Title: Factors affecting mobile home prevalence in the United States: Poverty, natural amenities, and employment in natural resources

Authors: Matthew M. Brooks¹; J. Tom Mueller¹

1. Department of Agricultural Economics, Sociology, and Education The
Pennsylvania State University

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Abstract

Mobile home residence in the United States is associated with negative social, economic, and health related outcomes. However, while research on mobile home residence at the individual level has been performed, a geographic understanding of mobile home prevalence in the United States remains absent from the literature. Therefore, the purpose of our analysis was to evaluate the county-level drivers of mobile home prevalence in the continental United States in 2015. The influence of five groups of variables – demographic, economic, housing, industry and occupation, and natural amenities – were assessed in a series of nested OLS regressions. Additionally, the full model was run as a spatial lag regression to control for spatial autocorrelation. Our results indicate that the primary drivers of mobile home prevalence in U.S. counties were the percent of population near poverty, the labor force participation rate, and the percent of the population employed in natural resource occupations.

Keywords: Mobile Homes, Poverty, Housing, Natural Resources, Natural Amenities, United States

Introduction

Mobile homes are often found on the perimeter of communities, hidden from sight and out of the minds of many Americans. This hidden nature of mobile homes, sometimes called trailers or manufactured housing, is rooted in their status as an undesirable housing option (Morgan & Hart, 1995). Mobile homes and their collective neighborhoods, often called trailer parks, are viewed in many communities as places of crime, as unattractive, and are often viewed

as detrimental to the value of neighboring properties (Wubneh & Shen, 2004; MacTavish, 2007; McCarty, 2014). Those who live in this housing type are likely to experience social stigma and isolation as well as financial instability via high rates of eviction and a lack of legal protections (MacTavish, 2007, Kusenback, 2009; Desmond, 2012; Sullivan, 2017b). Juxtaposed with these adverse outcomes is the fact that mobile homes are a significant source of affordable housing in the United States and account for a significant portion of the growth in this sector of the housing market (Boehm & Schlottmann, 2008; Sullivan, 2017b). This combination of social stigma and affordable housing should make understanding the factors that drive mobile home prevalence in communities a chief priority for both policymakers and social science researchers. Understanding why mobiles are more likely to be located in some communities compared to others has merit in numerous disciplines, but most importantly, it may lead to a better understanding of where large numbers of individuals are facing long-term financial and social challenges in regard to their housing choices.

Although most researchers have traditionally ignored mobile homes, there has been a recent resurgence in scholarly interest with books like *Evicted: Poverty and Profit in the American City* (Desmond, 2016) and *Singlewide: Chasing the American Dream in a Rural Trailer Park* (Salamon & MacTavish, 2017). In general, most scholarly work on mobile homes has tried to understand the hardships faced by occupants, either financial, social, or environmental; yet there has been limited attention given to the geographic distribution of mobile homes and their prevalence given relevant social and economic indicators.

Some studies have examined mobile home locations and change over time at a municipal level (Wubneh & Shen, 2004; Shen; 2005; Sullivan, 2017b). However, there is a missing national-level understanding of mobile home prevalence. At first glance, mobile homes appear

prevalent in many Sunbelt counties, as well as in rural counties with high levels of poverty (Figure 1, Figure 2). This southern bias is in line with the extant academic literature which describes the historic nature of mobile homes as located in more friendly climates (Hart, Rhodes, & Morgan, 2002). Mobile homes also appear to be prevalent in rural counties with high levels of poverty, possibly due to mobile homes being reserved for those with low incomes. However, the general notion that high poverty should lead to a higher percentage of mobile homes does not appear to provide the full explanation for the relative density of mobile homes in all regions (Figure 1, Figure 2). There are many places of traditionally high poverty, chiefly the Mississippi Delta and Texas Borderlands, where one may expect higher percentages of mobile homes if poverty was the key driver of mobile home prevalence. Additionally, mobile homes are prevalent in many regions not associated with persistent poverty, such as Florida and many Mountain-West counties (Lichter and Johnson, 2007; Thiede, Kim, & Valasik 2017), further demonstrating that poverty may not be the primary driver of mobile home prevalence. While those who are poor often inhabit mobile homes, not all of those who are poor live in mobile homes. Due to the adverse social, stigmatic, and health-based outcomes of mobile home residence, the purpose of our analysis was to assess which ecological factors lead to an increased mobile home prevalence at the county level.

FIGURE 1 ABOUT HERE

Our analysis was exploratory by design and was rooted in the limited past scholarship that has looked at determinants of mobile home prevalence at the county level. Mobile homes are prevalent in rural areas, yet they are not inherently a rural phenomenon (George & Barr, 2005). The widespread nature of mobile homes gives further credence to the need for a national study looking at determinants of mobile home prevalence. Although the intersection of poverty and

mobile home residency has been a topic of past work, most of this research has only focused on the adverse outcomes associated between the two. There is much research looking at the interaction between housing policy, community housing stock, and mobile homes. This research has emphasized the affordability of mobile homes and the need for policies to help ease the financial and legal burden associated with mobile home ownership (Aman & Yarnal, 2010; Sullivan, 2014; Sullivan, 2017a).

A predictive model of mobile home prevalence has yet to be estimated. Based on previous research it is likely that demographic, economic, and housing-related factors will influence mobile home prevalence. Beyond these factors, there are three other dimensions we felt were likely to influence mobile home prevalence. Industry and occupational factors were included to investigate the impact that industrial presence has on mobile home prevalence. Of particular interest was the natural resource sector.

The natural resource industry carries with it a boom and bust history where local economies and populations spike with increases in development and then plummet shortly after (Kinchy et al., 2014). These forces are likely to influence the need, and therefore prevalence, of cheap and affordable temporary housing such as mobile homes (MacTavish, Ziebarth, & George, 2014). In addition to the boom and bust impacts on housing stock, there is also the phenomenon of man camps, wherein natural resource and agricultural companies provide temporary housing in the form of mobile homes for their employees (Briody, 2017; Lyons, 2013; MacTavish et al., 2014; Sulzberger, 2011). Man camps, and other forms of temporary housing, are likely to have an impact on the prevalence of mobile homes at the county level. Finally, the transitory nature of employment in this sector, as well as the abundance of low-income and unemployed individuals drawn to boomtowns looking for work (Briody, 2017), could influence mobile home prevalence.

Beyond the possible influence of natural resource industries, the literature suggests mobile homes go hand in hand with natural amenity related development, and are likely influenced by environmental factors such as temperature, aridity, and topography (Morgan & Hart, 1995; Hackenberg & Benequista, 2001). Finally, given the spatial clustering tendencies of poverty, development, and policy in the United States, it is also likely that mobile home prevalence is spatially clustered, which indicates the need for spatial econometric models.

Research Questions

Based on prior scholarship we believe that mobile home density may be influenced by demographic, economic, housing, industry and occupational, and natural amenity characteristics. Our analysis was guided by six research questions:

R1: What county-level demographic characteristics have a significant relationship with mobile home prevalence?

R2: What county-level economic characteristics have a significant relationship with mobile home prevalence?

R3: What county-level housing characteristics have a significant relationship with mobile home prevalence?

R4: What related county-level industry and occupational characteristics have a significant relationship with mobile home prevalence?

R5: What county-level natural amenity characteristics have significant relationship with mobile home prevalence?

R6: How does the inclusion of spatial modeling affect our understanding of mobile home prevalence?

Background Literature

The most heavily cited negative outcome associated with living in mobile homes is social stigma and social isolation. The term ‘trailer trash’ is often used to describe those living in mobile home communities. Often meant as a derogatory term, the term refers to one’s low income and undesirable lifestyle (Kusenbach, 2009). This social stigma often extends into schools, limiting children’s educational outcomes, and the attainment of public services (Miller & Evko, 1985; Notter, MacTavish, & Shamah, 2008; MacTavish, 2007; MacTavish & Salamon, 2007). Children who live in mobile home communities may also be unwelcome in a variety of educational and community activities. Social isolation has been shown to increase due to the presumed, but not necessarily accurate (Aman & Yarnal, 2010), temporary nature of living in a mobile home and the lack of public spaces and amenities provided in mobile home communities (MacTavish & Salamon, 2009). Something of note is that the positive social effects of homeownership, something that is widely valued by many Americans, are not felt by all who own mobile homes, with Hispanic immigrants being more likely to see mobile home ownership as an accomplishment to be proud of than other groups (Kusenbach, 2017).

The second area of unfavorable outcomes for mobile home residents is financial and legal. In many states, those who live in mobile homes lack the legal protections that prevent speedy evictions and displacement (Aman & Yarnal, 2010; Sullivan, 2014; Desmond, 2016; Sullivan, 2017a). A complicating factor in the legal rights of mobile homeowners is the fact that while most mobile home residents own the structure they live in, they do not own the land, or ‘pad,’ the mobile home is sited on (Housing Assistance Council, 2011). This combination of ownership of the structure, but leasing of the land, leads to mobile home residents being at constant risk of pad-fee increases and pseudo-evictions due to unaffordable increases to rent

imposed by the owner of the mobile home community. This process of eviction only further continues the cycle of poverty, and often disqualifies one from living in public housing or living in more desirable neighborhoods (Desmond, 2012; Desmond, 2016). However, there are a few states, mainly in the Northeast, that give stronger legal protections to mobile home residents (Sullivan, 2017b).

There has been a devolution of the responsibility to enforce or provide tenant rights, specifically in the case of mobile-homeowners, from state governments to local governments in the United States. Local governments are much more likely to get rid of tenant rights to encourage new development, which further increases the burden on those living in mobile homes (Sullivan, 2014). Further, mobile home residents are systemically suspect to predatory or unfavorable loans; which limits resident's financial opportunities (MacTavish, Eley, & Salamon, 2006). Mobile homes, unlike traditional single-family homes, do not appreciate in value over time, which further compounds these financial problems (Kusenback, 2009).

Mobile homes are often unwanted in communities and in response, many municipalities have set up strict zoning laws to limit their prevalence (Mandelker, 2016). Outside of general NIMBYism (Not-In-My-Back-Yard) concerns, many believe that mobile homes increase crime and lower the value of neighboring properties (Davis & Bali, 2008; Sullivan, 2017b). The fear of increased crime in areas with mobile homes is unfounded in the literature, with neighborhoods containing mobile home communities not having statistically higher crime rates than surrounding neighborhoods (McCarty, 2010; McCarty, 2014). However, mobile homes do potentially reduce the property values of traditional single-family homes near mobile home communities (Munneke & Slawson, 1999; Wubneh & Shen, 2004). Overall, community resistance towards mobile home

communities has pushed the location of mobile home communities near the outskirts of many U.S. cities (Shen, 2005; Sullivan, 2017b; McTavish, 2007).

Due to the geographic isolation of mobile home communities, many mobile home residents are located farther away from services, such as hospitals, police, schools, compared to those living in other types of housing (Shen, 2005). Mobile homes are more likely to be prevalent in floodplains, which is both an environmental and financial risk (Shen, 2005). The disapproval of mobile homes has led to the removal of mobile home communities in many areas, often as part of broader redevelopment plans, resulting in gentrification (Sullivan, 2014; Sullivan, 2017b).

While we have discussed many negatives, there are positives of living in a mobile home; chiefly stability and affordability. Contrary to the dominant narrative, those who typically live in mobile homes own their homes and stay there for an extended period. The majority of mobile home owners in one study lived in their mobile home for over ten years (Aman & Yarnal, 2010). Mobile home residents are also far less mobile than traditional renters, which may have positive community impacts (Boehm & Schlottmann, 2008). Despite the name, most mobile homes are not mobile, and the majority have never been moved after their original build (Aman & Yarnal, 2010; Sullivan, 2017b). Further, mobile homes are places of racial integration, which may encourage positive community building (Benson, 1990).

As previously mentioned, mobile homes are one of the largest sources of affordable housing in the United States, and they are the largest source of unsubsidized affordable housing (Sullivan, 2017b). Due to this, the Department of Housing and Urban Development endorses mobile homes as a source of affordable housing (Sullivan, 2017b, Boehm & Schlottmann, 2008). An unusual subset of mobile home development is the creation of upscale mobile home

communities aimed at retirees (Morgan & Hart, 1995; Hart et al., 2002). These new mobile home communities are often located in retirement destination cities in Sunbelt states. In general, this trend breaks the mold of what traditionally defines a mobile home community and its location.

It is important to note that although mobile home residence is associated with negative outcomes, the housing unit itself does not often causes these outcomes. The location of mobile homes in communities, the policies surrounding their ownership, and the social stigma all drive the negative impacts for those that reside in manufactured housing. Therefore, while we investigated mobile home prevalence to increase our understanding of mobile homes in the United States, and believe this research is vital due to the documented negative impacts of living in a mobile home, increasing the number of individuals living in mobile homes is not by itself a negative. Given the multitude of impacts presented, we produced a series of models predicting county-level mobile home prevalence in the continental United States in the year of 2015.

Data and Methods

The data compiled for our analysis came from five primary sources: The 2011-2015 and 2006-2001 American Community Survey (ACS), the 1980-2010 Decennial Censuses, and the United States Department of Agriculture Economic Research Service (USDA-ERS) Rural-Urban Continuum Codes (RUCC; Parker, 2013) and Natural Amenity Scales (McGranahan, 1999). Our data from the ACS and the Decennial Census were extracted using the National Historical Geographic Information System from the Integrated Public Use Microdata Series (NHGISIPUMS; Manson, Schroeder, Van Riper, & Ruggles, 2017). In addition to the database output, we also extracted the corresponding 2015 county shapefiles for spatial analysis. We extracted data for all continental counties within the United States, except for four counties, which we excluded due to their boundaries changing over the period of analysis. Except for

population change over time, all variables were collected for the year of 2015 whenever possible. Some relatively time-invariant variables were last updated before 2015, and where this occurred it has been noted.

Dependent Variable

Our dependent variable in this analysis was the percentage of all 2015 households within a county who live in mobile homes. This variable comes from the 2011-2015 ACS estimates and is coded based upon household responses as either residing in a mobile home or trailer or not.

Independent Variables

Independent variables can be divided into five groups: (1) demographic, (2) economic, (3) housing, (4) industry and occupation, and (5) natural amenities.

Demographic. We included county-level demographic variables expected to affect mobile home density based on previous research (George & Barr, 2005, Salamon & McTavish, 2016). The variables included in our model were metro/nonmetro, which was calculated based upon 2013 RUCC codes (Parker, 2013), population in 2015, population change from 2000 to 2015, and percent elderly (≥ 65) in 2015. We also included three ethnicity variables from 2015: percent African American, percent Native American, and percent Hispanic. Further ethnicity variables were not included to prevent redundancy in the model.

Economic. The siting of mobile homes is likely influenced by the economic characteristics of a county. To account for this, we included seven indicators of county-level economic prosperity. This included percent of population with at least a bachelor's degree in 2015, whether or not a county was a persistent poverty county in 2010 (meaning that they had greater than 20 percent poverty from 1980 – 2010), the percent of 2015 population receiving public assistance, and percent of 2015 population near poverty at 150% of the poverty line. Two

labor force variables were also included: the 2015 labor force participation rate and the 2015 unemployment rate. We elected to use the near poverty measure, as opposed to a traditional standard measure, to capture a broader range of relative economic disadvantage. Lastly, we included the 2015 county-level Gini index – a measure of income inequality at the county level.

Housing. As our dependent variable in this model is the prevalence of a form of housing, we included multiple county-level housing characteristics in our model. Due to the likelihood of housing protection policy influencing the siting of mobile homes, we included a measure of state-level housing protection policy from Sullivan (2017b). Data was from 2009 and counties were coded as either residing in a state with policy protection for mobile homes or not. We also included the 2015 percentage of households within a county that were renters and the percentage of households within a county living in unaffordable housing – meaning the percent of households spending more than 30% of their monthly income on housing. Finally, we included a 2015 measure of mobility, representing the percent of residents who had moved into, or within, the county within the past year.

Industry and Occupation. A principal interest of our analysis was the influence that industry and occupation may have on mobile home prevalence. Given the history of boomtowns (Kinchy et al., 2014) and man camps (Lyons, 2013) related to natural resource industries, we were particularly interested in agriculture and natural resource related employment. We included three county-level industry and occupational variables from the 2011-2015 ACS estimates, the percent of the population employed in agriculture and natural resource industries, the percent employed in manufacturing industries, and the percent employed in natural resources and construction occupations. It is important to note the distinction made by the U.S. Census Bureau

regarding industry and occupation. Industry represents, “the type of activity at a person’s place of work,” while occupation represents, “the kind of work a person does to earn a living” (U.S. Census Bureau, n.d.).

Natural Amenities. Mobile homes are more suitable for certain climates than others are; additionally, they may generally be more prevalent in locations with higher natural amenities (Hart et al., 2002). To investigate the environmental antecedents of mobile home prevalence, we included all six items from the USDA-ERS Natural Amenities Scale (McGranahan, 1999). The scale is comprised of six environmental characteristics and, while a composite scale is preassembled, we elected to examine the effects of the environmental characteristics individually. The most recent data from the USDA-ERS is at the county level and from 1999. It includes average January temperature, average January hours of sun, average July temperature, average July humidity, topographic variation, and water area. All of which were utilized as Zscores, as produced by USDA-ERS.

Data Analysis

Six models were estimated to answer our six research questions. First, we performed a series of five nested OLS regressions using Stata 14. Each block of variables was included as a separate set to assess our guiding research questions. We evaluated the impacts of individual variables on mobile home prevalence, as well as the set of variables’ overall contribution to the model by testing the change in R-square (Tabachnick & Fidell, 2013). We assessed multicollinearity for each model using a variance inflation factor (VIF) cut-off of five (Vaske, 2008).

To address our sixth research question concerning spatial analysis, we used GeoDa Space to conduct a spatial lag regression (Anselin & Rey, 2014). A spatial lag regression was chosen based on the produced diagnostics for spatial dependence from GeoDa Space for our fifth OLS

regression model. In a technical sense, a spatial lag regression incorporates the weighted average of neighboring values, in this instance the weighted average of the percentage of mobile homes in all neighboring counties for every county in the data set (Anselin & Rey, 2014). Spatial lag was conducted using a first order queen's weight's matrix. The benefit of utilizing this type of model is that it accounts for the spatial dependence of the dependent variable and therefore accounts for peer effects within the model.

In addition to the six models presented in the paper, we also conducted a series of sensitivity tests on our models that we do not report in this paper. These tests were conducted to assess the stability of our models, as well as to evaluate the impacts of alternative measures for similar constructs. First, we tested the model using the measures for poverty, industry, and occupation as lagged effects from 2000 on mobile home prevalence in 2015. Second, we included regional dummy variables for the South and the West. Third, we also estimated our models using the traditional poverty measure, those living at or below the poverty line, and an extreme poverty measure, those living at or below 50% of the poverty line. None of these sensitivity tests substantively changed our model. Therefore, we have only reported our six main models in our results.

Results

The final dataset contained 3108 counties within the continental United States. The minimum percentage of mobile homes in a county was 0.0%, and the maximum was 60.17%, the average mobile home prevalence was 12.54% with a standard deviation of 9.34%, and the median mobile home prevalence was 10.41%. The global Moran's I for the percentage of mobile homes was very strong at .62; which indicated a need for a spatial regression model. Due to the

number of variables in our models, we have not provided a descriptive summary of each variable in this paper.

The omnibus F-test for all models was significant at the $p < .001$ level, and each set of variables added a significant increase of variance explained at $p < .001$ (Tables 1 & 2). Each model was assessed for multicollinearity and all variables in all models were below our designated cut-off of 5, with the exception of the percent of the population at 150% of the poverty level, which was over 5, but less than 6 in models three, four, and five, and labor force participation, which had a VIF of 5.2 for model five. Due to the importance of these variables and the marginal nature of their VIF values, they were retained in the models.

TABLE 1 ABOUT HERE

R1: What county-level demographic characteristics have a significant relationship with mobile home prevalence?

County-level demographic characteristics significantly predicted mobile home prevalence (Table 1). In total, six of the eight demographic variables had a significant relationship with mobile home prevalence. The percentage of African Americans in a county had the strongest relationship with mobile home prevalence, wherein a percentage of African American residents relates to a higher prevalence of mobile homes. The 2015 population of a county had a strong negative association with mobile home prevalence, meaning that higher levels of population in 2015 resulted in a lower prevalence of mobile homes.

R2: What county-level economic characteristics have a significant relationship with mobile home prevalence?

County-level economic characteristics added a significant contribution to the model (R-square $\Delta = .30$, $p < .001$; Table 1). All of our economic variables were significant in the model, except

persistent poverty and the Gini index. The strongest relationship among economic characteristics was between 2015 labor force participation rate and mobile home prevalence, as labor force participation rate decreased, mobile home prevalence increased. With the inclusion of our economic characteristics, a number of demographic effects decreased and were not significant in the second model (Table 1).

R3: What county-level housing characteristics have a significant relationship with mobile home prevalence?

Housing characteristics also added a significant increase in the variance explained in the model (R-square $\Delta = .04$, $p < .001$; Table 1). Three of the four housing variables were significant in the model, with only the effect of 1-year mobility failing to be significantly different from zero. The strongest relationship between housing characteristics and mobile home prevalence was for percent of 2015 households renting their home, which had a negative relationship with mobile home prevalence. The percent of households in unaffordable housing also had a negative relationship with mobile home prevalence, meaning that as more people lived in unaffordable housing the percentage of mobile homes went down. Housing protection policies had a negative effect as well, wherein counties with mobile home protection policies had a lower prevalence of mobile homes on average.

R4: What relevant county-level industry and occupational characteristics have a significant relationship with mobile home prevalence?

The addition of our three industry and occupational variables added a significant increase in the variance explained by the model (R Square $\Delta = .03$, $p < .001$; Table 2). All three variables had a significant impact in model four. The strongest relationship among the set of variables was the positive effect of natural resource and construction occupation employment. As the percentage of

a county employed in natural resource and construction occupations increased, the prevalence of mobile homes increased. Alternatively, as the percentage of agricultural and natural resource industry employment and manufacturing industry employment increased, mobile home prevalence decreased.

TABLE 2 ABOUT HERE

R5: What county-level natural amenity characteristics have a significant relationship with mobile home prevalence?

The final non-spatial model added natural amenity characteristics, which significantly increased the variance explained (R Square $\Delta = .04$, $p < .001$; Table 2). Four of the seven variables had a significant positive effect on mobile home prevalence. The most influential variable in the model was the average January temperature, followed by the average July temperature. Average July humidity and topographic variation did have a significant positive impact on mobile home prevalence. With the inclusion of natural amenities, some relationships changed. The percent of a population which is Hispanic had a significant negative relationship with mobile home prevalence, and both the percentage of the population working in agriculture and natural resource industries, as well as the manufacturing industry, had a weaker impact – with manufacturing industry percent's impact dropping out of the model altogether.

R6: How does the inclusion of spatial modeling affect our understanding of mobile home prevalence?

Incorporating spatial lag effects into our model increased our explanation in the dependent variable, with both the pseudo R Square and Spatial Pseudo R Square being the highest of any model. The only new variable added to this model was weighted mobile home percentages, which is highly significant and had relatively high non-standardized and standardized

coefficients. With the addition of these new variables, most previous variables kept their level of statistical significance with two exceptions. Population change was no longer statistically significant, and one-year mobility became very significant. Model six was the only model where one-year mobility was significant. The variables with the most considerable significant impact on mobile home percent were housing protection policy, January temperature, January hours of sun, July temperature, and weighted mobile homes; all of which except the latter also had substantial effects in previous models.

Discussion

Due to the lack of past literature on determinants of mobile home prevalence, our analysis was exploratory, and although these results are exploratory, they still provide useful insights into the nature of county-level variance in mobile home prevalence. In general, higher percentages of mobile homes were influenced by county population size, which is supported by the literature, however high population growth leading to higher rates of mobile homes is not present in past work (George & Barr, 2005). The positive relationship between population change and mobile homes is may be rooted in that mobile homes and mobile home communities are quickly built and can respond quickly to needs for additional housing in communities. This relationship could have an impact in high natural amenity areas, particularly in counties experiencing the dual migration of both high-income retirees and lower-income workers moving in to take jobs in construction and hospitality sectors (Hunter, Boardman, & Saint Onge, 2005; Nelson, Lee, & Nelson, 2008; Nelson & Nelson, 2010). The age makeup of a county, particularly the percentage of the population deemed elderly, had a surprisingly negative impact on mobile home percentages. As previously mentioned, many Sunbelt and retirement destination communities have seen the growth of upscale mobile home communities (Morgan & Hart, 1995; Hart et al.,

2002). Findings from this analysis run counter to this growth in non-traditional mobile home communities.

Much of the past literature on mobile homes has focused on the negative impacts mobile home residence has on their often-impooverished residents. Many measures of poverty and economic disadvantage are associated with higher percentages of mobile homes (MacTavish, 2007; Aman & Yarnal, 2010). In all models in which they are present, percent of the population with a bachelor's degree, percent in near poverty, and percent receiving public assistance have a significant relationship with the key variable, showing that areas of higher economic distress, or community well-being, often coincide with places where individuals are more likely to live in mobile homes. However, this does not indicate on its own that more impoverished people within these counties are more likely to live in mobile homes than apartments or traditional homes.

Two labor-related variables also had an impactful relationship with mobile home prevalence. Both higher levels of unemployment and lower levels of labor force participation were related to higher levels of mobile homes in counties. Our models showed that both the short term (unemployment rate) and long-term (labor force participation rate) economic conditions of counties had impacts on the types of housing in a county. It is interesting that places which may be deemed economically stagnate, with high amounts of people not participating in the labor market, are places where people often live in this untraditional housing type, which in itself is often associated with further adverse economic outcomes. Interestingly, being a persistent poverty county does not have an impact on mobile home density. These results may indicate that employment and labor-related economic factors play a much more robust role in determining the prevalence of mobile homes than the persistence of poverty.

As our dependent variable was itself the prevalence of a type of housing, it is unsurprising that county mobile home percentage is strongly affected by other housing variables. Many of the financial and social struggles of mobile home ownership are rooted in their lack of legal protections from speedy evictions and other housing issues (Sullivan, 2017b). While stronger state-level protections for mobile home residents, in theory, should make things better for those that live in mobile homes (Sullivan, 2017b), state-level protections did not increase the prevalence of mobile homes. In fact, our model estimated that state-level protections significantly decreased mobile home prevalence. We believe there are two possible explanations for this relationship. First, many states with housing protections are located in the Northeast, where other factors such as natural amenities and socio-economic characteristics may already decrease the prevalence of mobile homes. Second, legal protections may deter land developers from building mobile homes and mobile home communities in these states due to the policies protecting residents, ultimately making mobile home communities less attractive to developers. It is possible that since the number of states with strong protections for mobile homeowners is few, developers elect to build in states with policies more favorable to the developer. In this case, these state laws appear to have the unintended effect of promoting legal protections at the expense of affordable housing. This relationship requires further research to determine the cause of this inverse effect.

The other three housing variables in the models have a statistical relationship with mobile home percentages in most models. Our model estimates that mobile home prevalence is higher in areas with lower residential turnover, lower levels of renters, and more affordable housing. While we cannot make individual inference from our ecological analysis, these findings are in line with previous research finding that most mobile home residents own their own home

(Kusenbach, 2017), that mobile homeownership is often stable and long-term (Aman & Yarnal, 2010), and that mobile homeownership is an accessible form of affordable housing (Sullivan, 2017b).

In our analysis, we explored the relationship between industry presence and mobile home prevalence. While we explored the relationship for both natural resources and manufacturing, only natural resource industry presence was significant in the final model. Unfortunately, the ACS does not provide estimates for natural resource industry employment or occupational employment alone. Due to this, we cannot entirely separate the effect of natural resources from agriculture in the case of industry, and construction in the case of occupation. That being said, the relationship between the natural resource industry and mobile homes has a solid grounding in both the popular press (Sulzberger, 2011) and industry related press (Lyons, 2013). However, to our knowledge, there has yet to be an empirical link between natural resource industry presence and mobile home prevalence.

Our final model estimated that a one-percent increase in natural resource and construction occupation employment corresponds to a .39% increase in mobile home prevalence. The impact of natural resource and construction occupation employment on mobile home prevalence is the third strongest relationship in our model. However, employment in the agricultural and natural resource industries had a significant negative, albeit weak, effect on mobile home prevalence. These opposite relationships may be reflective of the difference in industry and occupation, as measured by the U.S. Census Bureau. The percent of people employed in the agriculture and natural resource industries includes people in all income brackets, from maintenance to upperlevel management. Given the little information available regarding natural resource employment and mobile homes, it seems unlikely that all people employed in the industry would

be likely to live in mobile homes. Rather, it is likely only to be people doing specific lower-level occupations related to natural resources, which may be more appropriately reflected by the percent of people employed in natural resource and construction occupations.

Given both the history of natural resource employment in the United States, wherein the industry sets up quickly and population growth occurs rapidly (Kinchy et al., 2014), and the frequent occurrence of man camps in areas of high natural resource extraction (Lyons, 2013), the positive relationship between natural resource and construction occupational employment and mobile home prevalence is unsurprising. However, although there is an anecdotal knowledge concerning impacts of natural resource extraction and mobile homes, as well as popular press (Sulzberger, 2011) and in-depth journalism (Briody, 2017) regarding the phenomenon, published research linking natural resource industry presence to mobile home prevalence remains absent from the literature.

Our model suggests that mobile home prevalence is not only tied to natural resource and construction occupations but has a stronger impact nationwide than all other variables except for the labor force participation rate and the percent of households near poverty. It should be noted that it is certainly possible that we are capturing the influence of the presence of those building the mobile home communities (e.g. construction), but given that mobile homes are generally built off-site and simply set up on location, we are confident that natural resource industry presence has an influence on mobile home prevalence that warrants further exploration.

Beyond the natural resource industry, we also explored the effect of natural amenities on mobile home prevalence. As we would expect, the effect of the natural amenity characteristics on mobile home prevalence decreased with the addition of a spatial control. However, four amenity characteristics remained significant in the final model. It appears that year-round temperature,

sunlight, and water area have a positive relationship with mobile home prevalence. Although humidity and topography do not have an effect. It is possible that these relationships are the result of the difficulties of heating and insulating mobile homes. Additionally, it is likely we are capturing the influence of the increase in mobile home density previously documented in Sunbelt and retirement communities (Morgan & Hart, 1995; Hart et al., 2002), which are likely to be in warm areas regardless of humidity or topography.

Conclusions

Those who live in mobile homes often experience adverse social and economic outcomes as a result of their residence (MacTavish, 2007; Sullivan, 2017), not due to the direct impact of the mobile home, but due to the social stigma and regressive housing policies associated with mobile home communities. This may lead some to advocate for the removal of mobile homes in many areas. However, as mobile homes are also a significant source of affordable housing, removal of mobile home communities removes one of the largest sources of affordable housing in the United States (Sullivan, 2017). The purpose of this analysis on county-level mobile home prevalence was in many ways an effort to understand what types of communities are most likely to feel the positive and negative effects of mobile homes. Our analysis found that while the strongest predictor of mobile home prevalence was the percent of the population near poverty, other variables play a significant role. Labor force participation, unemployment, and employment in natural resource industries all play an important role in influencing the percentage of a county population living in mobile homes. Environmental factors, chiefly yearround temperatures, are also an influential factor, possibly indicating that the positive benefits of mobile homes are relatively unobtainable in some places. This analysis is a first step in developing a large-scale, national understanding of mobile home prevalence in the United

States. Our findings with hope will lead to more research concerning this often forgotten, but important, type of housing.

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Tables

Table 1. OLS Regression for County Level Percentage of Mobile Homes

Variables	Model 1	Model 2 Poverty	Model 3
Nonmetro County	Demographic		Housing

	Coef.	Beta	Coef.	Beta	Coef.	Beta
	0.11	0.01	0.34	0.02	0.11	0.01
2015 Population (1000's)	-0.0064 ***	-0.22	-0.0027 ***	-0.09	-0.0016 **	-0.06
2000-2015 Population Δ	-0.00030	-0.00	0.0024 ***	0.02	0.0030 ***	0.02
Elderly (65+)	0.33 ***	0.15	-0.22 ***	-0.10	-0.38 ***	-0.18
Male	0.51 ***	0.13	-0.18 *	-0.05	-0.16	-0.04
African American	0.24 ***	0.37	0.032 *	0.05	0.040 **	0.06
Native American	0.17 ***	0.12	0.044	0.03	-0.029	-0.02
Hispanic	0.090 ***	0.13	0.014	0.02	0.024	0.03
Bachelor's Degree +			-0.24 ***	-0.23	-0.096 ***	-0.09
Labor Force Participation Rate			-0.51 ***	-0.42	-0.46 ***	-0.39
Unemployment Rate			0.35 **	0.07	0.64 ***	0.12
Persistent Poverty			0.38	0.01	-1.20 *	-0.04
Near Poverty (1.5 Poverty)			0.17 ***	0.14	0.37 ***	0.31
Receiving Public Assistance			-2.23 ***	-0.15	-1.35 ***	-0.09
Gini Index			-7.82	-0.03	-1.34	-0.00
Housing Protection Policy					-1.78 ***	-0.08
Percent Renter					-0.25 ***	-0.21
Living in Unaffordable Housing					-0.16 ***	-0.16
1-Year Mobility					-0.027	-0.01
Constant	-21.5		60.1		60.5	
F-value	(8, 3099) = 53.8 ***		(15,3092) = 164.3 ***		(19, 3088) = 149.7 ***	
R Square	.19		.49		.53	
R Square Δ	-		.30 ***		.04 ***	

Note: OLS based on Robust Standard Errors, Sig. * <.05, ** <.01, *** <.001

Table 2. OLS and Spatial Regression (LAG) for County Level Percentage of Mobile Homes

Variables	Model 4		Model 5		Model 6	
	Employment		Environment		Spatial	
	Coef.	Beta	Coef.	Beta	Coef.	Beta
Nonmetro County	0.081	0.00	0.39	0.02	.18	.009
2015 Population (1000's)	-0.0012 *	-0.04	-0.0014 **	-0.05	-.0008 **	-.03
2000-2015 Population Change	0.0027 ***	0.02	0.0028 ***	0.02	.009	.006
Elderly (65+)	-0.40 ***	-0.19	-0.40 ***	-0.19	-.26 ***	-.15
Male	-0.20 *	-0.05	-0.090	-0.02	.07	.06
African American	0.048 ***	0.07	0.0026	0.00	-.002	-.004
Native American	-0.027	-0.02	-0.024	-0.02	-.003	-.003
Hispanic	-0.020	-0.03	-0.081 ***	-0.12	-.05 ***	-.07

					-	
Bachelor's Degree +	-0.061 *	-0.06	-0.089 ***	-0.09	.06 **	-.06
Labor Force Participation Rate	-0.44 ***	-0.37	-0.32 ***	-0.27	-.20 ***	-.18
Unemployment Rate	0.63 ***	0.12	0.36 **	0.07	.34 ***	.07
Persistent Poverty County	-1.34 *	-0.04	-0.40	-0.01	-.60	-.02
Near Poverty (1.5 Poverty)	0.34 ***	0.28	0.38 ***	0.32	.26 ***	.27
Receiving Public Assistance	-1.28 ***	-0.09	-0.73 **	-0.05	-.37 *	-.03
Gini Index	3.96	0.01	2.28	0.01	-4.5	-.02
					-	
Housing Protection Policy (State)	-1.64 ***	-0.06	-.47 ***	-.06	.86 ***	-.04
Percent Renter	-.22 **	-.19	-.23 ***	-.20	-.18 ***	-.16
Living in Unaffordable Housing	-.12 ***	-.12	-.13 ***	-.13	-.09 ***	-.10
1-Year Mobility	-.03	-.01	-.07	-.03	-.11 ***	-.06
					-	
Ag. & Natural Res. Emp.	-.13 ***	-.10	-.09 *	-.07	.06 **	-.04
Manufacturing Industries Emp.	-.071 **	-.05	-.03	-.02	-.02	.02
Natural Res. & Con. Occ. Emp.	0.58 ***	.26	.47 ***	.21	.39 ***	.17
					.83	
Mean January Temperature (Z-score)			1.69 ***	.18	***	.08
Mean January Hours of Sun (Z-score)			1.22 ***	.13	.74 ***	.09
Mean July Temperature (Z-score)			1.29 ***	.14	.82 ***	.09
Mean July Humidity (Z-score)			.21	.02	.15	.02
Topographic Variation (Z-score)			-.01	-.001	.02	.003
Water Area (Z-score)			.39 **	.04	.31 **	.03
Weighted Mobile Homes					.45 ***	.46
Constant	51.6		42.5		21.7	
F-value	(22, 3085) = 150.1		(28, 3079) = 141.2		-	
R Square	.53		.57		-	
R Square Δ	.03 ***		.04 ***		-	
Pseudo R Square					.72	
Spatial Pseudo R Square					.62	

Note: OLS based on Robust Standard Errors, Sig. * <.05, ** <.01, *** <.001

Figure

Figure 1. Comparison of county percentages of households who live in mobile homes and poverty for the United States in 2015. Source: 2011-2015 ACS 5-Year Estimates