Changes in Homeownership in Pennsylvania's Rural Municipalities

By: Kristen B. Crossney, Ph.D.

West Chester University

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 For more information, contact the Center for Rural Pennsylvania, 625 Forster St., Room 902, Harrisburg, PA 17120, telephone (717) 787-9555, email: info@rural.palegislature.us, www.rural.palegislature.us.

Executive Summary

This study focused on homeownership rates in rural Pennsylvania municipalities[1]. Specifically, it analyzed the relationship between municipal demographic and market characteristics, and homeownership rates; modeled potential homeownership rates in 2020; classified municipalities based on changes in homeownership rates over time and analyzed if there were differences in municipal demographic and market characteristics in relation to homeownership rates; and, finally, examined whether homeownership rates and changes in homeownership rates were spatially distributed. The research used t-tests, ANOVAs, multivariate regression models, projection models, and ArcGIS.

Results

The research indicated that rural municipalities experienced similar changes in homeownership rates as the state as a whole, with some variation between the types of rural municipalities.

Pennsylvania as a whole experienced a decline of about 2 percentage points in homeownership rates, and an increase of about 1 percent in the number of homeownership units from 2000 to 2015.

Overall, rural Pennsylvania municipalities experienced a decline of about 1 percentage point in homeownership rates, and an increase of about 3 percent in homeownership units during the same time period. The increase in units occurred in rural townships, which experienced an increase of about 4 percent in the number of homeownership units; rural cities and boroughs experienced a decrease of almost 6 percent in the number of homeownership units. The research indicated that rural townships have higher homeownership rates than rural cities and boroughs, and that rural cities and boroughs have higher rates than their urban counterparts.

[1] The Center for Rural Pennsylvania's definitions of rural and urban municipalities were used.

Regression models were more effective at explaining homeownership rates in rural municipalities in 2010 and 2015, but performed somewhat poorly at explaining homeownership changes from 2000 to 2010 and 2010 to 2015. The variables associated with higher homeownership rates in 2010 were higher levels of homes that were mortgaged, lower housing values, and newer homes. The variables associated with higher homeownership rates in 2015 were higher incomes, lower housing values, lower levels of the population between the ages of 18 and 35, and newer homes.

Rural cities and boroughs were classified into groups based on similar changes in homeownership between 2010 and 2015 in an effort to better understand the current characteristics and possible relationships to homeownership changes. The groups were defined based on the average and standard deviations of change in homeownership from 2010 to 2015. The analysis found differences in the following variables across the three groups of rural cities and boroughs: percent change in population, change in the percent of the population between 18 and 35 years old, change in percent of the population age 65 years old and over, percent change in income, percent of houses mortgaged, vacancy rates, and percent of vacant other housing.

The analysis also suggested that cities and boroughs with declining homeownership are likely to have larger and increasing portions of the population that are 18 to 35 years old, lower percentages of college graduates, lower and decreasing portions of the population age 65 years old and over, greater vacancy rates, increases in income, and decreasing unemployment rates. Cities and boroughs with increasing homeownership are likely to have larger and decreasing portions of the population that are 18 to 35 years old, higher percentages of college graduates, lower and decreasing portions of the population age 65 years old and over, lower vacancy rates, increases in income, and decreasing unemployment rates.
The results indicate a complex relationship between homeownership and possible explanatory demographic, socioeconomic, and housing variables in rural Pennsylvania. Rural cities and boroughs do

not have the same characteristics as rural townships – nor are they experiencing the same type of changes. In addition, the experiences of rural municipalities vary from urban municipalities.

Based on the results, the researcher suggests that it is essential for researchers and government agencies to continue investigating these recent changes in homeownership, especially in the context of rural areas. Government efforts to stabilize or improve homeownership rates could focus on existing homeowners or on attracting first-time homeowners. Efforts could focus on assisting or preserving existing homeowners, such as senior citizens and low-and-moderate income homeowners, who are most likely to be negatively affected by changes in economic or housing conditions. Mortgage refinancing options may assist in maintaining housing affordability and reducing possible foreclosure risks. First-time homeownership may be encouraged or supported through programs such as down payment assistance, Individual Development Accounts (IDAs), direct subsidies, and low-cost loan options. Increased rental housing options may be useful in providing stability in housing markets and encourage households to transition to homeowners when financially able.

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Introduction

Housing has long been considered to be a crucial component of our national economy and the cornerstone of the "American Dream." President Franklin D. Roosevelt's New Deal linked the housing sector with economic stability, and represented a strong preference for homeownership over renting. Homeownership is believed to increase neighborhood quality and stability, improve quality of life, and create wealth for owner occupants (Rohe and Stegman, 1994a; Rohe and Stegman, 1994b; Rohe et al., 2002).

Housing Policies

Housing policy has a century-long history, and homeownership has been the preferred tenure since the 1930's. The Housing Act of 1937 and the Fair Housing Act (part of the Civil Rights Act of 1968), along with subsequent amendments to each, seek to promote equitable access to housing by preventing discrimination in the sale and rental of housing units, setting standards for housing conditions, and providing for public housing. The Equal Credit Opportunity Act of 1974, along with the Government Sponsored Enterprises (GSEs), seek to increase access in housing finance and mortgages, and increase the overall flow and availability of mortgage capital (Pinto, 2010). Additional efforts to promote low- and moderate-income homeownership emerged in the 1990s, such as with the "National Homeownership Strategy" (Allen et al., 2012; Belsky et al., 2014; Fishback et al., 2013; von Hoffman, 1996). Homeownership is more than just shelter, and has been linked to improved general access to social resources (Grinstein-Weiss et al., 2013).

Many of these policies were developed during periods of growth and stability in housing markets. Notable policies and programs have also been developed to stabilize or improve the housing market. One of the most notable was the Home Owners' Loan Corporation (HOLC), which operated in the aftermath of the Great Depression. HOLC restructured the existing loan instruments to the longer term amortized mortgages that are now commonplace. HOLC also provided refinancing options for homeowners in or in danger of foreclosure, which helped to reduce foreclosure rates, improve the liquidity of lending

institutions, and prevent declines in homeownership rates. Once the national housing market stabilized, the agency was disbanded (Crossney and Bartelt, 2005a, Crossney and Bartelt, 2005b; Fishback et al., 2013).

There are myriad government policies and programs related to housing, most of which affect homeownership. Most housing policy is developed at the national level, although there may be some administrative discretion for implementation. Federal policy is often developed in a top-down approach and in response to issues facing the nation as a whole or multiple states. State policies and programs are often more sensitive to local characteristics and issues, as well as needs not fully addressed by federal policy and programs. State housing finance agencies (HFAs) administer housing assistance policies and programs, and have had an increasingly significant role as federal support for affordable housing has decreased over time (Scally, 2009). Many housing policies and programs are not focused on the most severe housing needs, such as affordability, and it is unclear if local and state level priorities are emerging to fill this gap (Landis and McClure, 2010; Mueller and Schwartz, 2008).

The Great Recession and subsequent housing crisis greatly altered homeownership rates across the nation, and many homeowners lost equity as housing values decreased. It has been suggested that policy, in general, has not effectively mitigated the cyclical nature of housing markets, and that responses to the foreclosure crisis have been inadequate, leading to continuing declines and instability across housing markets (Bubb and Krishnamurthy, 2015; Gyourko, 2015; McCoy and Wachter, 2017; Molinsky et al., 2014). Previous efforts to increase homeownership among underserved populations, such as racial and ethnic minorities, and low-and-moderate income households, have been diminished as a result (Powell and Cardwell, 2014). Cyclical periods of growth and decline are common in housing markets, but can exacerbate income and racial and ethnic inequalities (McCoy and Wachter, 2017). Despite these dramatic shifts in the number and characteristics of homeowners, homeownership is largely still considered to be an effective avenue for building wealth for most people (Herbert et al., 2014; Reid, 2014).

Rural counties tend to have lower education levels and income than their urban counterparts, but have higher homeownership rates, lower average rents, and lower housing values (Flora and Flora, 2008). Most government housing policy does not have an explicit focus on rural areas. A notable exception is the U.S. Department of Agriculture's Rural Housing Program, which administers homebuyer programs exclusively in rural communities. Rural housing, and rural residents, are often different than their urban counterparts although rural housing is arguably an under-researched area, especially with respect to changes in homeownership and foreclsosures (Grinstein-Weiss et al., 2007; Latimer and Woldoff, 2010; Webb, 2017). A comparative advantage of rural areas is lower housing costs, although inflation in urban housing costs may make it difficult for rural residents to migrate to urban areas, which limits mobility (Flora and Flora, 2008). Women homeowners were found to have higher rates of foreclosure in rural Alabama, suggesting there are still persistent inequalities related to housing outcomes (Lichtenstein and Weber, 2015).

Changes in Homeownership Rates

Demographics help to explain current demands for housing as well as tenure, or the decision to rent versus own. Demand can also be viewed as a function of population size, or specifically the number of households. The number of households in the U.S. increased by more than 1 million a year in the 1980s and 1990s. Comparatively, from 2007 to 2013, annual household growth was between 600,000 and 800,000. This was a time period of declining incomes, and an overall decrease in household formation. In 2013, 15.3 million adults in their 20s and 3.1 million adults in their 30s lived in their parents' home. Recently, the most dramatic decreases in national homeownership rates have been among younger adults, with an almost 8 percentage point decrease for 25-34 year olds and 9 percentage points for 35-44 year olds (Joint Center for Housing Studies, 2014).

Nationwide, homeownership increases between 1994 and 2005 were largely due to the increased participation of households under age 35 (Chambers, 2009). Increases in the working population living

alone, and aging demographic structures of industrialized countries in the post-war period also have had substantial effects on the demand for housing (Yu and Myers, 2010). Current demographic trends suggest that, nationwide, the number of American households will grow over 11 million between 2015 and 2025. Most of this growth is expected to be in older households (70+ and older), and be driven by a growing number of minority households. Baby Boomer households are expected to decrease in size, while there may be as many as 24 million new Millennial households[2]. The size of the Millennial generation will be offset by its relatively slow entry into the housing market. By 2035, Millennials are expected to form 34 million new households, for a total of 50 million. In comparison, Generation X currently heads 43.2 million households (Joint Center for Housing Studies, 2017).

Historically, homeownership rates have been sustained or increased over time. The 1980s represented a decade of growth in the housing sector. Financial deregulation increased the availability and decreased the cost of home mortgages, helping to greatly increase the overall number of American homeowners, along with minority and low-to-moderate income homeowners. However, research has continued to document differences in homeownership rates across racial and ethnic identities, as well as across income groups (Crossney, 2010; Listokin and Casey, 1980; Munnell et al., 1996; Ross and Yinger, 2002).

The decreases in the last decade in homeownership, after many years of rising national homeownership rates, may reflect national, state or local declines in the economy, demographic shifts, and changes in the financial sector. From 2000 to 2010, homeownership in Pennsylvania remained higher than national statistics, but declined from 71.3 percent to 69.8 percent, an overall decline of just over 2 percentage points. This decline was not felt equally across the Commonwealth. Pennsylvania's small cities and boroughs experienced a 4.5 percent decline in homeownership from 2000-2010.

[2] The Baby Boomer generation is generally defined as individuals born between 1946 and 1964. The Millennial generation is generally defined as individuals born between 1981 and 1997. For more information on common definitions of generations, see Pew Research Center, 2017, http://www.pewresearch.org/fact-tank/2017/05/05/its-becoming-more-common-for-young-adults-to-live-at-home-and-for-longer-stretches/.

Goals and Objectives

After many years of rising national homeownership rates, the past decade has brought declines. The Great Recession of 2007-2009 led to decreases in homeownership rates and housing values, which negatively affected some areas and populations more than others. The impacts of the financial crisis were not felt equally across socio-economic classes, or across space. Stagnating wages were unable to keep up with rent and mortgage payments, and many renters turned to alternative measures to afford rent (e.g. multiple families living in a single family unit) (Palomera, 2014; Rolnik, 2013). Between 2009 and 2013, 5.3 million American homes, about 7 percent of households, were foreclosed upon (Bratt and Immergluck, 2015).

This research focused on homeownership in Pennsylvania's rural cities and boroughs[3]. Figure 1 shows the location of rural cities and boroughs in Pennsylvania, along with rural townships and urban municipalities. From 2000 to 2010, homeownership rates in Pennsylvania remained higher than national rates, but declined overall. During this period, homeownership rates in rural Pennsylvania cities and boroughs experienced a decrease of more than 4 percent.

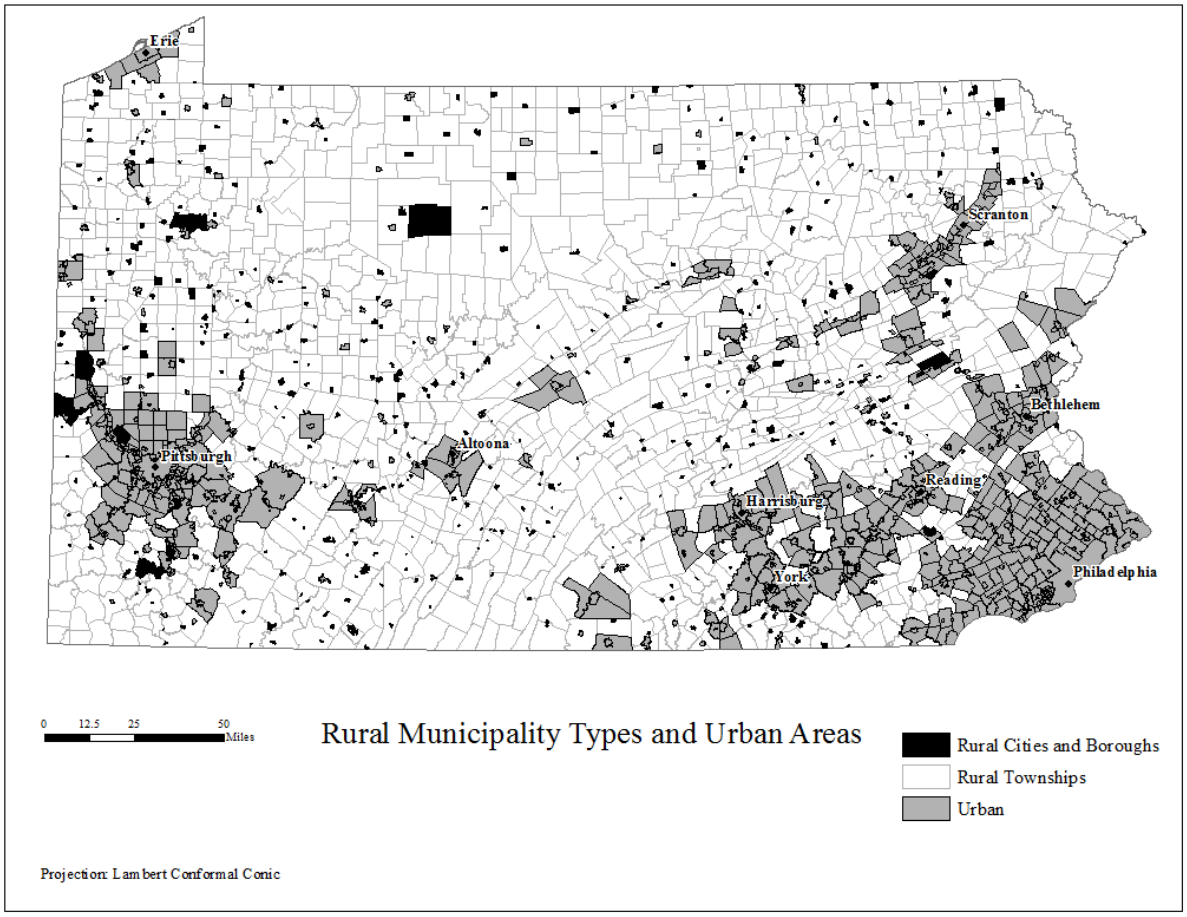
In an effort to better understand changes in homeownership in rural cities and boroughs, the researcher analyzed data to address the following questions:

1. What is the relationship between demographic and market characteristics, and homeownership rates?
2. What will homeownership rates look like in 2020?
3. What are the different types of rural cities and boroughs with respect to demographic and market characteristics, and homeownership rates?

[3] The research used the Center for Rural Pennsylvania's definitions of rural and urban municipalities: A municipality is rural when the population density within the municipality is less than the statewide density of 284 persons per square mile, or the total population is less than 2,500, unless more than 50 percent of the population lives in an urbanized area as defined by the U.S. Census Bureau. All other municipalities are considered urban.

4. How are homeownership rates and changes in homeownership rates spatially distributed?

Figure 1. Pennsylvania Rural Municipality Types and Urban Municpalities



Methodology

This study examined homeownership in rural Pennsylvania municipalities in the context of demographic, socioeconomic and housing variables. It used Census data from 2000 to 2015[4].

In Pennsylvania, the most common type of municipality is townships of the second class, most of which are rural (Table 1). Boroughs are the next most common municipality type, and are found almost equally in urban and rural Pennsylvania. Most cities and townships of the first class are urban. The research first determined homeownership rates across the different municipality types. It then focused on rural municipalities, specifically cities and boroughs.

Table 1. Types of Municipalities in Pennsylvania (n=2,570).

	City	Borough	Townships of the 1st Class	Townships of the 2nd Class	Total
Rural	2	423	1	1,167	1,593
Urban	55	544	91	287	977
Total	57	967	92	1,454	2,570

First, the research determined homeownership rates for all of Pennsylvania and then only rural Pennsylvania. It used a t-test to assess if homeownership rates in rural Pennsylvania varied between cities and boroughs, and townships. A t-test was also used to assess the differences between rural and urban cities and boroughs. Next, the researcher used the four research questions to describe changes in rural Pennsylvania cities and boroughs.

For the first research question, the researcher used a multivariate regression model to examine the relationship between homeownership rates and socioeconomic and demographic characteristics in rural

[4] This report used the Center for Rural Pennsylvania's municipal definition of rural and urban along with variables from the National Historical Geographic Information System, Version 2.0. Minneapolis, MN: University of Minnesota, 2011, https://www.nhgis.org.

Pennsylvania. Regression models are a way to statistically estimate the relationships between multiple variables and the impacts independent variables have on a dependent variable.

For the second question, the researcher used different projection models and homeownership rates from 1980-2015, and rural municipality types to estimate homeownership rates for 2020. While the 35-year range of data gives a longer view, and, arguably a more grounded approach for considering rural homeownership rates, it is less influenced by recent changes. Using data from 1980-2015, the research employed five different projection models to estimate homeownership rates, and the number of owner occupied units by municipal type for 2020: linear; exponential; logarithmic; polynomial; and power. Each model used a different equation to create a "best fit line" to project future time periods based on past values and how those values have changed over time.

For the third research question, the researcher developed a typology of cities and boroughs in rural Pennsylvania based on changes in homeownership rates from 2010-2015. Three different types of rural cities and boroughs were identified based on changes in homeownership between 2010 and 2015. Analysis of Variances (ANOVAs) and discriminant analysis were used to model the differences between groups, in this case changes in homeownership rates between 2010 and 2015 in rural cities and boroughs. ANOVA considers the variation within each of the individual groups, and then compares it to the variation across the different groups. An ANOVA is an effective way to assess if the variation between groups is statistically significant, although it does not tell us about the nature of the variation. Discriminant analysis tests the hypotheses that groups have similar characteristics. The differences between groups are estimated using a discriminant score that is based on the weights and values of each independent variable, and is used in geographic research involving ordinal variables (Alonzo, 2013; Brands et al., 2015; Chen and Hua, 2015; Crossney, 2017; Greenberg, 2009; Hill et al., 1998; Mikelbank, 2004; Reibel, 2011).

Lastly, ArcGIS was used to map homeownership rates, and recent changes, across Pennsylvania. ArcGIS was used to illustrate the spatial distribution of homeownership across Pennsylvania in 2000, 2010, 2015, as well as the change in homeownership rates from 2000 to 2010, 2010 to 2015 and 2000 to 2015.

Results

Pennsylvania homeownership rates have consistently varied by municipality type. Before addressing the four main research questions or goals with respect to rural municipalities, homeownership rates across Pennsylvania were examined to provide context.

Historically, cities and boroughs have had the lowest homeownership rates, while townships of the first class and second class have had the highest (Table 2). Between 1980 and 2000, homeownership rates, along with the number of owner-occupied units, declined in cities and boroughs. During the same time period, homeownership rates remained relatively consistent in townships while the number of owner-occupied units increased.

Table 2. Homeownership Rates by Municipality Type, Pennsylvania, 1980-2015 (n=2,570)

		1980	1990	2000	2010	2015
City	%	58.3%	58.3%	56.7%	52.1%	51.0%
	# units	774,402	748,305	706,004	641,196	612,006
Borough	%	66.3%	65.0%	64.4%	62.5%	62.3%
	# units	650,754	655,514	663,581	658,701	646,751
1st Township	%	76.6%	76.9%	77.0%	75.7%	75.1%
	# units	387,551	423,081	451,830	466,950	458,491
2nd Township	%	81.1%	81.6%	82.9%	81.5%	81.2%
	# units	1,114,918	1,323,351	1,567,244	1,724,329	1,713,382
All Municipalities	%	69.9%	70.6%	71.3%	69.6%	69.2%
	# units	2,927,625	3,150,251	3,388,659	3,491,176	3,430,630

Source: National Historic Geographic Information System

The housing bust and the Great Recession led to a decline in homeownership units across all municipality types between 2000 and 2010. However, these changes were not equally felt (Table 3). In the 15-year time period of 2000 to 2015, the percent change in homeownership units ranged from a decline of 13.31 percent in cities, to a more modest loss of 2.54 percent in boroughs, and overall gains in both types of townships.

Table 3. Percent Change in Homeownership Units for Pennsylvania Municipalities (n=2,570).

	% change 2000-2010	% change 2010-2015	% change 2000-2015
City	-9.18%	-4.55%	-13.31%
Borough	-0.74%	-1.81%	-2.54%
1st Township	3.35%	-1.81%	1.47%
2nd Township	10.02%	-0.63%	9.32%
All Municipalities	3.03%	-1.73%	1.24%

Source: National Historic Geographic Information System

Rural municipalities in Pennsylvania tend to have higher homeownership rates than the state overall. Because of the limited number of rural cities and townships of the first class (Table 1), cities and boroughs were combined into one municipality type and townships were combined into a second municipality type. Rural cities and boroughs experienced a similar declining trend as that felt across both rural and urban areas, but to a less severe degree (Table 4). Although rural municipalities experienced declining homeownership rates from 2000-2015, the overall rate was similar to what it had been in 1980 and the number of owner-occupied units increased greatly between 1980 and 2015 (Table 4).

Table 4. Homeownership Rates by Rural Municipality Type, 1980-2015 (n=1,593)

	1980	1990	2000	2010	2015
Cities and	73.8%	72.1%	72.0%	69.7%	69.9%
Boroughs	98,854	95,932	99,054	94,716	93,322
Townships	83.6%	84.1%	85.2%	83.8%	83.9%
	572,976	651,999	744,160	787,393	777,607
Rural	82.0%	82.3%	83.4%	82.0%	82.1%
	671,830	747,931	843,214	882,109	870,929

Source: National Historic Geographic Information System

Unlike rural townships, the number of owner-occupied units in cities and boroughs decreased from 2000 to 2015 (Table 5). Townships did experience a small decline in the number of homeownership units between 2010 and 2015, but overall had over a 4 percent increase between 2000 and 2015. The number of homeownership units in rural cities and boroughs declines by almost 6 percent.

Table 5. Percent Change in Homeownership Units in Pennsylvania Rural Municipalities (n=1,593)

	% chg 2000-2010	% chg 2010-2015	% chg 2000-2015
Cities and Boroughs	-4.38%	-1.47%	-5.79%
Townships	5.81%	-1.24%	4.49%
Rural	4.61%	-1.27%	3.29%

Source: National Historic Geographic Information System

The change in homeownership rates varied in rural municipalities (Table 6). Homeownership rates in cities and boroughs declined 2.3 percentage points between 2000 and 2010, while rates in townships declined 1.2 percentage points. There was a small but positive change between 2010 and 2015 across all rural municipalities. The change in percentage points in cities and boroughs from 2000 and 2015 is larger than the decline in townships.

Table 6. Homeownership Rate Changes in Pennsylvania Rural Municipalities, (n=1,593)

	2000-2010	2010-2015	2000-2015
Cities and Boroughs	-2.32	0.23	-2.09
Townships	-1.38	0.03	-1.36
All Rural Municipalities	-1.38	0.06	-1.31

Source: National Historic Geographic Information System

A t-test was used to test whether these two municipality types in rural Pennsylvania had statistically different homeownership rates (Table 7). Townships have statistically significantly higher homeownership rates than cities and boroughs across all observed time periods. The homeownership rate in rural townships is consistently about 8 percentage points higher than rural cities and boroughs. The

change in the percent of homeownership units from 2000 to 2010 and 2000 to 2015 is statistically significantly different between rural cities and boroughs and rural townships.

A t-test was used to test if rural cities and boroughs had different homeownership rates than their urban counterparts (Table 8). Rural cities and boroughs had statistically significantly higher homeownership rates than urban cities and boroughs in 1980, 1990, 2000, 2010, and 2015. The homeownership rates in rural cities and boroughs were approximately 8.5 percentage points higher than urban cities and boroughs. However, the change in the percent of homeownership units was not statistically significantly different between rural and urban cities and boroughs. Cities and boroughs, regardless of whether they are urban or rural, experienced similar levels of decline between 2000 to 2010, 2010 to 2015, and 2000 to 2015.

Table 7. Summary of T-test Results,
Homeownership Rates in Rural Pennsylvania, (n=1,593)

		Mean	Std Dev	Sig
1980	Cities and Boroughs	75.7%	0.10	**0.001**
	Townships	83.6%	0.05	
1990	Cities and Boroughs	75.0%	0.10	**0.001**
	Townships	84.4%	0.05	
2000	Cities and Boroughs	74.7%	0.11	**0.001**
	Townships	85.6%	0.05	
2010	Cities and Boroughs	72.4%	0.12	**0.001**
	Townships	84.4%	0.05	
2015	Cities and Boroughs	72.4%	0.13	**0.001**
	Townships	84.6%	0.06	
2000-2010	Cities and Boroughs	-2.29	6.78	**0.001**
	Townships	-1.19	3.14	
2010-2015	Cities and Boroughs	0.04	8.55	0.701
	Townships	0.16	4.34	
2000-2015	Cities and Boroughs	-2.29	9.36	**0.001**
	Townships	-1.03	5.01	

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

Table 8. Summary of T-test Results, Change in Homeownership Rates in Cities and Boroughs (n=1,024).

		Mean	Std Dev	Sig
1980	Rural	75.7%	0.10	**0.001**
	Urban	67.6%	0.12	
1990	Rural	75.0%	0.10	**0.001**
	Urban	66.6%	0.13	
2000	Rural	74.7%	0.11	**0.001**
	Urban	66.3%	0.13	
2010	Rural	72.4%	0.12	**0.001**
	Urban	63.8%	0.14	
2015	Rural	72.4%	0.13	**0.001**
	Urban	63.5%	0.14	
2000-2010	Rural	-2.29%	6.78%	.358
	Urban	-2.61%	4.44%	
2010-2015	Rural	0.04%	8.55%	0.464
	Urban	-0.29%	5.70%	
2000-2015	Rural	-2.29%	9.36%	0.214
	Urban	-2.91%	6.60%	

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

What is the relationship between demographic and market characteristics, and homeownership rates?

The relationship between demographic and market characteristics in rural municipalities was examined using multivariate regression models for four different dependent variables, including the homeownership rates in 2010 and 2015, and the changes in the homeownership rates from 2000-2010 and 2010-2015. Regression models were used to quantify the direction and strength of relationships between homeownership and demographic, socioeconomic, and housing variables in rural municipalities.

Tables 9 and 10 present the standardized Beta coefficients for each variable, which indicates the strength of each variable in explaining variation in the dependent variables (homeownership rates). The larger the standardized Beta coefficient, the stronger the relationship. The sign of each coefficient reflects the nature of the relationship: a negative sign indicates that, as the value of the independent variable decreases,

homeownership rates will increase. Changes in homeownership rates between 2000 and 2010, and 2010 to 2015 are not well explained by the regression models.

Table 9. Homeownership in Rural Pennsylvania Municipalities Regression Models, 2010 (n=1,593)

	homeownership rate	change 2000-2010
% Change in Population	**-0.079**	**0.201**
% Hispanic	**-0.197**	0.044
Change in % Hispanic	-0.008	0.020
% White	**-0.154**	**-0.131**
Change in % White	-0.003	**0.118**
% 18-35	**-0.22**	**-0.238**
Change in % 18-35	0.031	0.015
% 65+	**0.043**	**-0.104**
Change in %65+	**0.05**	**0.139**
Income	**0.216**	**-0.380**
% Change in Income	**-0.039**	**0.224**
% Unemployed	0.023	**0.088**
Change in % Unemployed	**-0.081**	-0.052
% college graduates	**-0.137**	**0.097**
Change in % College Graduates	**0.085**	**-0.068**
% Houses Mortgaged	**0.598**	**0.243**
Vacancy Rate	**0.125**	0.043
% Vacant Other	**0.223**	**0.130**
Housing Value	**-0.319**	**0.138**
% Change in Housing Value	**0.049**	**-0.060**
Average Year Built	**0.252**	0.015
R^2	0.677	0.198
Adj R^2	0.672	0.185

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

Table 10. Homeownership in Rural Pennsylvania Municipalities Regression Models, 2015 (n=1,593)

	homeownership rate	change 2010-2015
% Change in Population	0.026	-0.020
% Hispanic	**-0.148**	0.025
Change in % Hispanic	**0.045**	-0.017
% White	**-0.083**	0.051
Change in % White	0.025	-0.023
% 18-35	**-0.353**	**0.112**
Change in % 18-35	**0.131**	**-0.195**
% 65+	**-0.12**	0.085
Change in %65+	**0.117**	0.024
Income	**0.596**	**0.188**
% Change in Income	**-0.084**	**0.078**
% Unemployed	-0.024	-0.020
Change in % Unemployed	0.007	0.042
% college graduates	**-0.075**	0.028
Change in % College Graduates	-0.001	-0.028
% Houses Mortgaged	**0.086**	0.007
Vacancy Rate	0.002	-0.048
% Vacant Other	**0.153**	-0.013
Housing Value	**-0.384**	**-0.131**
% Change in Housing Value	**0.036**	0.012
Average Year Built	**0.349**	-0.012
R^2	0.499	0.054
Adj R^2	0.492	0.040

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

The regression models explained about 20 percent of the variation of change in homeownership rates from 2000 to 2010, but only about 5 percent of the variation between 2010 to 2015 (Tables 9 and 10). The regression models were stronger in explaining the homeownership rate in 2010 and 2015, accounting for about 50 percent and 67 percent, respectively. There were several variables that are significant in all four models: percent of 18 to 35 year olds, income, percent change in income, and housing value. Differences between the models in terms of the significance, and sign, of the Beta coefficients suggest there were

different forces at work related to differences in homeownership rates and changes in these rates over time.

Each of the four regression models had different independent variables that were the strongest predictors. For the homeownership rate in 2010, the strongest explanatory variables were the percent of houses mortgaged, housing values, and average year built (Table 9). Higher levels of homes that are mortgaged, lower housing values, and newer houses were associated with higher homeownership rates in 2010.

For the change in homeownership rates between 2000 and 2010, the strongest explanatory variables were income, percent of houses mortgaged, percent of the population between 18 and 35 years old, and percent change in population (Table 9). Lower incomes, higher levels of homes that are mortgaged, lower levels of the population between 18 and 35, and higher percent change in population were associated with greater increases in homeownership rates between 2000 and 2010.

The strongest explanatory variables for homeownership rates in 2015 were income, percent of the population between 18 and 35, housing value, and average year built (Table 10). Higher incomes, lower housing values, lower levels of the population between 18 and 35, and newer houses were associated with higher homeownership rates in 2015.

For the change in homeownership rate between 2010 and 2015, the strongest explanatory variables were change in the percent of the population between 18 and 35, income, housing value, percent of the population between 18 and 35, and percent change in income (Table 10). Larger portions of the population aged 18 to 35 but decreasing, along with higher incomes, and lower housing values were associated with greater increases in homeownership rates between 2010 and 2015.

What will homeownership rates look like in 2020?

The substantive differences between the four presented regression models indicated that homeownership rates, and changes in homeownership rates vary over time in rural areas. The variables explaining homeownership rates in 2010 were not the same as the explanatory variables for 2015. Changes in the values of the statistically significant variables over time could be used along with the regression models to estimate changes in homeownership rates, assuming the direction and strength of these relationships remains constant over time. Another way to estimate homeownership rates in 2020 is to plot the values over time, and then extrapolate the line to future time periods. Similar to regression as a prediction method, extrapolation assumes that the previous trends will continue into future time periods.

Table 11. Projection Models to Estimate 2020 Homeownership Rates in Rural Pennsylvania by Municipality Type, (n=1,593)

	Cities and Boroughs	Townships
Linear	$y = -0.0102x + 0.7456$	$y = -0.0001x + 0.8239$
Exponential	$y = 0.746e^{-0.014x}$	$y = 0.8239e^{-1E-04x}$
Logarithmic	$y = -0.025\ln(x) + 0.7393$	$y = 0.0011\ln(x) + 0.8225$
Polynomial	$y = 0.0011x^2 - 0.0171x + 0.7536$	$y = -0.0021x^2 + 0.0123x + 0.8094$
Power	$y = 0.7395x^{-0.035}$	$y = 0.8225x^{0.0014}$

Source: National Historic Geographic Information System

Five different projection models were used to estimate homeownership rates and the number of owner-occupied units by rural municipality type for 2020, using data from 1980-2015: linear; exponential; logarithmic; polynomial; and power. Tables 11 and 12 present the equation, or best fit line, used for each projection model to estimate homeownership rates in 2020 based on past homeownership rates. The models vary in their assumptions of how homeownership rates and owner-occupied units will change over time, which leads to various estimates, or projections, of expected values in 2020 (Tables 13 and 14).

Table 12. Projection Models to Estimate Number of Owner-Occupied Units in 2020 in Rural Pennsylvania by Municipality Type, (n=1,593)

	Cities and Boroughs	Townships
Linear	$y = -1228x + 100060$	$y = 54466x + 543430$
Exponential	$y = 100119e^{-0.013x}$	$y = 552132e^{0.0799x}$
Logarithmic	$y = -2835\ln(x) + 99090$	$y = 141514\ln(x) + 571327$
Polynomial	$y = -314.57x^2 + 659.43x + 97858$	$y = -16182x^2 + 151557x + 430157$
Power	$y = 99110x^{-0.03}$	$y = 574333x^{0.2093}$

Source: National Historic Geographic Information System

Although the five projection methods varied in their underlying assumptions and estimation equations (Tables 11 and 12), there was a high degree of similarity in their estimates of what homeownership will look like in 2020 (Tables 13 and 14). For cities and boroughs, the homeownership rate is projected to remain very similar to the 2015 rate of 69.9 percent (Table 14). The number of owner-occupied units in cities and boroughs is expected to remain the same or increase very slightly, about 1 percent (Table 13). Cities and boroughs are expected to have a homeownership rate between 69.5 percent and 69.9 percent, and between 93,291 and 94,527 owner-occupied housing units in 2020. The homeownership rate in townships is expected to decrease slightly in 2020 from the 2015 of 83.9 percent (Table 13). However, the number of owner-occupied units in townships is expected to increase slightly, about 3 percent (Table 14). Townships are expected to have a homeownership rate between 81.8 percent and 82.4 percent, and between 783,392 and 823,272 owner-occupied housing units in 2020.

Table 13. Projected 2020 Homeownership Rates in Rural Pennsylvania by Municipality Type and Projection Model (n=1,593)

	Linear	Exponential	Logarithmic	Polynomial	Power
Cities and Boroughs	69.5%	69.6%	69.9%	69.6%	69.9%
Townships	82.3%	82.3%	82.4%	81.8%	82.4%

Source: National Historic Geographic Information System

Table 14. Projected Number of Owner-Occupied Units in 2020 in Rural Pennsylvania by Municipality Type and Projection Model (n=1,593)

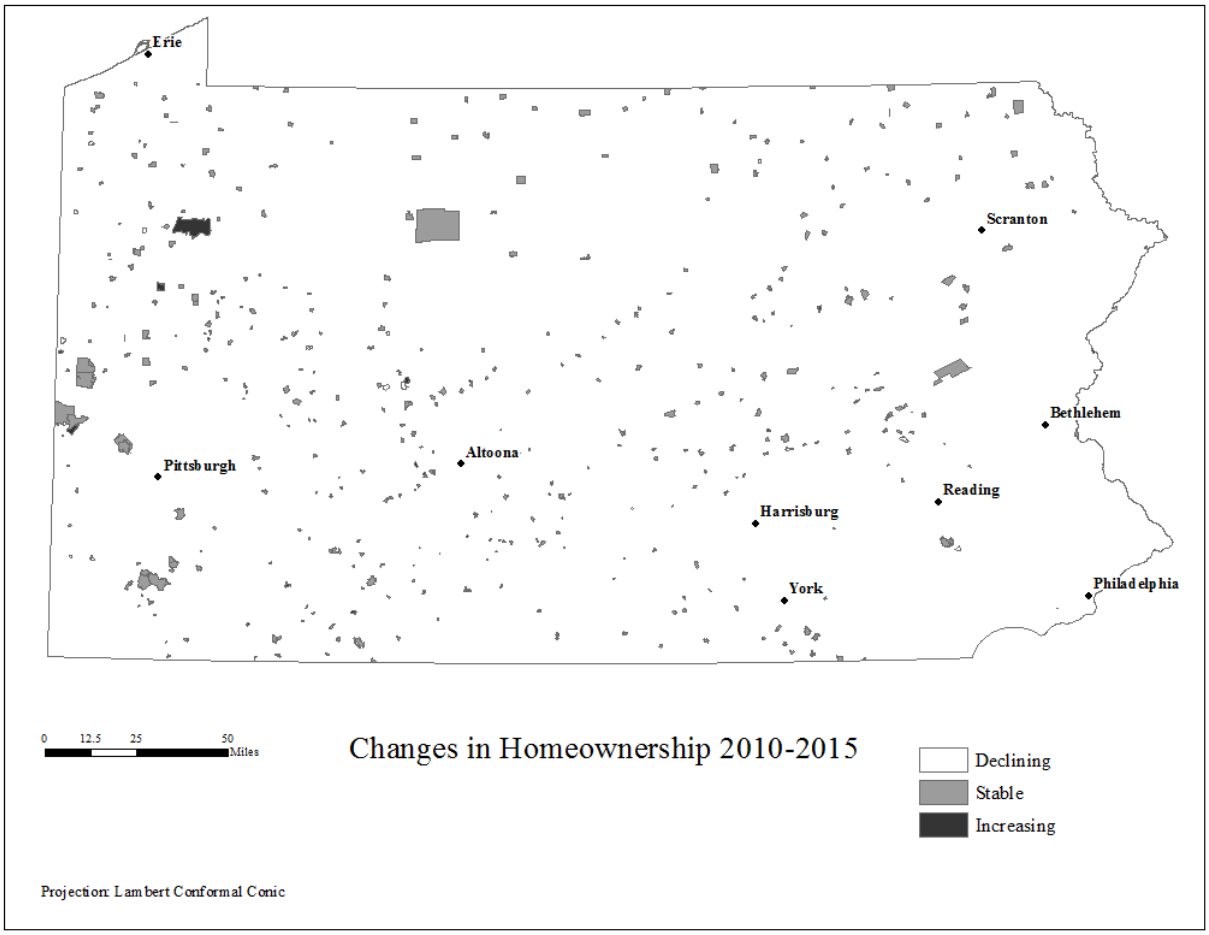
	Linear	Exponential	Logarithmic	Polynomial	Power
Cities and Boroughs	93,920	93,818	94,527	93,291	94,438
Townships	815,760	823,272	799,085	783,392	804,374

Source: National Historic Geographic Information System

What are the different types of rural cities and boroughs with respect to demographic and market characteristics?

For this research question, the researcher classified rural cities and boroughs based on changes in homeownership rates from 2010 to 2015. Three groups were identified based on the change in percentage points from the 2010 homeownership rate to the 2015 homeownership rate: declining rates, stable rates, and increasing rates. Changes in municipal homeownership rates were classified as declining if the change was more than one standard deviation below zero, and increasing if the change was more than one standard deviation above zero. Rural cities and boroughs with changes in homeownership rates within one standard deviation of zero were classified as stable. Rural cities and boroughs, along with group assignment, are shown in Figure 2. Discriminant analysis was used to correlate each of the three different types of rural cities and boroughs with the variables that are most strongly associated with each.

Figure 2. Group Membership Based on Change in Homeownership between 2010 and 2015 in Rural Cities and Boroughs (n=425).



The majority of rural cities and boroughs fell into the stable homeownership group (Table 15). The decreasing and increasing homeownership groups were similar in size, at 38 and 34 cities and boroughs, respectively. The cities and boroughs classified as having declining homeownership had higher than average homeownership rates in 2000 and 2010, and then significantly lower homeownership rates than other cities and boroughs in 2015. This is in direct contrast to those cities and boroughs classified as increasing homeownership, which had lower than average homeownership rates in 2010 and substantially higher rates in 2015 (Table 15).

Table 15. Homeownership in Rural Cities and Boroughs (n=425)

	2000		2010		2015	
Group	mean	std dev	mean	std dev	mean	std dev
Declining (38)	78.35%	9.95	77.83%	12.87	63.37%	15.87
Stable (353)	74.40%	11.24	72.40%	12.27	72.57%	12.75
Increasing (34)	73.06%	10.87	66.40%	10.87	81.23%	10.60
Rural Cities and Boroughs (425)	74.65%	11.14	72.40%	12.41	72.44%	13.39

Source: National Historic Geographic Information System

Rural cities and boroughs classified as having increasing homeownership rates had substantially larger population declines (Table 16). Across the three groups, there were no substantive differences in racial and ethnic characteristics or in age composition. It is interesting to note that both the decreasing and increasing homeownership groups had decreases in the size and a smaller portion of the population age 65 years old and over as compared to the cities and boroughs with stable homeownership rates (Table 16).

Table 16. Descriptive Statistics of Demographic Characteristics by Groups Defined Using Homeownership Rate Change, 2010-2015 (n=453)

		Mean	Std. Dev.
% Change in Population	Declining	0.20%	19.94
	Stable	-1.00%	12.06
	Increasing	-10.96%	23.91
	Rural Cities and Boroughs	-1.69%	14.41
% Hispanic	Declining	1.44%	2.76
	Stable	1.96%	4.99
	Increasing	1.78%	3.12
	Rural Cities and Boroughs	1.90%	4.70
Change in % Hispanic	Declining	98.21	316.80
	Stable	85.69	344.55
	Increasing	105.59	242.78
	Rural Cities and Boroughs	87.89	336.36
% White	Declining	97.61%	4.16
	Stable	96.95%	5.02
	Increasing	96.40%	5.25
	Rural Cities and Boroughs	96.96%	4.96
Change in % White	Declining	-0.22	4.06
	Stable	-0.31	2.71
	Increasing	-1.37	5.64
	Rural Cities and Boroughs	-0.39	3.18
% 18-35	Declining	19.83%	7.17
	Stable	18.59%	5.31
	Increasing	18.57%	12.75
	Rural Cities and Boroughs	18.70%	6.38
Change in % 18-35	Declining	0.50	7.68
	Stable	-0.18	4.40
	Increasing	-2.81	7.34
	Rural Cities and Boroughs	-0.33	5.10
% 65+	Declining	16.85%	9.12
	Stable	18.79%	6.50
	Increasing	17.58%	8.13
	Rural Cities and Boroughs	18.52%	6.92
Change in %65+	Declining	-1.95	10.73
	Stable	1.27	4.07
	Increasing	-1.60	12.57
	Rural Cities and Boroughs	0.75	6.12

Source: National Historic Geographic Information System

Cities and boroughs categorized as having increasing homeownership rates had lower incomes, but a greater percent change in income (Table 17). Stable homeownership cities and boroughs, by comparison, had higher incomes but experienced the greatest decrease in percent change in income. Unemployment rates are highest in the stable homeownership cities and boroughs, and the unemployment rates declined more in the declining and increasing homeownership groups. The stable homeownership group had the highest portion of the population who were college graduates and the declining homeownership group had the lowest portion (Table 17).

Table 17. Descriptive Statistics of Socioeconomic Characteristics by Groups Defined Using Homeownership Rate Change, 2010-2015 (n=453)

		Mean	Std. Dev.
Income	Declining	$44,233	8670
	Stable	$46,235	15044
	Increasing	$42,223	9101
	Rural Cities and Boroughs	$45,769	14280
% Change in Income	Declining	0.77%	20.51
	Stable	-3.54%	17.47
	Increasing	3.56%	32.67
	Rural Cities and Boroughs	-2.67%	19.25
% Unemployed	Declining	7.17%	5.78
	Stable	7.72%	4.22
	Increasing	7.15%	6.64
	Rural Cities and Boroughs	7.63%	4.59
Change in % Unemployed	Declining	-1.77	4.95
	Stable	-0.72	4.88
	Increasing	-1.41	7.41
	Rural Cities and Boroughs	-0.87	5.11
% College Graduates	Declining	12.80%	8.97
	Stable	15.66%	9.71
	Increasing	14.63%	10.86
	Rural Cities and Boroughs	15.32%	9.75
Change in % College Graduates	Declining	1.55%	10.52
	Stable	0.91%	4.86
	Increasing	1.57%	8.86
	Rural Cities and Boroughs	1.02%	5.94

Source: National Historic Geographic Information System

Rural cities and boroughs considered to have increasing homeownership rates between 2010 and 2015 had a higher percent of all houses that were mortgaged, lower overall vacancy rates, and a higher than average percent of properties considered to be "vacant other" (Table 18). This group also had lower housing values and larger declines in housing values than other rural cities and boroughs. By comparison, rural cities and boroughs with declining homeownership rates had a lower percent of houses that were mortgaged and a significantly higher vacancy rate. Housing values in the declining homeownership group were below average, but greater than the cities and boroughs with increasing homeownership rates (Table 18).

Table 18. Descriptive Statistics of Housing Characteristics by Groups Defined Using Homeownership Rate Change, 2010-2015 (n=453)

		Mean	Std. Dev.
% Houses Mortgaged	Declining	45.34%	12.26
	Stable	46.51%	10.40
	Increasing	51.76%	17.22
	Rural Cities and Boroughs	46.83%	11.32
Vacancy Rate	Declining	51.99%	31.29
	Stable	46.54%	28.62
	Increasing	34.49%	31.99
	Rural Cities and Boroughs	46.07%	29.27
% Vacant Other	Declining	13.45%	9.83
	Stable	12.63%	9.64
	Increasing	21.14%	24.30
	Rural Cities and Boroughs	13.39%	11.69
Housing Value	Declining	$99,577	46,441
	Stable	$108,095	67,971
	Increasing	$90,653	26,973
	Rural Cities and Boroughs	$106,121	64,406
% Change in Housing Value	Declining	0.70%	18.97
	Stable	-2.36%	17.50
	Increasing	-6.85%	21.60
	Rural Cities and Boroughs	-2.43%	17.96
Average Year Built	Declining	1947	15
	Stable	1948	11
	Increasing	1950	14
	Rural Cities and Boroughs	1948	12

Source: National Historic Geographic Information System

ANOVAs (Analysis of Variances) statistical tests were used to assess if the differences in demographic, socioeconomic and housing characteristics were statistically significant between the three different groups of rural cities and boroughs (Tables 19-21). ANOVAs do not model the direction of differences, but do assess if the differences are statistically significant.

The following variables are statistically significantly different between the three groups of cities and boroughs: percent change in the population, change in percent of the population between 18 and 35 years old, change in percent of the population 65 years old and over, percent change in income, percent of houses mortgaged, vacancy rates, and percent of vacant other housing (Tables 19-21).

Table 19. ANOVA Results of Demographic Characteristics by Groups Defined Using Homeownership Rate Change, 2010-2015 (n=453)

		Sum of Squares	df	Mean Square	F	Sig.
% Change in Population	Between Groups	0.322	2	0.161	8.014	**0.000**
	Within Groups	8.482	422	0.020		
	Total	8.804	424			
% Hispanic	Between Groups	0.001	2	0.000	0.221	0.802
	Within Groups	0.936	422	0.002		
	Total	0.937	424			
Change in % Hispanic	Between Groups	1.075	2	0.538	0.047	0.954
	Within Groups	3811.572	335	11.378		
	Total	3812.647	337			
% White	Between Groups	0.003	2	0.001	0.537	0.585
	Within Groups	1.042	422	0.002		
	Total	1.044	424			
Change in % White	Between Groups	0.004	2	0.002	1.801	0.166
	Within Groups	0.425	422	0.001		
	Total	0.428	424			
% 18-35	Between Groups	0.005	2	0.003	0.651	0.522
	Within Groups	1.721	422	0.004		
	Total	1.726	424			
Change in % 18-35	Between Groups	0.024	2	0.012	4.743	**0.009**
	Within Groups	1.077	422	0.003		
	Total	1.101	424			
% 65+	Between Groups	0.016	2	0.008	1.698	0.184
	Within Groups	2.013	422	0.005		
	Total	2.029	424			
Change in % 65+	Between Groups	0.056	2	0.028	7.726	**0.001**
	Within Groups	1.530	422	0.004		
	Total	1.586	424			

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

Table 20. ANOVA Results of Socioeconomic Characteristics by Groups Defined Using Homeownership Rate Change, 2010-2015 (n=453)

		Sum of Squares	df	Mean Square	F	Sig.
Income	Between Groups	548614276	2	274307138	1.347	0.261
	Within Groups	84487171971	415	203583547		
	Total	85035786246	417			
% Change in Income	Between Groups	0.185	2	0.092	2.513	**0.082**
	Within Groups	15.235	414	0.037		
	Total	15.420	416			
% Unemployed	Between Groups	0.002	2	0.001	0.437	0.646
	Within Groups	0.890	421	0.002		
	Total	0.892	423			
Change in % Unemployed	Between Groups	0.005	2	0.002	0.925	0.397
	Within Groups	1.097	420	0.003		
	Total	1.102	422			
% College Graduates	Between Groups	0.030	2	0.015	1.579	0.207
	Within Groups	4.003	422	0.009		
	Total	4.033	424			
Change in % College Graduates	Between Groups	0.003	2	0.001	0.356	0.701
	Within Groups	1.490	421	0.004		
	Total	1.493	423			

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

Table 21. ANOVA Results of Housing Characteristics by Groups Defined Using Homeownership Rate Change 2010-2015 (n=453).

		Sum of Squares	df	Mean Square	F	Sig.
% Houses Mortgaged	Between Groups	0.095	2	0.047	3.736	**0.025**
	Within Groups	5.315	420	0.013		
	Total	5.409	422			
Vacancy Rate	Between Groups	0.560	2	0.280	3.302	**0.038**
	Within Groups	35.006	413	0.085		
	Total	35.566	415			
% Vacant Other	Between Groups	0.224	2	0.112	8.487	**0.000**
	Within Groups	5.574	422	0.013		
	Total	5.798	424			
Housing Value	Between Groups	10044184064	2	5022092032	1.212	0.299
	Within Groups	1711445718147	413	4143936364		
	Total	1721489902212	415			
% Change in Housing Value	Between Groups	0.093	2	0.046	1.444	0.237
	Within Groups	13.290	413	0.032		
	Total	13.383	415			
Average Year Built	Between Groups	108.422	2	54.211	0.382	0.682
	Within Groups	59821.517	422	141.757		
	Total	59929.939	424			

Source: National Historic Geographic Information System
Bold indicates significance at p=.10

Discriminant analysis was used to quantify the differences between the three groups of rural cities and boroughs. In discriminant analysis, variables that have statistically significant differences between groups are identified in the test of equality at group means (Table 22). The following variables are considered statistically different between the groups: percent of the population between 18 and 35 years old, change in percent of the population between 18 and 35 years old, and percent change in income These differences reflect variation in the current characteristics of these cities and boroughs, and changing demographic trends.

Table 22. Discriminant Analysis Results, Test of Equality at Group Means. Rural Cities and Boroughs (n=425).

	Wilks' Lamda	F	Sig
% Change in Population	0.996	0.699	0.498
% Hispanic	0.998	0.251	0.778
Change in % Hispanic	1.000	0.067	0.935
% White	1.000	0.026	0.974
Change in % White	1.000	0.077	0.926
% 18-35	0.975	4.268	0.015
Change in % 18-35	0.962	6.473	0.002
% 65+	0.990	1.620	0.199
Change in %65+	0.993	1.246	0.289
Income	0.998	0.315	0.730
% Change in Income	0.985	2.537	0.081
% Unemployed	0.995	0.805	0.448
Change in % Unemployed	0.992	1.273	0.281
% college graduates	0.989	1.805	0.166
Change in % College Graduates	0.995	0.831	0.436
% Houses Mortgaged	1.000	0.023	0.978
Vacancy Rate	0.994	1.077	0.342
% Vacant Other	1.000	0.010	0.990
Housing Value	0.994	0.957	0.385
% Change in Housing Value	1.000	0.032	0.969
Average Year Built	0.997	0.439	0.645

Source: National Historic Geographic Information System

The three groups of cities and boroughs were treated as equal probability in terms of classification by the discriminant analysis. Rather than trying to maximize the percent of municipalities correctly classified,

the model attempted to predict all three groups well rather than prioritizing the significantly larger group of cities and boroughs with stable homeownership rates. Over half of all municipalities were correctly classified by the discriminant analysis (Table 23). The increasing homeownership rates group was the poorest in terms of correctly predicting group membership based on independent variables.

The structure matrix details the canonical correlations, which reflect the strength and direction of the relationship between each variable and the discriminant function (Table 24). Canonical correlation coefficients greater than .250 indicate at least a weak relationship between the factor and the variable. Function 1 is related to decreases in the percent of the population 18 to 35, higher number of college graduates, and lower vacancy rates. Function 2 is related to larger portions of the population 18 to 35, positive changes in income, lower portions of the population 65 years old and over, decreases in the percent unemployed, decreases in the 65 years old and over population, and lower housing values (Table 24).

Table 23. Discriminant Analysis Results, Predicted Group Membership, Rural Cities and Boroughs (n=425)

			Predicted Group Membership			
			Declining	Stable	Increasing	Total
Original	#	Declining	21	10	7	38
		Stable	96	195	62	353
		Increasing	10	11	13	34
	%	Declining	55.3	26.3	18.4	100.0
		Stable	27.2	55.2	17.6	100.0
		Increasing	29.4	32.4	38.2	100.0

**53.9% of original grouped cases correctly classified.*

The functions at group centroids help to distinguish the groups from each other. Discriminant analysis is most effective when there are larger differences between groups. Table 25 indicates that function 1 distinguishes between areas experiencing increasing homeownership rates from other cities and boroughs. Function 2 mostly distinguishes the stable homeownership cities and boroughs from the others, although there is some differentiation between the declining homeownership group and the increasing

homeownership group. The areas that experienced declining homeownership rates between 2010 and 2015 are negatively related to function 1, and positively related to function 2.

Table 24. Discriminant Analysis Results, Structure Matrix, Rural Cities and Boroughs (n=425)

	Function	
	1	2
Change in % 18-35	**-0.554**	**0.352**
% College Graduates	**0.296**	-0.177
Vacancy Rate	**-0.252**	0.026
% Change in Population	-0.189	0.097
% Hispanic	0.118	0.042
Change in % White	0.068	-0.005
% Change in Housing Value	0.036	-0.031
% White	-0.031	-0.031
% Vacant Other	0.023	0.011
% 18-35	0.033	**0.634**
% Change in Income	0.228	**0.397**
% 65+	0.041	**-0.388**
Change in % Unemployed	0.123	**-0.31**
Change in %65+	0.129	**-0.302**
Housing Value	-0.054	**-0.293**
Change in % College Graduates	0.124	0.233
% Unemployed	0.142	-0.21
Average Year Built	-0.018	-0.203
Income	-0.048	-0.162
Change in % Hispanic	0.013	0.078
% Houses Mortgaged	-0.024	0.035

Source: National Historic Geographic Information System

This suggests that areas with declining homeownership rates are likely to have larger portions of the population 18 to 35 years old and increasing, lower percentages of college graduates, lower portions of the population 65 years old and over and decreasing in size, greater vacancy rates, increases in income, and decreasing unemployment rates (Table 24). The areas that experienced increasing homeownership rates between 2010 and 2015 were positively related to functions 1 and 2. This suggests that areas with increasing homeownership rates were likely to have a larger portion of the population 18 to 35 years old but decreasing in size, higher percentages of college graduates, lower portions of the population 65 years

old and over and decreasing, lower vacancy rates, increases in income, and decreasing unemployment rates (Tables 24 and 25).

Table 25. Discriminant Analysis Results, Functions at Group Centroids, Rural Cities and Boroughs (n=425)

	Function	
	1	2
Declining	-0.594	0.771
Stable	-0.030	-0.097
Increasing	1.088	0.445

How are homeownership rates and rate changes spatially distributed?

The researcher created maps that represent homeownership rates in 2000, 2010, and 2015, and changes in homeownership rates from 2000 to 2010, 2010 to 2015 and 2000 to 2015 (Figures 3-8). The change over time was measured as a change in the homeownership rate. Homeownership rates in 2000 were mapped according to quintile and then time-series maps were created using a common legend to make comparisons over time easier. The legend, color and values, for 2000 were also used for 2010 and 2015.

There was not an absolute spatial or regional distribution of homeownership across Pennsylvania. The highest homeownership rates were located in the northern half of the state and in central Pennsylvania (Figures 3-5). However, municipalities with homeownership rates in the lowest and highest quintiles were spread across the state. While much of the state experienced a decline in homeownership rates between 2000 to 2010, as well as 2000 to 2015, there were municipalities with stable or increasing homeownership rates (Figures 6-8). Many of these municipalities are rural and located in the northern parts of Pennsylvania. There were more municipalities with increases in homeownership rates between 2010 and 2015, and those municipalities were found across the state (Figure 7).

Figure 3. Homeownership in Pennsylvania. 2000

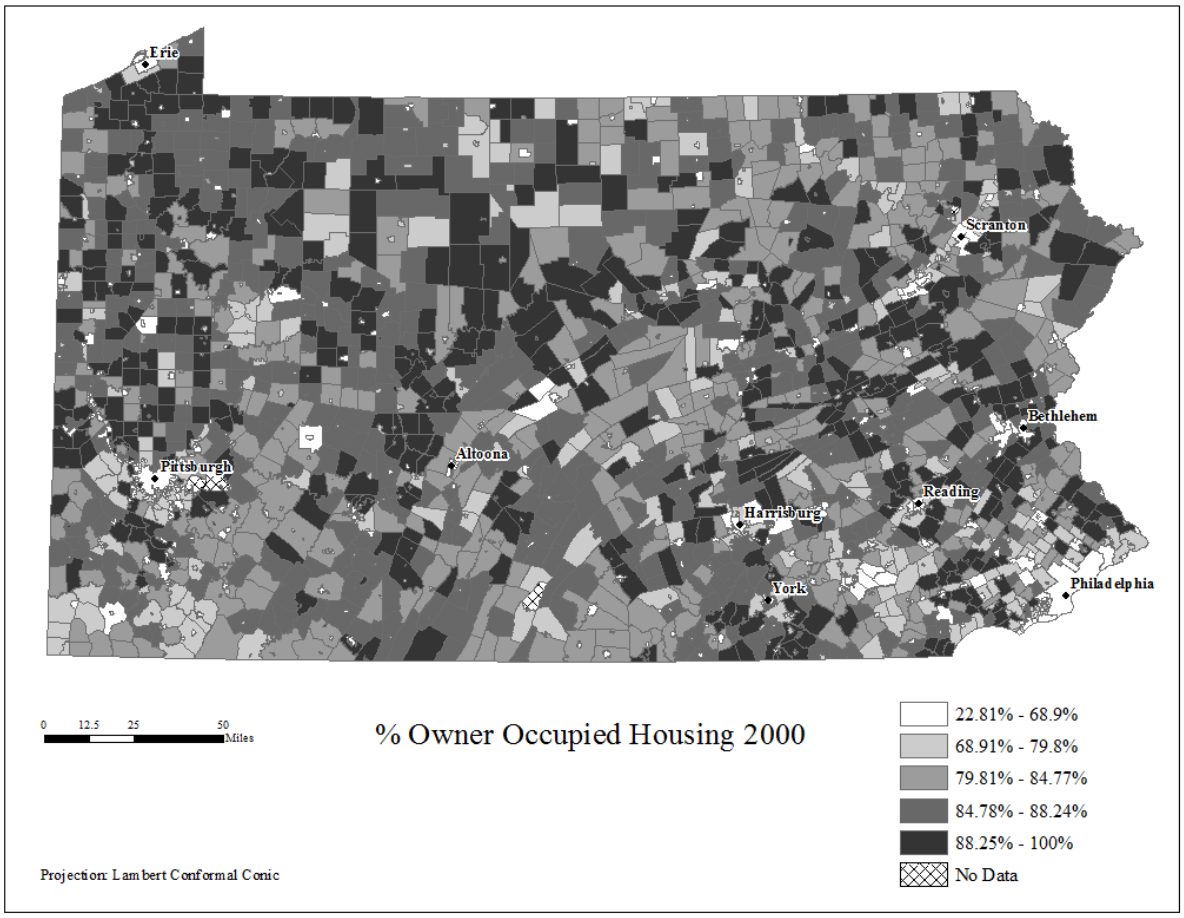


Figure 4. Homeownership in Pennsylvania, 2010

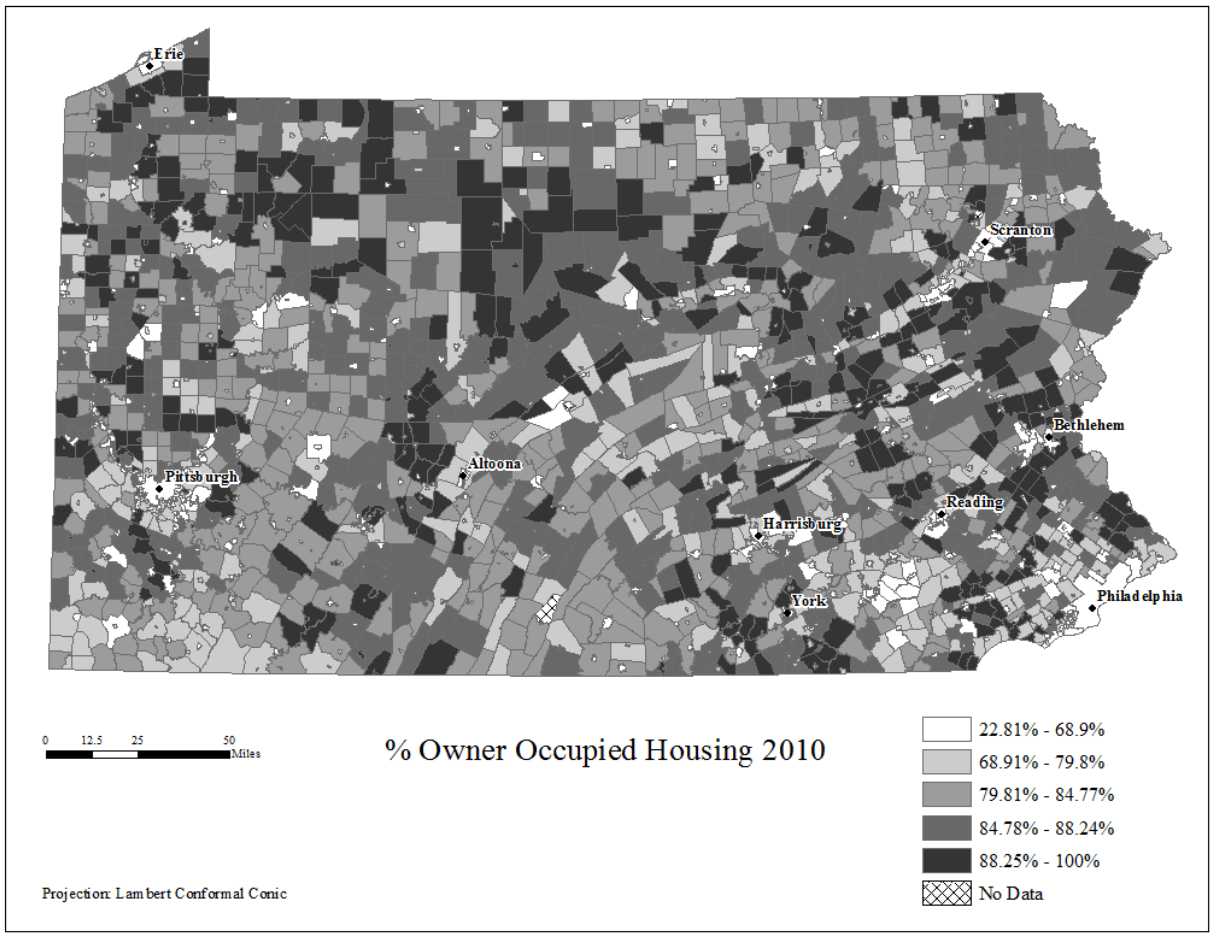


Figure 5. Homeownership in Pennsylvania, 2015

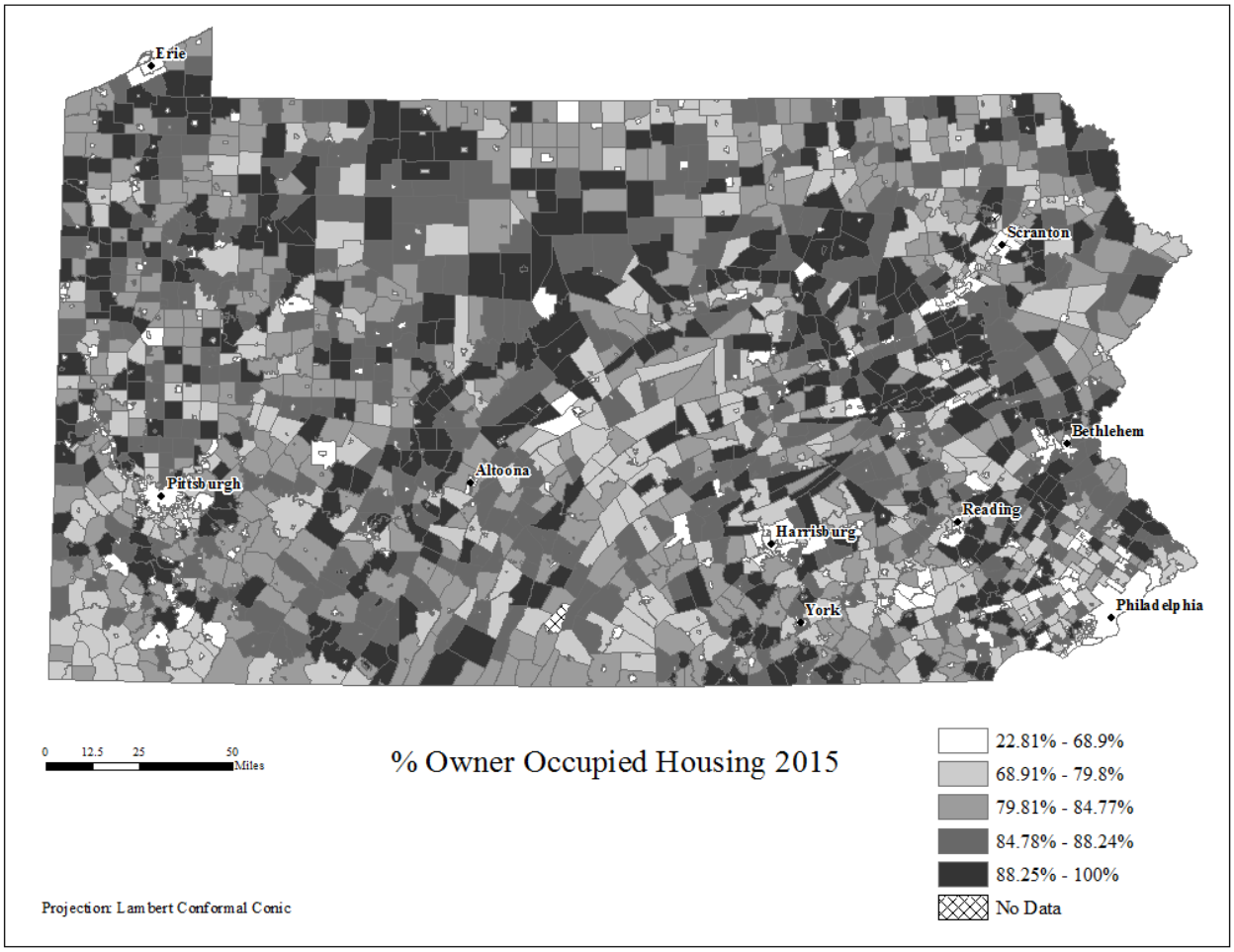


Figure 6. Changes in Homeownership in Pennsylvania, 2000-2010

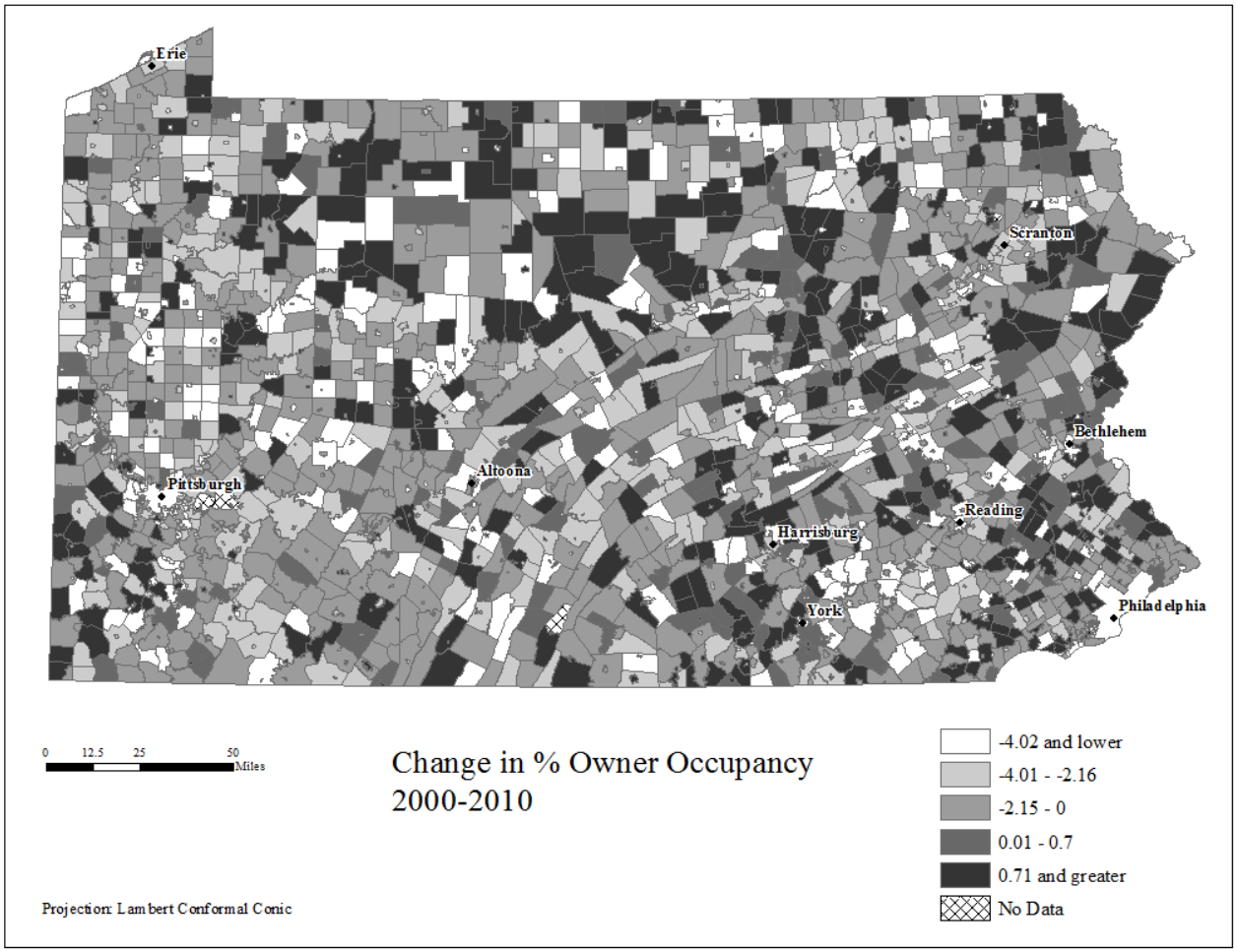


Figure 7. Changes in Homeownership in Pennsylvania, 2010-2015

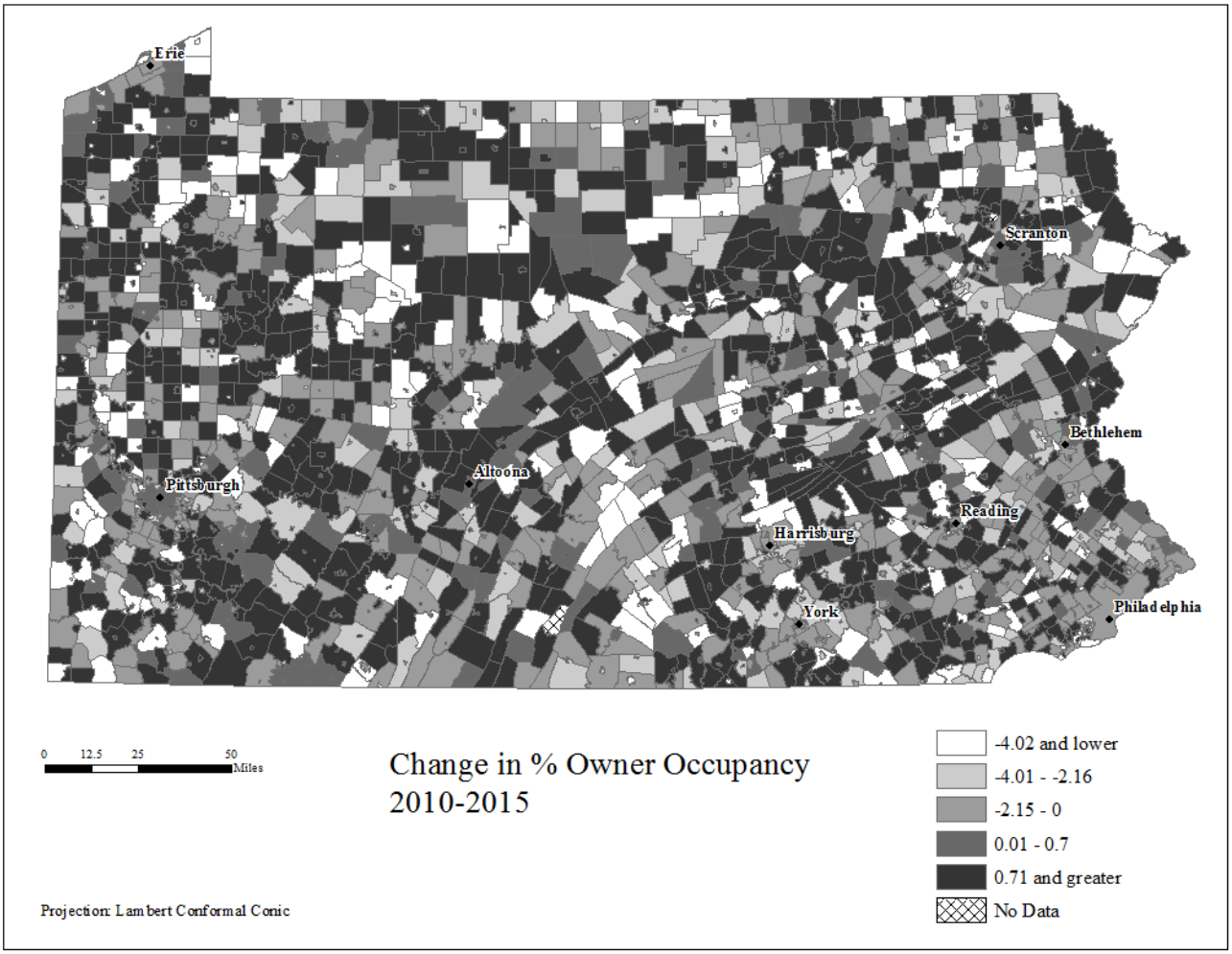
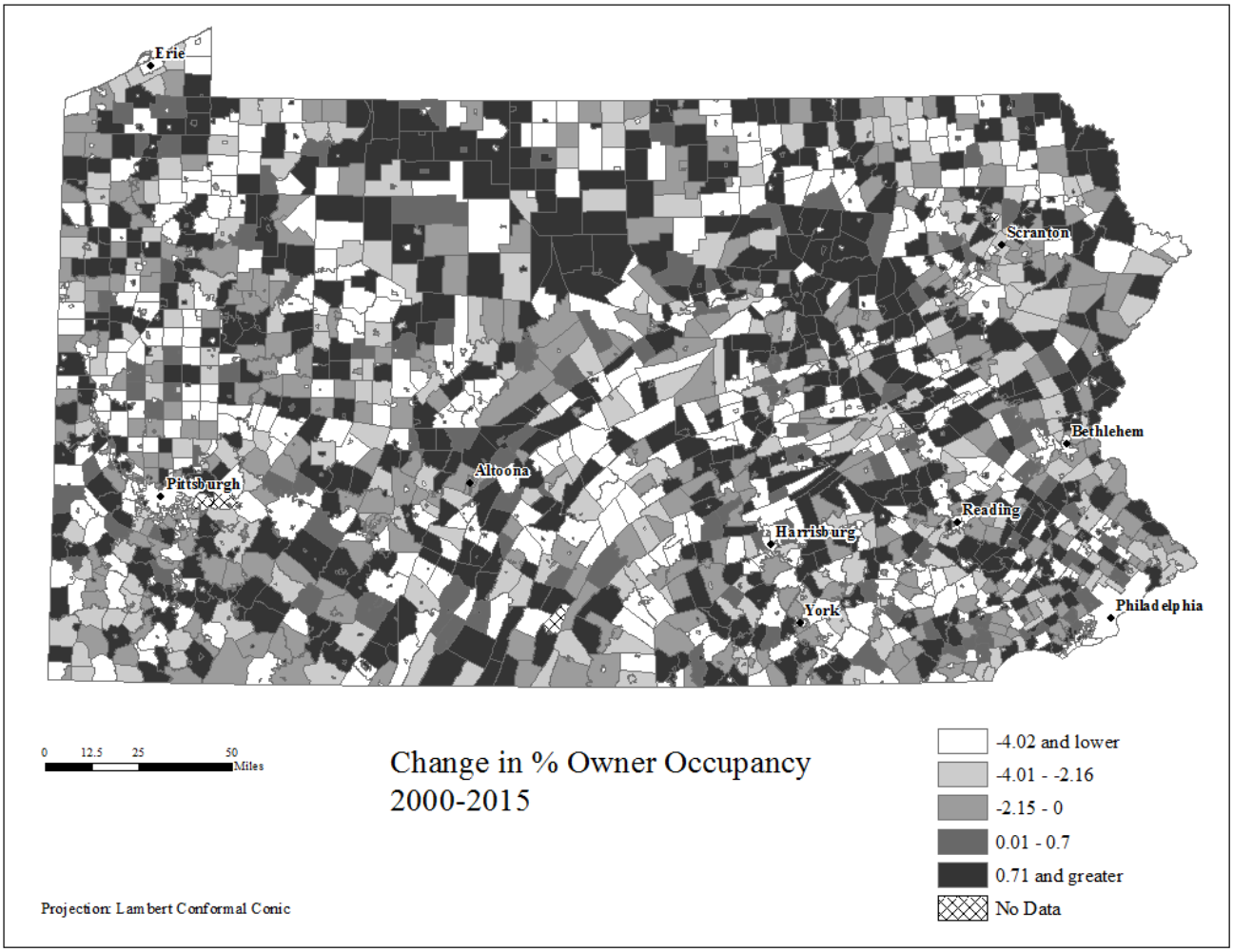


Figure 8. Changes in Homeownership in Pennsylvania, 2000-2015



Conclusions

The research found that, overall, Pennsylvania municipalities, as a whole, experienced a decline of about 2 percentage points in homeownership rates, and an increase of about 1 percent in the number of homeownership units from 2000 to 2015.

Rural Pennsylvania municipalities experienced a decrease of about 1 percentage point in homeownership rates, and an increase of about 3 percent in homeownership units during the same time period.

Rural cities and boroughs experienced a decrease of about 2 percentage points in homeownership rates and a decrease of almost 6 percent in the number of homeownership units, compared to a decrease of about 1 percentage point in homeownership rates and an increase of about 4 percent in the number of homeownership units in rural townships.

The research indicated that rural townships have higher homeownership rates than rural cities and boroughs, and that rural cities and boroughs have higher rates than their urban counterparts.

Regression models were more effective at explaining the homeownership rates in rural municipalities in 2010 and 2015, but performed somewhat poorly at explaining homeownership changes between 2000 to 2010, and 2010 to 2015. The percent of the population age 18 to 35 years old, income, the percent change in income, and housing value variables were significant in all four regression models. Since there were differences between the regression models, the research could not pinpoint why there are differences in homeownership rates and changes in these rates over time.

Although the statistical results do support work in previous research that examines differences in homeownership, it appears that homeownership in rural Pennsylvania is not easily explained by demographic and socioeconomic resident characteristics. This research did not find a significant

relationship between race and ethnicity of a municipality and homeownership rates, but this likely reflects low levels of heterogeneity or variation across rural Pennsylvania.

Multiple projection models were considered to estimate 2020 homeownership rates. Linear, exponential, logarithmic, polynomial and power models all yielded similar estimates for changes in homeownership rates as well as the number of homeowner units in 2020. These models predict that the rate of homeownership decline may slow in rural cities and boroughs.

Rural small cities and boroughs were classified into groups based on similar changes in homeownership between 2010 and 2015 to better understand the current characteristics and the possible relationship to homeownership changes. The groups were defined based on the average and standard deviation of change in homeownership from 2010 to 2015. Most rural cities and boroughs were classified as having stable homeownership rates. The declining homeownership group and increasing homeownership group were each comprised of 35 rural cities and boroughs. The tests used to find the differences in demographic, socioeconomic and housing variables between these three groups found that the following variables differed across the three groups of rural cities and boroughs: the percent change in population, change in the percent of the population 18 to 35 years old, change in the percent of the population 65 years old and over, the percent change in income, the percent of houses mortgaged, vacancy rates, and the percent of vacant other housing.

Discriminant analysis modeled two functions, or dimensions, to explain the assigned group of rural cities and boroughs. The model correctly predicted group membership of a little over half of all rural cities and boroughs. These results suggest that cities and boroughs with declining homeownership rates were likely to have larger portions of the population who are 18 to 35 years old and increasing, lower percentages of college graduates, lower portions of the population who were 65 years old and over and decreasing in size, greater vacancy rates, increases in income, and decreasing unemployment rates. Cities and boroughs

with increasing homeownership were likely to have larger portions of the population who were 18 to 35 years old but decreasing in size, higher percentages of college graduates, lower portions of the population who were 65 years old and over and decreasing, lower vacancy rates, increases in income, and decreasing unemployment rates.

The research supports a complex relationship between homeownership and possible explanatory demographic, socioeconomic and housing variables in rural Pennsylvania. The experiences of rural municipalities vary from their urban counterparts. Rural cities and boroughs do not have the same characteristics as rural townships– nor are they experiencing the same type of changes. Maps of homeownership rates across Pennsylvania indicated that, while there are some likely differences across the state, there were no clear or absolute regional variations. This suggests that while regional characteristics do likely influence homeownership rates, there are still shared characteristics and experiences within rural municipalities, and with the same type of municipalities. The presented statistical models varied between weak and moderately strong. There was not a singular, defining, and consistent predictor of homeownership rates or changes.

Rural areas, particularly related to housing issues, tend to be less understood and under-researched, making it more difficult to provide context or insight based on previous research and findings. The Great Recession and related foreclosure crisis led to changes in homeownership not previously seen before, although this experience could likely be described as part of the cyclical nature of housing markets. Research has sought to quantify and better understand the extent and causes of these changes, but was most often focused on urban areas or smaller geographic areas. Policy responses across multiple government levels have been slow or inadequate in responding to these changes in housing.

It is essential that researchers and government agencies continue to investigate and better understand these recent changes in homeownership, especially in the context of rural areas. Government efforts to

stabilize or improve homeownership rates could focus on existing homeowners or on attracting first-time homeowners. Efforts could focus on assisting or preserving existing homeowners most likely to be negatively affected by changes in economic or housing conditions, such as senior citizens and low-and-moderate income homeowners. Mortgage refinancing options may assist in maintaining housing affordability and reducing possible foreclosure risks. First-time homeownership may be encouraged or supported through programs such as down payment assistance, Individual Development Accounts (IDAs), direct subsidies, and low-cost loan options. Increased rental housing options may be useful in providing stability in housing markets and encourage households to transition to homeowners when financially able.

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The Center for Rural Pennsylvania
625 Forster St., Room 902
Harrisburg, PA 17120
Phone: (717) 787-9555
www.rural.palegislature.us
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