population. This is likely because small cities and suburban areas have varying preferences for restrictive zoning. Localities that provide valuable public services, like strong public schools, have incentives to tighten land use in order to restrict access for lower-income homeowners. As a result, we observe that restrictive zoning for MHPs, modeled by a lower total zoning score, generates higher park rents for the units grandfathered into the zoning area. These higher rents are likely premiums for the valuable public goods that led to such tighter zoning measures. We do not observe this effect in larger urban areas, where the scarcity of parks does not justify zoning measures restricting them, and rural areas, where an absence of substantial public services and population outflows do not incentivize restrictive zoning measures at all. We also reiterate that this finding only emerges when we aggregate our zoning measures across 11 subsections of land use, and then control for endogeneity by using a 2SLS estimation procedure. It is also critical to note that the zoning*ln population interaction term is positive, implying that the zoning permissiveness effect is strongly felt only in the less populous urban counties.

For parks in large urban areas, the strongest determinant of park rent appears to be local poverty status, in which a doubling of the impoverished population for that block group signifies a 188% decrease in MHP rents. This effect is not sensitive to OLS/2SLS estimation. Rather, it reflects the very large differences in rents across North Carolina's thriving and dying towns and cities.

We also observe a strong age effect for parks in major urban areas at this level. Rural park rents, on the other hand, depend largely on their geographic distance to a highway, where a one-mile increase in highway distance equates to a 12% decrease in park rents. While distance is important for units in parks in major urban areas as well, it is not significant for units in small cities and periurban areas.

Finally, the proportion of housing that is manufactured is associated with lower rents in metro areas, but with higher rents in small cities, periurban areas, and rural areas. This asymmetry reflects the dualistic signal sent by manufactured housing. In North Carolina's cities and their environs, MHPs signal the presence of a low income region. However, on the periphery of cities and elsewhere in the state, the presence of parks is associated with economic activity – local manufacturing and labor-intensive agriculture – and even economic growth.

Table 3
Manufactured Housing Park Lot Rent regressions (IV)

Statewide (n = 2865; R^2 = .46)				Urban (n = 1883; R^2 = .296)			
ln(Avg. Rent)	**Coeff.**	**St. Err.**	**t**	**ln(Avg. Rent)**	**Coeff.**	**St. Err.**	**t**
ln(Home Price)	0.1248	0.1968	0.63	ln(Home Price)	-0.8397	0.4611	-1.82
ln(FMR 2B)	0.0474	0.3807	0.12	ln(FMR 2B)	2.1973	0.9199	2.39
Total Zoning Score	-0.4838	0.1358	-3.56	Total Zoning Score	0.0715	0.2611	0.27
Age of model	-0.0672	0.0069	-9.71	Age of model	-0.0614	0.0112	-5.49
Age Squared	0.0013	0.0001	8.58	Age Squared	0.0013	0.0002	5.95
Highway dist.	-0.0168	0.0104	-1.61	Highway dist.	-0.1016	0.0306	-3.32
Prop. of educ.	-1.0731	0.2093	-5.13	Prop. of educ.	-0.3638	0.4162	-0.87
Gini coeff.	0.7994	0.2733	2.92	Gini coeff.	1.4232	0.5566	2.56
Poverty	-1.2829	0.1823	-7.04	Poverty	-1.8565	0.2723	-6.82
Race	-1.6365	0.6663	-2.46	Race	-1.3809	1.0878	-1.27
Urban Dist.	-0.0024	0.0016	-1.5	Urban Dist.	-0.0075	0.0040	-1.89
ln(PC Income)	0.0952	0.0622	1.53	ln(PC Income)	-0.1620	0.1153	-1.41
MH Rate	-0.3001	0.0684	-4.39	MH Rate	-0.2616	0.0943	-2.78
Race * ln(Pop.)	0.1469	0.0528	2.78	Race * ln(Pop.)	0.1341	0.0827	1.62
Zoning * ln(Pop)	0.0391	0.0108	3.61	Zoning * ln(Pop)	-0.0083	0.0212	-0.39
_cons	3.5537	0.8632	4.12	_cons	3.0368	1.4073	2.16

Rural (n = 121; R^2 = .641)				Small Cities and Periurban Areas (n = 861; R^2 = .165)			
ln(Avg. Rent)	**Coeff.**	**St. Err.**	**t**	**ln(Avg. Rent)**	**Coeff.**	**St. Err.**	**t**
ln(Home Price)	-0.9352	0.3648	-2.56	ln(Home Price)	-0.0876	0.2886	-0.3
ln(FMR 2B)	0.7094	0.6344	1.12	ln(FMR 2B)	0.0067	0.4180	0.02
Total Zoning Score	-0.1220	0.6764	-0.18	Total Zoning Score	-1.9922	0.4705	-4.23
Age of model	-0.0150	0.0232	-0.65	Age of model	-0.0737	0.0223	-3.31
Age Squared	0.0001	0.0004	0.26	Age Squared	0.0012	0.0004	2.75
Highway dist.	-0.1191	0.0208	-5.73	Highway dist.	0.0133	0.0199	0.67
Prop. of educ.	3.9019	1.1702	3.33	Prop. of educ.	0.0612	0.4421	0.14
Gini coeff.	3.1050	0.9573	3.24	Gini coeff.	2.5479	0.9229	2.76
Poverty	-1.8046	0.8382	-2.15	Poverty	0.0046	0.4725	0.01
Race	-9.9875	3.6950	-2.7	Race	5.1954	3.2519	1.6
Urban Dist.	0.0055	0.0061	0.9	Urban Dist.	0.0021	0.0028	0.76
ln(PC Income)	-0.2396	0.2116	-1.13	ln(PC Income)	0.7326	0.1497	4.89
MH Rate	0.7578	0.3668	2.07	MH Rate	0.8155	0.2456	3.32
Race * ln(Pop.)	0.7908	0.3043	2.6	Race * ln(Pop.)	-0.4391	0.2637	-1.67
Zoning * ln(Pop.)	0.0222	0.0595	0.37	Zoning * ln(Pop.)	0.1625	0.0384	4.23
_cons	12.3333	5.5820	2.21	_cons	-1.2799	2.8699	-0.45

7. WHAT HAVE WE LEARNED?

It is impossible to come away from this analysis without being struck by the heterogeneity of manufactured housing park markets. Zoning matters considerably, but only in small cities and on the fringes of large metro areas. Distance to highways is critical in rural areas, matters in North Carolina's metro areas, but is not important in small cities and periurban areas, likely because there is much less variation in access. Competing local rents matter everywhere, but especially so in metro areas. Whether this is because greater density makes markets more competitive or because there is less measurement error in metro areas is unclear.

The findings in this paper also serve as a lesson in the importance of controlling for endogeneity. The patterns from simple correlations and OLS regressions are useful for some aspects – in identifying the importance of location/distance to highways and amenities, for example. But, they do not capture the relationships between park rents and clearly endogenous variables, or of controls whose purpose is to capture some of the unobserved heterogeneity.

Absence of complete information on the parks and units means that we estimate a reduced form model with a lot of controls to absorb omitted variables' bias. These coefficients are not readily interpretable. In an ideal world we would have repeat sales data (and hence multiple observations on rents within the same park). While this is in principle feasible at the national level (though unrepresentativeness of parks with multiple sales in different periods could be problematic), there are too few observations to make this feasible for North Carolina alone.

Low income rental housing emerges as a close substitute for MH parks in North Carolina's metro areas – which is where most parks are located, albeit outside the central business districts. In rural areas, there are few low-income apartment complexes; there, and on the outskirts of metro areas, there are few close substitutes.

The question of substitutes leads naturally to the matter of relative costs. Tables 4a and 4b provide basic information on median MH lot rents by type of location, along with median Zillow starter home prices, median MH unit sales prices, and median FMR two-bedroom apartment rental costs, estimated by HUD for the 40^{th} percentile on the quality distribution. Table 4b converts Zillow starter home values from a stock to a flow values, using the FHA mortgage rate of 4.375 percent. It also converts the median MH park house sales price to a flow value by assuming that a chattel (personal property) loan interest rate of 12 percent is applicable, and then adds to that the median lot rent.

Table 4a
Manufactured Housing Park and Substitute Housing Cost Data

Total Manufactured Housing Cost				
Area	**Median FMR 2B ($)**	**Median MH Lot Rent ($)**	**Median Home Price ($)**	**Median MH Unit Price ($)**
Statewide	694.00	180.00	138750.00	20000.00
Urban	716.00	185.00	143750.00	20172.73
Rural	678.00	172.50	132075.00	20740.00
Periurban	672.00	175.00	129500.00	19345.75

Table 4b

Manufactured Housing Park and Starter Home Monthly Costs

Monthly Cost of a Starter Home		Monthly Cost of Manufactured Housing	
Area	**Cost ($)**	**Area**	**Cost ($)**
Statewide	549.22	Statewide	380.00
Urban	569.01	Urban	386.73
Rural	522.80	Rural	379.90
Periurban	512.60	Periurban	368.46

These are intended to give ballpark comparisons rather than precise numbers: we do not make an effort to evaluate the benefit of asset accumulation to homeowners. Rather, we simply multiply asset values by the relevant interest rate: payments in excess of that amount reflect real asset accumulation, and should not be included for comparative purposes. Nor do we account for the fact that renters are not responsible for out-of-pocket charges for maintenance and depreciation, along with some ancillary services (clubhouses, security, laundry facilities) provided in many apartments that owners of starter homes must provide for themselves. These services will be incorporated in rents, which as a result are greater than monthly costs of starter homes that do not include these charges. Note, too, that owner-occupiers in MHPs fall in between renters and starter home owner-occupiers, as MHPs tend to provide some services, but often not as many as in comparable apartments, and in any case do not cover the costs of structure maintenance and depreciation.

Even given these caveats, it is impossible not to be stunned by the difference in costs of living in rental housing (or a starter home) and a MHP. Depending on one's location, the monthly outlay differential is $300 or more, implying a more than 40 percent discount for living in a MHP and owning one's own home. While greater proximity to the CBD (and to public transportation) may explain a portion of this difference, the coefficients from Table 3 indicate that less than one-quarter of the gap could be explained. In addition, greater crowding and possibly greater crime risk could have offsetting effects.

What could possibly account for this vast gulf between MHP housing costs and comparable housing costs? We have seen that the effect of zoning is both modest and limited in scope. Moreover, unless zoning is used to restrict apartment and starter home construction but not to limit the supply of MHPs – which most certainly is not the case – then the presence of zoning can do little to explain housing cost differentials.

Note, too, that the median MHP housing sales prices are high (by the standards of used manufactured housing) and, as we have seen, are relatively new. Clearly, the second-hand sales market that is recorded contains housing that is more valuable than the average over all stock: we have no data to prove this, but, having seen thousands of manufactured homes across North Carolina, we are comfortable in asserting that the median home value is almost certainly well below 2/3 of the cost of a new 14x56 single-wide Clayton unit, which retailed for about $30,000 during the period of our study data. By implication, the units trading hands in our study are not decrepit properties, but rather are nice and generally well-maintained homes – and hence similar to starter homes and likely nicer than FRM apartments.

Consequently, we focus on a different explanation; namely, the possibility that MHP housing owners are severely credit constrained. We have already assumed that MHP housing owners have to borrow at "chattel" lending rates. In practice, many people near the low end of the housing market do not have access to conventional personal property loans. Insofar as they have any access to credit at all, much of it will come from family and friends, or lenders who charge a higher rate (but abide by the North Carolina legal small loan interest cap of 36% APR). If potential MHP housing buyers are severely credit constrained, demand will be reduced, and equilibrium price will be less.

One way to get a sense of the severity of the implied credit constraint is to ask what the implied interest rate facing MHP housing borrowers would have to be to make them indifferent between living in a park or elsewhere. For manufactured housing to have approximately equal cost to that of renting, we determine an interest rate that equates the cost of financing a unit and paying rent equal to the HUD Fair Market Rent, solving

$$\textit{Median FMR} = \textit{Median Lot Rent} + \frac{1}{12}\,(\textit{Median Unit Price}) * (\textit{Interest Rate}) \quad \textbf{(1)}$$

A similar equation can be used to equate the cost of manufactured housing to that of starter homeownership, once again using the FHA rate for those who place homes on land they own:

$$\frac{1}{12}\,(\textit{Home Price}) * (4.375\%) = \textit{Median Lot Rent} + \frac{1}{12}\,(\textit{Median Unit Price}) * (\textit{Interest Rate}) \quad \textbf{(2)}$$

Tables 5a and 5b show the equilibrating interest rates, or implicit costs of capital:

Table 5a
Implicit Capital Cost to MHP Residents that Equates Renting and MHP Owner-Occupancy

Rates for Equal Cost of Renting	
Area	**Interest Rate (%)**
Statewide	30.84%
Urban	31.59%
Rural	29.25%
Periurban	30.83%

Table 5b
Implicit Capital Cost to MHP Residents that Equates Starter Home and MHP Owner-Occupancy

Rates for Equal Cost of Ownership	
Area	**Interest Rate (%)**
Statewide	19.55%
Urban	20.17%
Rural	17.88%
Periurban	18.43%

We then break these aggregates down further for the specific counties explored in Section 3:

Table 5c
Implicit Capital Cost to MHP Residents that Equates Renting, Starter Home, and MHP Owner-Occupancy

Rates for Equal Cost of Renting		Rates for Equal Cost of Ownership	
County	**Interest Rate (%)**	**County**	**Interest Rate (%)**
Alamance	38.55%	Alamance	17.95%
Buncombe	29.55%	Buncombe	28.90%
Carteret	34.30%	Carteret	50.84%
Forsyth	35.74%	Forsyth	22.20%
Guilford	24.52%	Guilford	10.89%
Johnston	32.58%	Johnston	16.03%
New Hanover	26.66%	New Hanover	17.46%
Onslow	33.85%	Onslow	27.69%
Orange	38.08%	Orange	40.33%
Pitt	n/a	Pitt	n/a
Wake	31.78%	Wake	25.03%

It is clear from Tables 5a-5c that the implicit cost of capital that makes modest-income families indifferent to living in their own homes in MHPs or in alternative arrangements is very high. However, while high, these rates are not implausible. Rather, they point to what we regard as the true culprit underlying low MHP living costs: limited access to credit by lower middle-class North Carolinians, and especially by those who are retired or disabled, and who have few assets.

This credit constraint hinders demand for housing by those who form the low end of owner-occupied housing demand. Lack of credit hurts park owners and, ultimately, manufactured housing manufacturers. Those who live in parks benefit from having cheaper park rents but, of course, they also lose when they wish to sell their homes, since demand is curtailed. And, of course, the greatest proportionate losses may be to the many Americans who cannot raise capital to buy a used manufactured home, and hence who have to pay inflated rents.

Designing a government insurance program that raises access to credit for MHP residents is not conceptually impossible. Indeed, the Federal Housing Finance Agency is moving in this direction, and vastly improved credit access may become a reality in the foreseeable future (see https://www.fhfa.gov/Media/PublicAffairs/PublicAffairsDocuments/Chattel-Pilot-RFI.pdf). If and when that happens, zoning restrictions will become far more important than they are today.

Figure 1
Urban, Rural, and Small Town/Periurban Block Groups

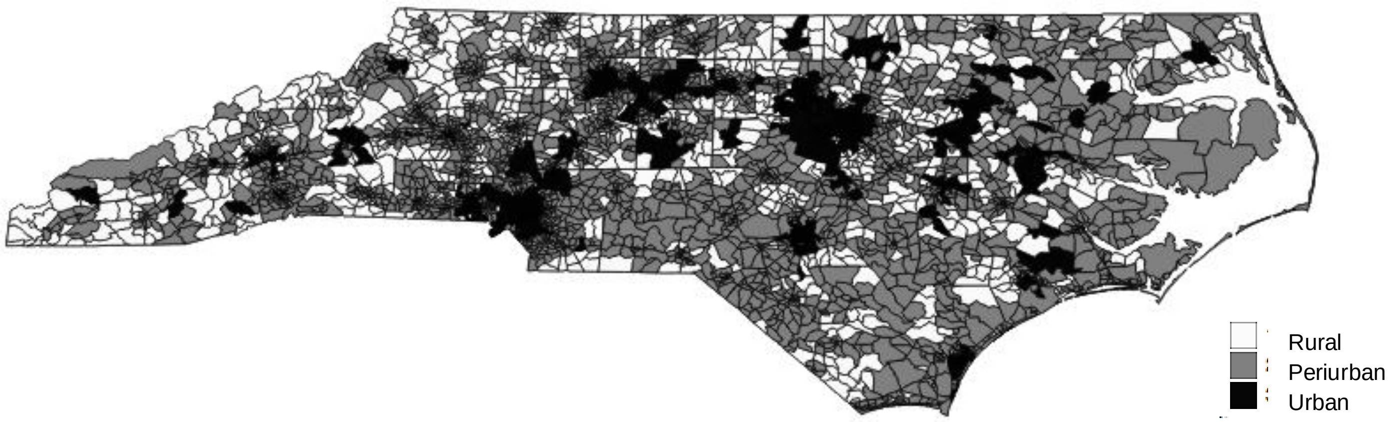


Figure 2
Proportion Black, Hispanic, or Native American, by county

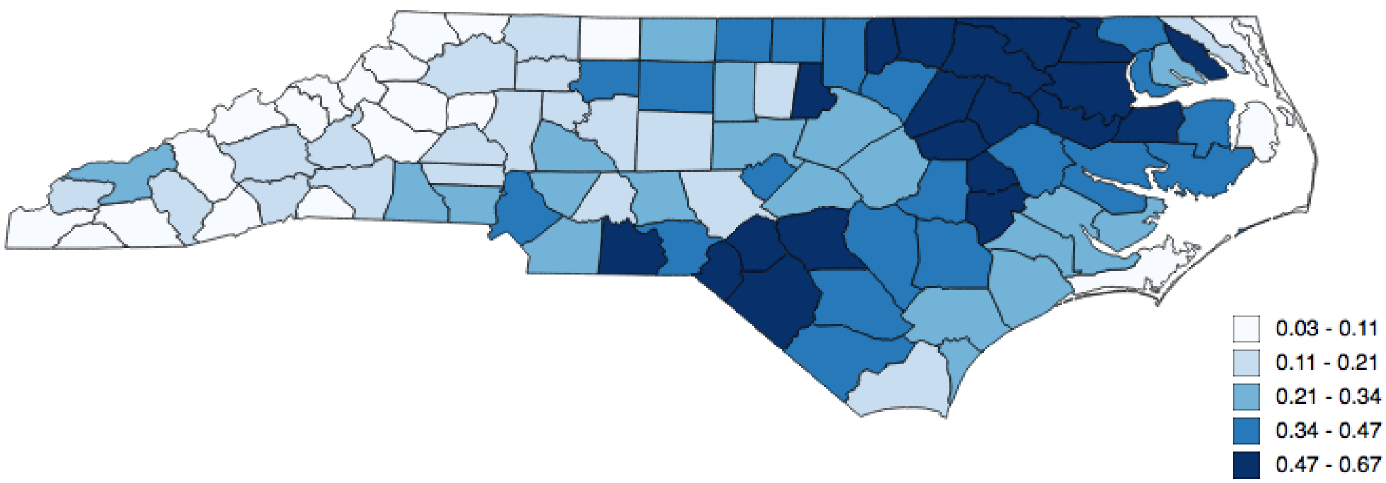


Figure 3
Zoning Permissiveness Total Score, by block group

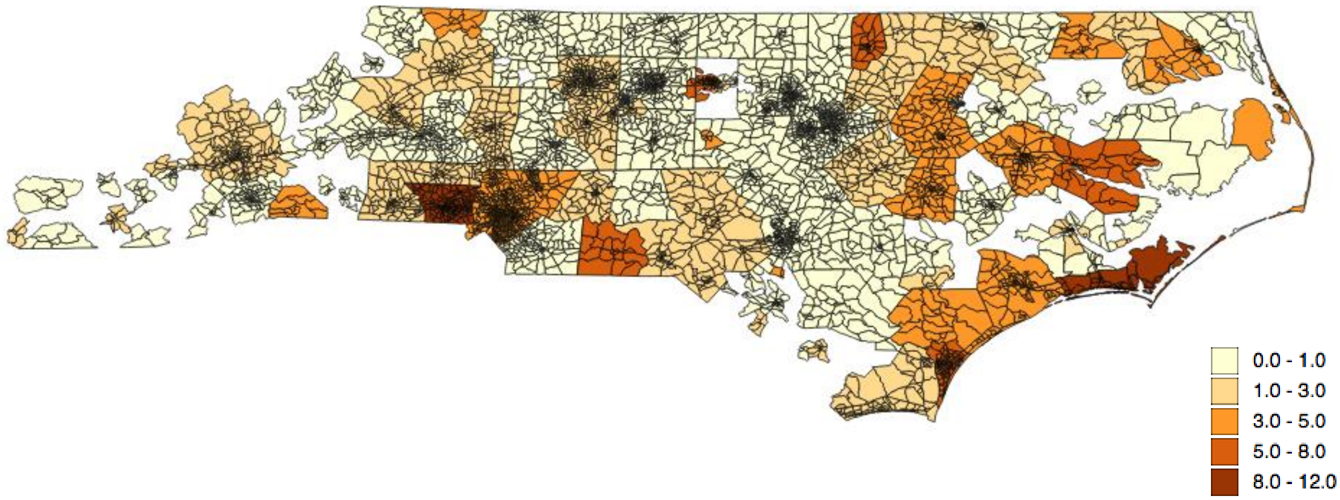


Figure 4
Manufactured Housing as a Proportion of Total Housing Stock, by county

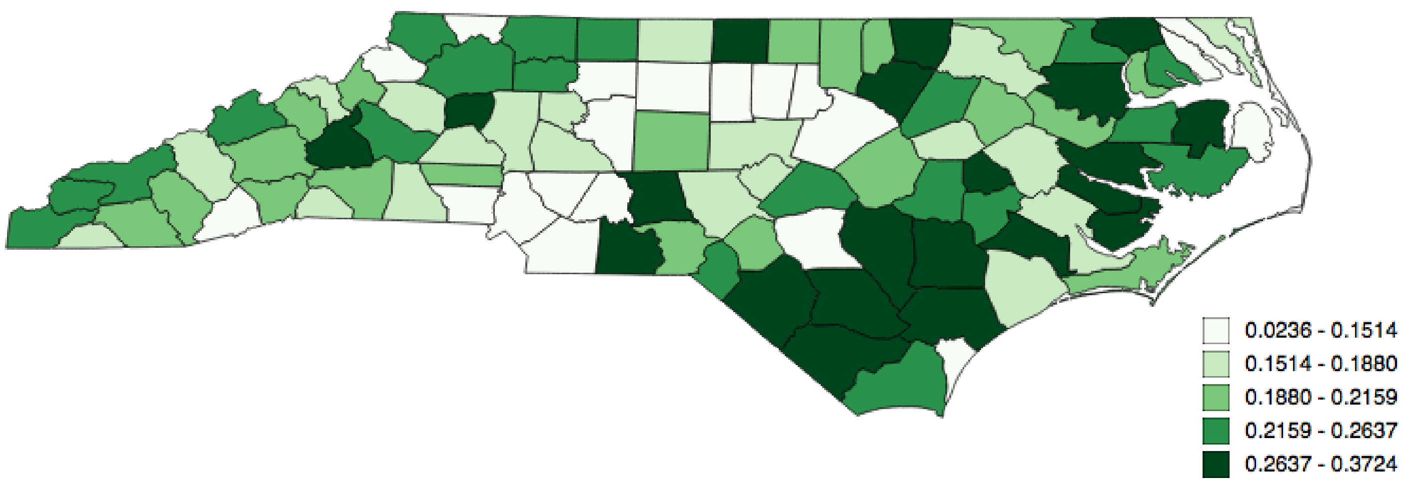
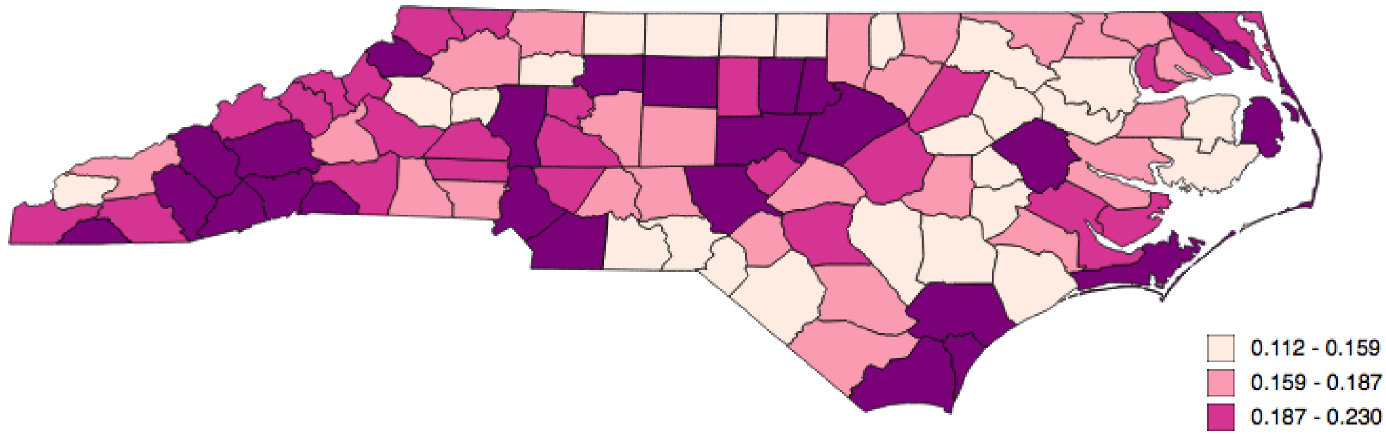


Figure 5
Educational Attainment (associates degree and above), by county



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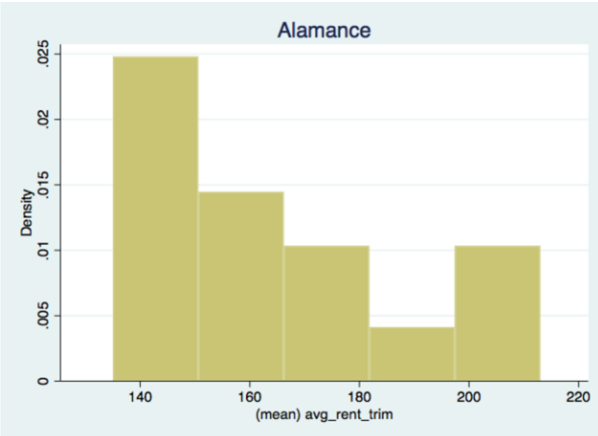
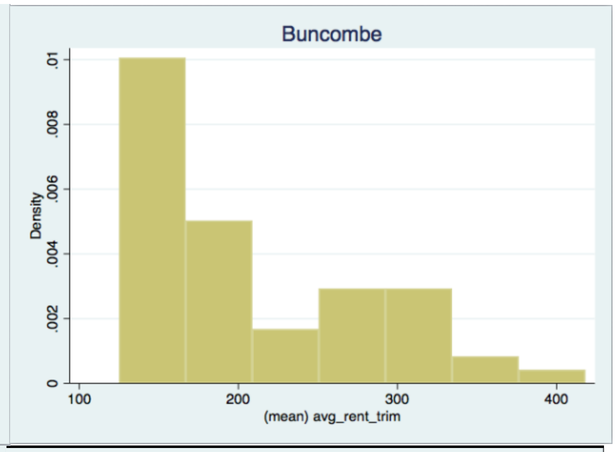
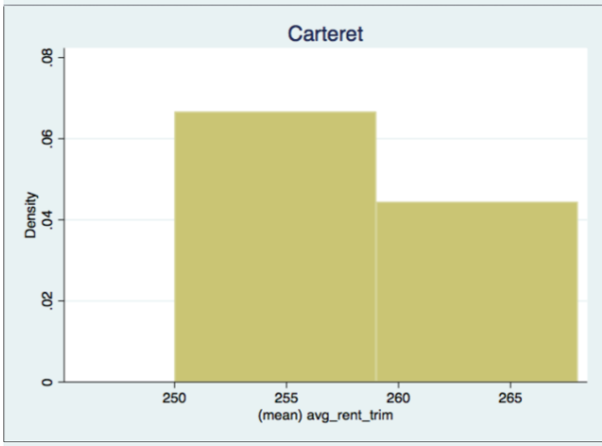
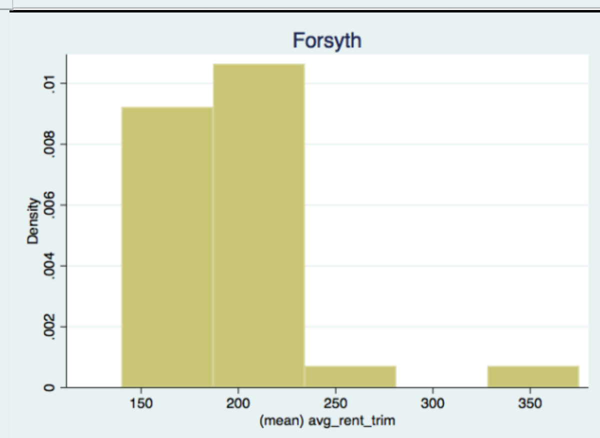
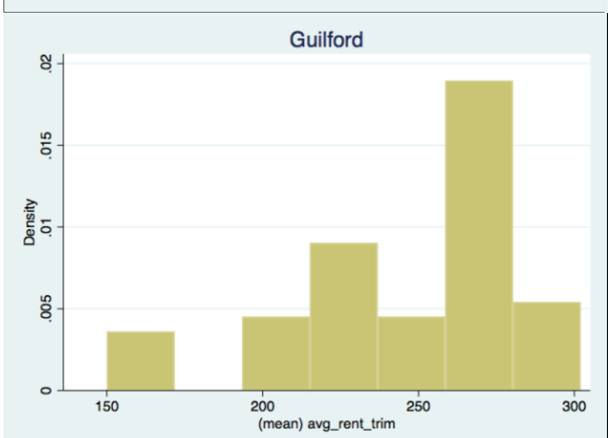
APPENDIX 1: HISTOGRAMS OF LOT RENTS FOR SPECIFIC NORTH CAROLINA COUNTIES

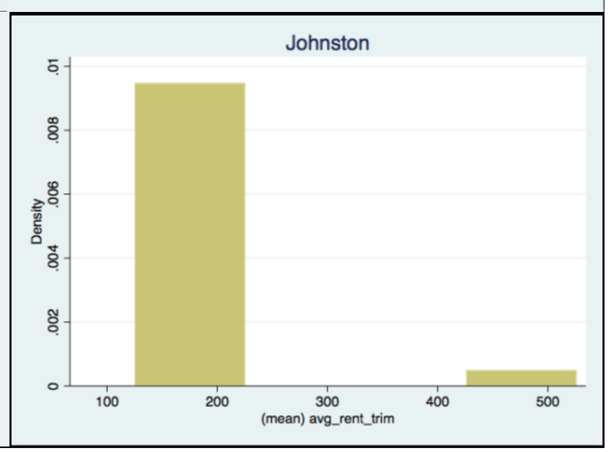


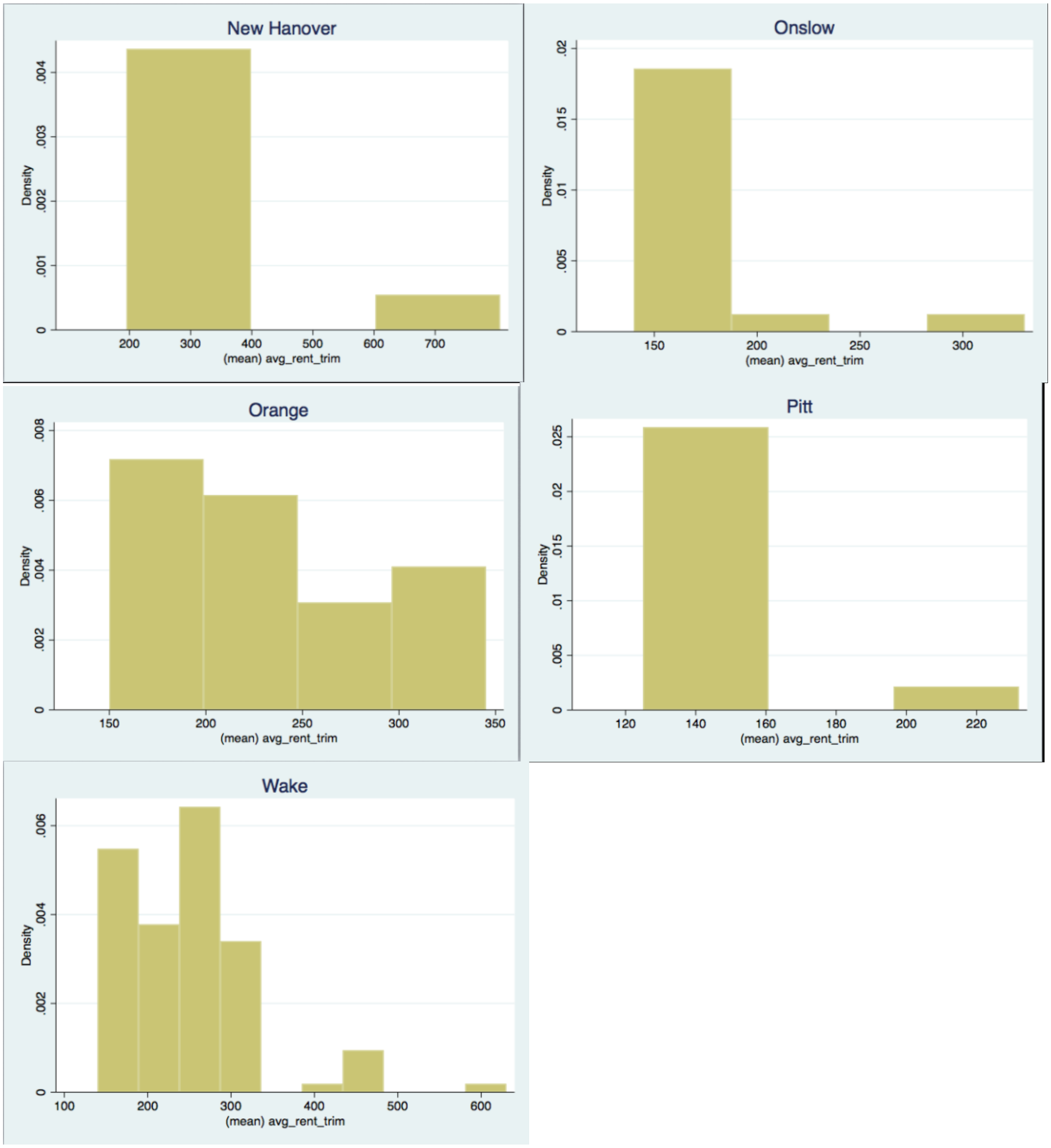











New Hanover
Density
0
.001
.002
.003
.004
200
300
400
500
600
700
(mean) avg_rent_trim
Onslow
Density
0
.005
.01
.015
.02
150
200
250
300
(mean) avg_rent_trim
Orange
Density
0
.002
.004
.006
.008
150
200
250
300
350
(mean) avg_rent_trim
Pitt
Density
0
.005
.01
.015
.02
.025
120
140
160
180
200
220
(mean) avg_rent_trim
Wake
Density
0
.002
.004
.006
100
200
300
400
500
600
(mean) avg_rent_trim

APPENDIX 2: FIRST-STAGE REGRESSION RESULTS ON ENDOGENOUS VARIABLES

Home Price							
Statewide				Urban			
ln(Home Price)	Coeff.	St. Err.	t	ln(Home Price)	Coeff.	St. Err.	t
1 Unit Housing Starts (by pop.)	0.0006253	0.0000704	8.89	1 Unit Housing Starts (by pop.)	0.0008302	0.0001188	6.99
Multi-Unit Housing Starts	0.0000050	0.0000043	1.17	Multi-Unit Housing Starts	0.0000014	0.0000046	0.3
Annual Population Growth	3.5192670	0.2271788	15.49	Annual Population Growth	3.8289540	0.3242481	11.81
Population Growth since 1990	-0.2569399	0.0436563	-5.89	Population Growth since 1990	-0.3499494	0.0822181	-4.26
Per Capita County Taxes	-0.0000003	0.0000001	-4.92	Per Capita County Taxes	-0.0000003	0.0000001	-4.73
Age of model	-0.0000466	0.0029921	-0.02	Age of model	0.0030154	0.0041073	0.73
Age Squared	0.0000531	0.0000595	0.89	Age Squared	0.0000387	0.0000847	0.46
Highway dist.	-0.0047528	0.0047356	-1	Highway dist.	-0.0235907	0.0104884	-2.25
Prop. of educ.	0.3345904	0.0787824	4.25	Prop. of educ.	0.2960402	0.1114090	2.66
Gini coeff.	0.2340075	0.1278389	1.83	Gini coeff.	0.4102343	0.1608857	2.55
Poverty	0.0798231	0.0805312	0.99	Poverty	-0.0223402	0.0909839	-0.25
Race	1.8807200	0.2137308	8.8	Race	2.4833250	0.2916518	8.51
Urban Dist.	0.0028148	0.0007076	3.98	Urban Dist.	-0.0010544	0.0014202	-0.74
ln(PC Income)	0.0422852	0.0270131	1.57	ln(PC Income)	0.0127682	0.0355085	0.36
MH Rate	0.1802481	0.0270016	6.68	MH Rate	0.1308692	0.0331872	3.94
Race * ln(Pop.)	-0.1455169	0.0168470	-8.64	Race * ln(Pop.)	-0.1947666	0.0229975	-8.47
Zoning * ln(Pop)	-0.0017806	0.0001884	-9.45	Zoning * ln(Pop)	-0.0020726	0.0003051	-6.79
_cons	11.0091300	0.2685725	40.99	_cons	11.2700700	0.3545039	31.79
Rural				Periurban			
ln(Home Price)	Coeff.	St. Err.	t	ln(Home Price)	Coeff.	St. Err.	t
1 Unit Housing Starts (by pop.)	-0.0000264	0.0004597	-0.06	1 Unit Housing Starts (by pop.)	0.0007362	0.0002143	3.43
Multi-Unit Housing Starts	0.0000603	0.0000539	1.12	Multi-Unit Housing Starts	0.0000127	0.0000101	1.25
Annual Population Growth	5.1402010	0.9092520	5.65	Annual Population Growth	3.3414730	0.4352198	7.68
Population Growth since 1990	-0.5143928	0.1956189	-2.63	Population Growth since 1990	-0.2333407	0.0723251	-3.23
Per Capita County Taxes	0.0000013	0.0000008	1.64	Per Capita County Taxes	-0.0000007	0.0000002	-2.81
Age of model	-0.0088780	0.0115955	-0.77	Age of model	-0.0131481	0.0056455	-2.33
Age Squared	0.0001437	0.0002225	0.65	Age Squared	0.0002481	0.0001063	2.33
Highway dist.	0.0225309	0.0129010	1.75	Highway dist.	-0.0025413	0.0070775	-0.36
Prop. of educ.	1.1628320	0.3770331	3.08	Prop. of educ.	0.2269941	0.1344756	1.69
Gini coeff.	-0.5165056	0.4729123	-1.09	Gini coeff.	-0.0352653	0.2442344	-0.14
Poverty	0.7619877	0.4546659	1.68	Poverty	0.2566333	0.1839725	1.39
Race	-0.5678914	2.7916080	-0.2	Race	1.8492650	0.6367927	2.9
Urban Dist.	0.0026826	0.0024050	1.12	Urban Dist.	0.0043721	0.0009895	4.42
ln(PC Income)	0.1442444	0.1239667	1.16	ln(PC Income)	0.0805196	0.0499638	1.61
MH Rate	0.3835451	0.1906152	2.01	MH Rate	0.2490731	0.0561380	4.44
Race * ln(Pop.)	0.0291431	0.2279386	0.13	Race * ln(Pop.)	-0.1458271	0.0508934	-2.87
Zoning * ln(Pop)	-0.0010756	0.0007314	-1.47	Zoning * ln(Pop)	-0.0017187	0.0003102	-5.54
_cons	10.0710600	1.1756660	8.57	_cons	10.8790100	0.4938580	22.03

2B Fair Market Rent							
Statewide				**Urban**			
ln(FMR 2B)	**Coeff.**	**St. Err.**	**t**	**ln(FMR 2B)**	**Coeff.**	**St. Err.**	**t**
1 Unit Housing Starts (by pop.)	0.0001447	0.0000282	5.13	1 Unit Housing Starts (by pop.)	0.0001962	0.0000426	4.61
Multi-Unit Housing Starts	-0.0000022	0.0000019	-1.17	Multi-Unit Housing Starts	-0.0000017	0.0000019	-0.89
Annual Population Growth	0.9791151	0.0903558	10.84	Annual Population Growth	1.6290910	0.1136362	14.34
Population Growth since 1990	0.0844754	0.0179200	4.71	Population Growth since 1990	-0.0407366	0.0283702	-1.44
Per Capita County Taxes	0.0000000	0.0000000	-1.43	Per Capita County Taxes	-0.0000001	0.0000000	-2.46
Age of model	0.0010277	0.0012111	0.85	Age of model	-0.0031417	0.0015886	-1.98
Age Squared	-0.0000143	0.0000239	-0.6	Age Squared	0.0000706	0.0000329	2.14
Highway dist.	-0.0043377	0.0017340	-2.5	Highway dist.	-0.0114362	0.0039547	-2.89
Prop. of educ.	-0.1099355	0.0319177	-3.44	Prop. of educ.	-0.1725096	0.0411655	-4.19
Gini coeff.	-0.0401941	0.0509234	-0.79	Gini coeff.	-0.0742895	0.0629827	-1.18
Poverty	0.0071545	0.0316137	0.23	Poverty	0.0449261	0.0345254	1.3
Race	0.1410224	0.0797322	1.77	Race	0.3020775	0.1016517	2.97
Urban Dist.	0.0004505	0.0001647	2.74	Urban Dist.	0.0010452	0.0002089	5
ln(PC Income)	0.0622618	0.0112511	5.53	ln(PC Income)	0.0851272	0.0135486	6.28
MH Rate	-0.0329821	0.0103056	-3.2	MH Rate	-0.0108599	0.0114959	-0.94
Race * ln(Pop.)	-0.0106113	0.0063787	-1.66	Race * ln(Pop.)	-0.0238890	0.0079304	-3.01
Zoning * ln(Pop)	0.0007774	0.0000771	10.08	Zoning * ln(Pop)	0.0004508	0.0001130	3.99
_cons	5.8298810	0.1125963	51.78	_cons	5.6895000	0.1364439	41.7
Rural				**Periurban**			
ln(FMR 2B)	**Coeff.**	**St. Err.**	**t**	**ln(FMR 2B)**	**Coeff.**	**St. Err.**	**t**
1 Unit Housing Starts (by pop.)	-0.0003735	0.0002596	-1.44	1 Unit Housing Starts (by pop.)	0.0002212	0.0000803	2.76
Multi-Unit Housing Starts	0.0000212	0.0000315	0.67	Multi-Unit Housing Starts	-0.0000066	0.0000040	-1.64
Annual Population Growth	-0.4057864	0.4824242	-0.84	Annual Population Growth	0.2023621	0.1554030	1.3
Population Growth since 1990	0.3756090	0.1120809	3.35	Population Growth since 1990	0.1899440	0.0271706	6.99
Per Capita County Taxes	0.0000000	0.0000004	0.03	Per Capita County Taxes	0.0000001	0.0000001	0.64
Age of model	0.0072587	0.0064668	1.12	Age of model	0.0034697	0.0019637	1.77
Age Squared	-0.0001114	0.0001211	-0.92	Age Squared	-0.0000563	0.0000369	-1.52
Highway dist.	0.0075363	0.0064459	1.17	Highway dist.	-0.0064109	0.0021832	-2.94
Prop. of educ.	0.2268416	0.2055376	1.1	Prop. of educ.	-0.1358648	0.0481330	-2.82
Gini coeff.	0.6051692	0.2743775	2.21	Gini coeff.	-0.1485591	0.0820313	-1.81
Poverty	-0.3570816	0.2644921	-1.35	Poverty	-0.0403927	0.0576881	-0.7
Race	-3.6958190	1.4158920	-2.61	Race	-0.0586306	0.1858574	-0.32
Urban Dist.	-0.0004150	0.0008213	-0.51	Urban Dist.	0.0005146	0.0002718	1.89
ln(PC Income)	0.0978945	0.0694990	1.41	ln(PC Income)	0.0262881	0.0181527	1.45
MH Rate	0.2614295	0.1106750	2.36	MH Rate	-0.0477448	0.0187880	-2.54
Race * ln(Pop.)	0.3158017	0.1169428	2.7	Race * ln(Pop.)	-0.0019625	0.0154487	-0.13
Zoning * ln(Pop)	0.0023593	0.0004145	5.69	Zoning * ln(Pop)	0.0011314	0.0001172	9.65
_cons	4.9414260	0.6659347	7.42	_cons	6.2114240	0.1823598	34.06

Total Zoning Score							
Statewide				Urban			
Total Zoning Score	**Coeff.**	**St. Err.**	**t**	**Total Zoning Score**	**Coeff.**	**St. Err.**	**t**
1 Unit Housing Starts (by pop.)	0.0001259	0.0000674	1.87	1 Unit Housing Starts (by pop.)	-0.0001290	0.0000867	-1.49
Multi-Unit Housing Starts	-0.0000136	0.0000045	-3.02	Multi-Unit Housing Starts	-0.0000022	0.0000038	-0.57
Annual Population Growth	-0.8393789	0.2159767	-3.89	Annual Population Growth	-1.0546930	0.2313285	-4.56
Population Growth since 1990	0.1586877	0.0428340	3.7	Population Growth since 1990	0.2520009	0.0577530	4.36
Per Capita County Taxes	-0.0000007	0.0000001	-12.16	Per Capita County Taxes	-0.0000005	0.0000000	-11.56
Age of model	-0.0055932	0.0028949	-1.93	Age of model	-0.0013214	0.0032339	-0.41
Age Squared	0.0000938	0.0000570	1.64	Age Squared	0.0000239	0.0000670	0.36
Highway dist.	-0.0079073	0.0041448	-1.91	Highway dist.	-0.0215383	0.0080506	-2.68
Prop. of educ.	-0.0668289	0.0762925	-0.88	Prop. of educ.	-0.0423225	0.0838004	-0.51
Gini coeff.	1.0056890	0.1217217	8.26	Gini coeff.	0.0422880	0.1282134	0.33
Poverty	-0.2168415	0.0755659	-2.87	Poverty	-0.2727650	0.0702831	-3.88
Race	2.6936830	0.1905833	14.13	Race	2.2042580	0.2069317	10.65
Urban Dist.	0.0024804	0.0003936	6.3	Urban Dist.	0.0032505	0.0004252	7.64
ln(PC Income)	-0.0397554	0.0268934	-1.48	ln(PC Income)	-0.0504962	0.0275808	-1.83
MH Rate	0.0235567	0.0246333	0.96	MH Rate	0.0507340	0.0234021	2.17
Race * ln(Pop.)	-0.2182529	0.0152470	-14.31	Race * ln(Pop.)	-0.1706788	0.0161439	-10.57
Zoning * ln(Pop)	0.0815133	0.0001843	442.23	Zoning * ln(Pop)	0.0818584	0.0002301	355.73
_cons	0.1155641	0.2691379	0.43	_cons	0.5054457	0.2777580	1.82
Rural				Periurban			
Total Zoning Score	**Coeff.**	**St. Err.**	**t**	**Total Zoning Score**	**Coeff.**	**St. Err.**	**t**
1 Unit Housing Starts (by pop.)	-0.0000427	0.0003030	-0.14	1 Unit Housing Starts (by pop.)	0.0002891	0.0001927	1.5
Multi-Unit Housing Starts	0.0000199	0.0000368	0.54	Multi-Unit Housing Starts	-0.0000205	0.0000097	-2.11
Annual Population Growth	-1.4964430	0.5631850	-2.66	Annual Population Growth	-0.1496486	0.3731882	-0.4
Population Growth since 1990	0.1683503	0.1308439	1.29	Population Growth since 1990	0.0352766	0.0652482	0.54
Per Capita County Taxes	0.0000002	0.0000005	0.49	Per Capita County Taxes	-0.0000005	0.0000002	-2.3
Age of model	-0.0103086	0.0075494	-1.37	Age of model	-0.0101278	0.0047156	-2.15
Age Squared	0.0001242	0.0001414	0.88	Age Squared	0.0001381	0.0000887	1.56
Highway dist.	-0.0063434	0.0075250	-0.84	Highway dist.	-0.0092388	0.0052429	-1.76
Prop. of educ.	0.3235071	0.2399459	1.35	Prop. of educ.	-0.1070246	0.1155878	-0.93
Gini coeff.	0.0777833	0.3203100	0.24	Gini coeff.	1.1439870	0.1969919	5.81
Poverty	0.0986756	0.3087697	0.32	Poverty	0.1532953	0.1385335	1.11
Race	5.5439830	1.6529210	3.35	Race	4.7330870	0.4463223	10.6
Urban Dist.	0.0088250	0.0009588	9.2	Urban Dist.	0.0015353	0.0006528	2.35
ln(PC Income)	-0.0788904	0.0811336	-0.97	ln(PC Income)	0.0630926	0.0435924	1.45
MH Rate	0.0320330	0.1292027	0.25	MH Rate	0.1428150	0.0451180	3.17
Race * ln(Pop.)	-0.4386260	0.1365198	-3.21	Race * ln(Pop.)	-0.4085019	0.0370988	-11.01
Zoning * ln(Pop)	0.0831739	0.0004839	171.88	Zoning * ln(Pop)	0.0820617	0.0002815	291.48
_cons	0.7005493	0.7774164	0.9	_cons	-0.9283316	0.4379229	-2.12

APPENDIX 3: PRINCIPAL COMPONENTS ANALYSIS FOR ZONING MEASURES IN OLS REGRESSION

Principal components analysis serves as a means to reduce the dimensionality of a collection of highly correlated variables. The process generates a set of orthogonal axes upon which we project the vectors for our zoning measures. By convention, we reject as insignificant components with eigenvalues of less than 1. In our data, we identified four such components, outlined below:

Components	Eigenvalue	Difference	Proportion
Comp1	3.30815	1.48128	.2757
Comp2	1.82687	.426485	.1522
Comp3	1.40038	.133733	.1167
Comp4	1.26665	.352326	.1056

The eigenvectors for each specific zoning measure, which depict its relationship with that component, are also provided. Component 1 captures the presence of a large amount of non-MHP zoning, including permission for commercial-industrial use, agriculture, and residential, including high density residential. Component 2 reflects zoning restrictions in favor of larger residential lots (as 1 acre = 43,560 square feet, it captures ½ - ¾ acre lot zoning) and agricultural use. Component 3 is based on zoning for very large lot sizes, mixed-use (but not agriculture), and high-density MHPs. Finally, Component 4 is based on zoning for large as well as small MHPs.

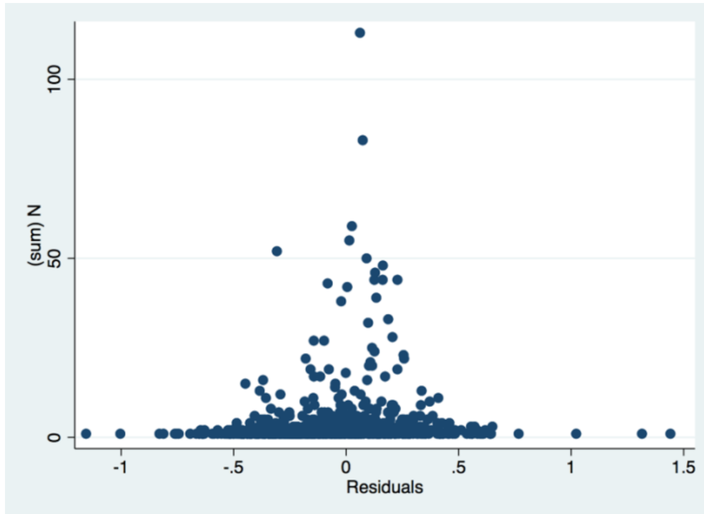
Zoning Measure	Comp1	Comp2	Comp3	Comp4
Total Number of MHPs in this zoning area	-0.0665	-0.0213	0.5658	-0.2483
Agricultural-Residential	0.3757	0.2363	-0.2754	-0.1621
Residential (Lot Size 0-9,999 sq. ft.)	0.3718	-0.2245	0.0779	-0.0152
Residential (Lot Size 10,000-19,999 sq. ft.)	0.4121	0.2444	0.2192	0.0723
Residential (Lot Size 20,000-29,999 sq. ft.)	0.0898	0.6175	-0.0515	-0.1331
Residential (Lot Size 30,000-39,999 sq. ft.)	0.0795	0.5751	-0.0832	0.114
Residential (Lot Size ≥ 40,000 sq. ft.)	0.3929	-0.1199	0.3421	0.1636
Business/Commercial	0.4085	-0.1863	-0.1394	-0.0271
Industrial	0.4364	-0.1814	-0.0733	0.0304
Mobile Home Parks (Lot Size < 20,000 sq. ft.)	-0.0455	0.1841	0.5165	0.5625
Mobile Home Parks (Lot Size ≥ 20,000 sq. ft.)	-0.1152	-0.0518	-0.2534	0.4841
Other (including mixed use, conservation, etc.)	-0.0699	0.0547	0.2597	-0.5448

APPENDIX 4: DISCUSSION OF LARGEST RESIDUALS

The residuals on our 2SLS regression appeared fairly randomized with respect to observable features. However, a more thorough analysis of the observations our models predict poorly is in order. We do this to check for obvious omitted variables and, frankly, because looking up the outliers is both fun and instructional: one gets a sense of the huge range of park quality within North Carolina.

Our residual values appear to be strongly correlated with our weight term, N, which signifies the number of MHP sales within a particular park. This was not unexpected; using an average weight in the regressions (and we did runs both with and without aggregating by park) obviously leads to greater significance to be placed on parks with many transactions. Only if we aggregate by park and do not weight will single sales not be over-represented among the outliers. However, we are reluctant to do this: some small but unknown fraction of single sales appear to occur not in conventional parks, but of units on land rented from an individual (for example, an adult child may rent a piece of her/his parent's property and place a manufactured house on it). One also finds many "mini-parks" with half a dozen or fewer units on a plot of land in North Carolina, and we do not wish to weight these equally with a giant Yes! Communities park.

Thus, as indicated in the plot below, the most extreme residuals tend to be the parks with only 1 sale captured by our dataset. These units are elusive because they are either standalone and not in a park, or in a park so small that we cannot identify it. This reiterates the problem of repeat-sales outlined above; parks that only turn over 1 unit every year do not provide sufficient variability to model. We attempted to correct for this problem by trimming park rents by 5%, yet clearly it still poses an issue to both our model and to future research.



Of the residuals we could identify, we found an interesting relationship of park quality. Due to lack of information, our regression models lack a general control for park amenities or park management, which poses a problem in predicting rents. Take, for instance, Coastal Plantation in Pender County, a retirement community owned by corporate developer Jensen Communities (http://www.jensencommunities.com/retirement-communities/nc-active-adult-communities/coastal-plantation/). In our model, transactions from Coastal Plantation resulted in large, positive residuals of 0.761 on average. It makes intuitive sense that our model would under-predict rents for Coastal Plantation, given that the community offers unobserved amenities like a pool, a clubhouse, and a fountain. Coastal Plantation is also in a valuable location, just off highway 17 (and hence with excellent access to shopping, health care, and other amenities) and just a few miles from Topsail Beach.

The converse of this phenomenon is present in Shady Grove Mobile Home Park in Mecklenburg County, for which our model over-predicts rents with a negative residual of .908. Shady Grove has park characteristics that lead our model to over-predict rents. The park is high density, lacks valuable amenities, has an old housing stock (photos suggest pre-1976 HUD guidelines) and is not managed by a large corporate developer. The difference between these two parks is that we do control for distance from the nearest CBD (and for highways, though Coastal Plantation is not disadvantaged in this respect) – causing us to underestimate Coastal Plantation and overestimate Shady Grove, whose residents may actually be unlikely to commute to downtown Charlotte.

Positive and negative residuals should not be confused with park quality. Indeed, both Coastal Plantation and Shady Grove get very high ratings from their enthusiastic tenants. Shady Grove may be inexpensive, but it appears to be well-maintained and residents have not built randomly on their structures. In contrast, another park (whose name we will not reveal) near Coastal Plantation also has a high positive residual (of 0.667: recall that these are in natural log units, so that the error reflects the difference between our predicted monthly rent of $135 and the actual rent of $250 for a unit that sold for $11,000). But, as opposed to the first two parks, residents of this park appear to loathe it. Comments on Google reviews include, along with a unanimous 1-star (out of 5) rating:

- *Crappy little trailer park*
- *This place is a dump, and that's being kind*
- *Horrible living conditions…gave me 24 hours to leave…stole everything I had in trailer…bugs everywhere…holes in side of trailer…have called many times to go get my stuff n get no answer, that was everything I owned.*

These examples raise two questions. First, how important is park quality and does its absence bias our other coefficient estimates? Unfortunately, data on park quality and amenities are rare and inconsistent in the data set we use, so that we cannot answer this question directly. However, a case-by-case evaluation of residuals does little to establish an economic link. Residents of the unnamed park may be unhappy, but the location amenity is sufficiently valuable that they are willing to pay $115/month more than they would in a park of average unobserved characteristics. This importance of location is consistent with the findings of Becker and Yea (2015) who, using a Colliers dataset, find that locational features tend to dominate park amenities.

Second, why did we not control for obviously important locational amenity factors like distance to the ocean and golf courses (obviously relevant in the case of Coastal Plantation retirement community)? Obviously, we could have done so – though it would have been a time-consuming process. We regard North Carolina as a heterogeneous place with a very large number of natural amenities that are often (nearly) site-specific. Access to ocean, inland waterways, golf courses, mountains, schools, health care, shopping centers, employment, parks, and other amenities all matter – and do so to varying degrees for residents of different parks. Rather than trying to control for each of these in a way that allows their importance to vary, we choose to focus on key factors – local market demand for housing and zoning restrictions – and then explore residuals to make sure that large outliers have a fairly obvious explanation.