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Homeownership Adjustments By Occupation After The Collapse Of The Housing Bubble

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HOMEOWNERSHIP ADJUSTMENTS BY OCCUPATION AFTER THE COLLAPSE OF THE
HOUSING BUBBLE

By

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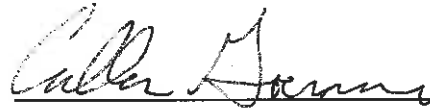
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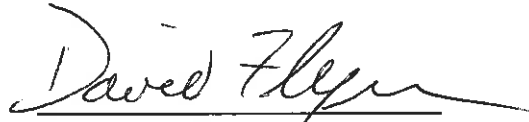
This thesis, submitted by James D. Gunning in partial fulfillment of the requirements for the Degree of Master of Science Applied Economics from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Dr. Wayne Swisher
Dean of the Graduate School

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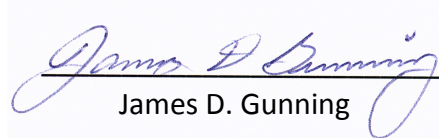
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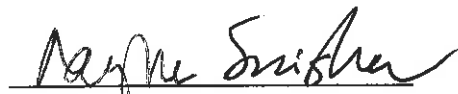In presenting this thesis in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised my thesis work or, in his absence, by the chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this thesis or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my thesis.

James D. Gunning

May 2, 2016
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ABSTRACT

Housing is a foundational element in both the American economy and society.

The housing bubble and collapse that occurred in the mid to late 2000's due to reduced

credit standards was a substantial shock to the institution of American homeownership.

To observe how different segments of the population were impacted as traditional

lending standards were reestablished, a review of homeownership by occupation is

examined over a ten-year period beginning just prior to the collapse in 2005. By

examining the changes in homeownership probability between the occupations, a

comparison can be made on how the different occupations responded to the collapse

and the return of traditional lending standards. The results of the analysis revealed that

occupations that have higher employment tenure rates and occupations that are

connected to the community tended to retain higher probabilities for homeownership

even after the collapse. Low wage occupations with high employment mobility

displayed the largest decreases in homeownership probability.

CHAPTER I

INTRODUCTION

Homeownership is a foundational element in American society and has

historically acted as a wealth builder for millions of Americans. Additionally, research

has shown that social capital associated with homeownership has strengthened our

communities, reinforced positive behaviors in our children and promoted higher school

attainment (DiPasquale and Glaeser, 1999; Green and White, 1997). The housing

bubble and collapse that occurred in the mid to late 2000's was a substantial external

shock to the institution of American homeownership. Questions concerning the shocks'

long-term impact on homeownership are still outstanding. The focus of this paper is to

better understand how the shock has impacted homeownership in different

occupations since occupations combine a unique combination of socioeconomic factors.

The social capital associated with homeownership is equally if not more

significant than the economic aspects. DiPasquale and Glaeser (1999) define social

capital with respect to homeownership as a connection to others that enables them to

benefit from their neighbors' local community investment or to cooperate with their

neighbors to improve local public goods. They show that homeownership increases

investment in this social capital and strengthens community ties. Additionally, the

increased community awareness leads to increased voter turnout in local elections and

higher awareness of elected officials.

There are not only local community benefits associated with homeownership but

also strong implications for children's behavioral and educational development. Green

and White (1997) show that children coming from homeownership households are

more likely to stay in school and attain a higher level of education (Aaronson, 1999).

They also display positive behaviors when compared to children from non-

homeownership households (Grinstein-Weiss, 2012).

Because of the many community benefits noted above, President George W.

Bush's White House reaffirmed in 2001 that increasing homeownership had been

longstanding national policy even though the homeownership rate had reached an all-

time high of 68%. At the time of this policy initiative, the country was midway into a

ten-year expansion of homeownership that would culminate in the housing bubble

bursting in 2006. This "irrational exuberance" (Shiller, 2008) that permeated both the

public and private sectors created an illusion of easy ownership and unlimited price

appreciation. The severity of the bubble is partially revealed by the extended and

steady decline in homeownership from near an all-time high of 68.9% in 2005 to 64.5%

in 2014 (Census, 2014). The extent of the socioeconomic damage caused by the housing

collapse is the subject of ongoing research.

Research on the financial aspects of the housing collapse have been examined

repeatedly and are well documented attributing the housing bubble to increased "price

expectations easing the default concerns of lenders and thus increasing their willingness

to extend loans to risky borrowers (Brueckner, Calem and Nakmura, 2012). This accelerated as the bubble developed and "helped fuel the boom in house prices between 2003 and 2007 while the boom in house prices supported the credit expansion" (Barakova, Calem and Wachter, 2014).

However, it's important to note that the housing bubble was created by the artificial and temporary reductions in lending standards described above and not because of a structural shift in the economy. This shift though likely benefited sectors that previously could not get loans. As these excesses were wrung out of the market, one would expect to see a reshifting appear in homeownership within occupations due to both the social and financial variances associated with the labor force. One-way to breakout these differences in the workforce are through the use of occupations.

By using the changes in homeownership probability from 2005 to 2014 for 22 different occupational groups, it's possible to examine how the different occupational groups responded. This analysis revealed differences beginning to appear between the occupational groups in the 35 - 44 age group and carrying through the remaining age groups. This age-delayed appearance of a divergence between the occupational groups was not unexpected since homeownership increases with employment tenure (Kim, 2014) and employment tenure correlates with age. This supports the hypothesis examined in this analysis that occupations with either low incomes or high mobility that were seduced into homeownership during the housing boom will show greater decreases in the probability of homeownership when compared to traditional higher income or lower mobility occupations.

The following results sustain the aforementioned hypothesis that occupations with longer occupational tenure rates do have better performing homeownership probabilities after the housing collapse when compared to occupations with lower occupational tenure rates. Additionally, occupations exhibiting strong community or job ties (Kronenberg and Carree, 2012) are also shown to have performed better after the housing collapse. These occupations characteristically have better employment longevity and are often associated with strong client bases in the community or are based on public sector employment.

CHAPTER II

OCCUPATION AND JOB MOBILITY INTERPLAY

Most of the research concerning residential tenure and employment mobility

has focused on the individual level (Boehm, 1981; Ioannides, 1996; Kan, 2002) using the

Panel Study of Income Dynamics (PSID) and has shown that there is a significant

negative effect of expected employment mobility on housing tenure choice. Ozyildirim,

Onder and Yavas (2005) and Fisher and Gervais (2011) both pursued life-cycle models

and acknowledged mobility as a possible contributor to the tenure decision. In a break

from probabilistic and life cycle approaches, Kim (2014) used aggregate data with a

simultaneous equations model approach to highlight the significant influence of job

turnovers on residential relocation processes.

Boehm (1981) was one of the first to recognize the relationship between housing

tenure choice and expected employment mobility. By modeling the simultaneous

decision of tenure choice with an expectation to move, a joint logit probability equation

was derived to estimate the housing tenure choice. This was combined with a vector of

socioeconomic variables that were considered to have influence on the tenure choice.

PSID was used as a data source and the results of the study strongly confirmed that

expected mobility influences the tenure decision. Boehm's research using PSID data

substantiated the proposition that job stability influences tenure choice at the individual

level.

Ozyildirim et al., (2005) pursued an alternative approach to the probability model for tenure choice and expected mobility. They offered the first dynamic life-cycle model using a genetic algorithm to derive "the optimal tenure choice strategy from the discrete choice problem of forward looking individuals." Their forward-looking solution correlates very well with the empirical data from the PSID datasets. Interestingly, they remark that one extension to their model would be to correlate mobility rate with the current ownership status and to incorporate length of stay in current residence.

Fisher and Gervais (2011) also used a life cycle model but focused instead on evaluating idiosyncratic earnings risk with respect to the tenure decision versus a life cycle optimization of the homeownership transaction. Their research indicated that the declining marriage rate mechanically lowers homeownership. Together, marriage and rising earnings risk accounted for a large part of the decline in homeownership rates in their model. In reviewing other possible explanations, they acknowledge that a decline in homeownership could be attributed to frequent moves; however, they discount this because the Census data for the period 1980-2000 showed little change.

Kim (2014) pursued an aggregate regional analysis based on residential mobility from the American Community Survey (ACS) and job-to-job flows from the Longitudinal Employer-Household Dynamics (LEHD) program with results indicating "that residential and job mobility rates are tightly connected and thus need to be managed with consideration of their interplay" (p. 2876).

Explanatory variables used by most of the above studies but specifically Boehm (1981), Kan (2002) and Ozyildirim et al., (2005) all incorporate very similar aspects. Each

study accounts for the following demographic characteristics: education, race,

marriage, family size, age, some degree of occupation and various income indicators.

Additionally, each study also accounts for employment mobility and household tenure.

However, differences exist with incorporating macro factors like unemployment or

housing affordability as well as additional household demographics.

CHAPTER III

DATA AND MODEL SPECIFICS

Data for homeownership and occupation was obtained using the American

Community Survey (ACS) Uniform Extract from the Center for Economic and Policy

Research (CEPR) and pooling the years 2005 and 2014 into a combined sample with

1,908,338 million observations. This is a change from the typical practice of using the

Panel Study of Income Dynamics (PSID). The PSID survey is focused on the individual

and family versus the following analysis that focuses on occupations with respect to

homeownership across time. Therefore, the ACS survey provided the opportunity to

obtain a broader and more comprehensive snapshot of occupations with respect to

homeownership across a period of time by using pooled cross sections. The ACS survey

itself was not fully implemented until 2005, but that corresponded well with the period

just before the housing collapse and made it possible to examine how occupational

homeownership had shifted from just prior to the collapse to a period of stabilization

ten years later in 2014.

The purpose in implementing the ACS in 2005 was to shorten the information

gap between the decennial census and assist with funding and policies for a wide variety

of federal programs. The ACS includes household data on the demographic, social, and

economic characteristics of the U.S. population and the physical and financial

characteristics of the nation's housing. The survey samples independent household

addresses for each of the 3,143 counties and county equivalents in the U.S., including the District of Columbia. It is comprised of continuous monthly independent samples. Each year from 2005–2010, the ACS selected approximately 2.9 million household addresses in the U.S. for interviews and in June 2011 they increased the sample size to 3.54 million addresses per year. In 2014, 2,322,722 actual final interviews were completed compared to 1,924,527 for 2005.

Since the ACS survey is based on households, the decision was made to extract occupations from the ACS data and retain only the observation for the household member with the highest paying occupation under the assumption that the dominant household income was a controlling factor in household decisions on renting versus buying. Additional data like homeownership, occupation, race, education level, age and marital status for the retained household member were also extracted along with the number of children under the age of 18 living in the household.

Although observations were only retained for the dominant occupation as explained earlier, total household income associated with the retained observations were used in the logistic regression since total household income factors into the household's decision to rent or own. Because the ACS survey is ongoing on a month-to-month basis and surveyed incomes for the year are separated by as much as twelve months, the ACS publishes an income adjustment factor to adjust total household income to a common calendar year baseline for the survey year. This baseline adjusted total household income for 2005 was then inflation adjusted to 2014 using the CPT-U-RS factors for 2005 and 2014. This income data was then winsorized (Campbell, Hilscher, &

Szilagyi, 2008) to account for extreme outliers. Winsorization was needed to allow the maximum likelihood estimation to converge. It replaces the outlying 5% of values with either the 95th percentile value for those values greater than the 95th percentile or the 5th percentile value for those less than the 5th percentile.

Two-digit Standard Occupational Classification (SOC) codes from the Bureau of Labor Statistics (BLS) are used to segment the ACS data into occupations used in the analysis. The SOC system is used by Federal statistical agencies to classify workers and jobs into occupational categories. It is designed to reflect the current occupational structure of the United States and classifies all occupations in which work is performed for pay or profit. The SOC is a tiered system with four levels ranging from major groups to detailed occupations. There are 23 major or two digit groups, broken into 97 minor or three-digit groups. Each minor group is broken into broad groups, of which there are 461. There are, at the most specified level, 840 detailed occupations. The ACS data used has 24 two-digit occupational groups. However, the "Other" category is a catchall category used by the survey. For the regressions used in the analysis "Other" and "Military" occupation codes were used in the probability regressions, but they are excluded from the analysis segment since "Other" is a catchall and the "Military" occupation is a unique and non-comparable occupation to civilian employment. The 2-digit SOC codes and their defined occupational groupings are listed in Table 1 below.

Table 1. 2 – Digit Standard Occupational Classification (BLS)

SOC	Occupation Title
11	Management Occupations
13	Business and Financial Operations Occupations
15	Computer and Mathematical Occupations
17	Architecture and Engineering Occupations
19	Life, Physical, and Social Science Occupations
21	Community and Social Service Occupations
23	Legal Occupations
25	Education, Training, and Library Occupations
27	Arts, Design, Entertainment, Sports, and Media Occupations
29	Healthcare Practitioners and Technical Occupations
31	Healthcare Support Occupations
33	Protective Service Occupations
35	Food Preparation and Serving Related Occupations
37	Building and Grounds Cleaning and Maintenance Occupations
39	Personal Care and Service Occupations
41	Sales and Related Occupations
43	Office and Administrative Support Occupations
45	Farming, Fishing, and Forestry Occupations
47	Construction and Extraction Occupations
49	Installation, Maintenance, and Repair Occupations
51	Production Occupations
53	Transportation and Material Moving Occupations

To investigate how the different occupations responded to the housing collapse, a logistic regression model is used to predict homeownership relative to occupations using a pooled cross section for the years 2005 and 2014 from the ACS survey.

The form of the binary logistic response model is:

$$P(y = 1|\boldsymbol{x}) = G(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k) = G(\beta_0 + \boldsymbol{x\beta})$$

Where G is a logistic function:

$$G(\beta_0 + \boldsymbol{x\beta}) = \exp(\beta_0 + \boldsymbol{x\beta}) / [1 + (\beta_0 + \boldsymbol{x\beta})]$$

taking on the values:

$$0 < G(\beta_0 + \boldsymbol{x\beta}) < 1$$

The resulting logistic specification used to evaluate occupational homeownership

probability is:

$$\text{Pr(ownership} = 1|\text{income, year, married, race, age, education, children, occupation)}$$

The variables used in the specification above in addition to occupation were

selected to control for confounding effects between the occupational groups and

homeownership. They were derived using previous research specifications from the

references noted above and economic theory. Control variables included household

income, marital status, race, age groups, education and number of children in the

household. Household income is a dominant factor in qualifying for a home loan and

varies significantly across occupations. Marriage and education are both factors that

have proven to be significantly associated with homeownership in previous studies by

Robst, Dietz and McGoldrick (1999) and Fisher and Gervais (2011) with education having

a likely confounding effect on occupations. Race is controlled for due to unobserved

biases and different socioeconomic factors that may exist between occupations as well

as homeownership. Historically, homeownership has always increased with age parallel

to how occupations are established over time. The logic behind the number of children

in the household is based on the tradeoff between the increased need for more room

that is normally afforded by single-family homes and the budget constraints imposed by

additional children. Table 2 below list the variables described above and are comprised

of both categorical and continuous variables. Income and number of children are both

continuous while the remaining variables are categorical. The base categories for the

categorical variables are annotated in Table 2 below. The summary statistics for the

variables used in the specification are listed in Table 8 of the Appendix for the years

2005 and 2014. The homeownership rate has dropped by 0.05 in accordance with the

decline in homeownership over the period. The remaining demographic characteristics

are nearly the same from period to period. The same is true for the occupational

employment distribution between the two periods.

Table 2. Variable Definitions

Variable Names	Definition
Homeownership	Non-homeowner (base) = 0, Homeowner = 1
Real Household Income	Thousands of 2014 dollars winsorized at 5%
Survey Year	2005 (base) and 2014
Marital Status	Unmarried (base) = 0, Married = 1
Race	White (base) = 1, Black = 2, Hispanic = 3, Other = 4
Age Groups	18-24 (base), 25-34, 35-44, 45-54, 55-64, 65+
Education Level	Less than HS (base), HS, Some College, College or Advanced
Number of Children	Number of children under 18 years of age in the household

The results for the logistic regression described above using the pooled sample

are listed in Appendix Table 6. The model produced a McFadden pseudo R2 equal to

0.229. This falls between McFadden's own stated range of 0.2 to 0.4 representing an

excellent fit (McFadden, 1977). Based on this criteria, the model performs well in

predicting homeownership using the variables described above. Additionally, since the

ACS is a geographical cluster sample and errors for individuals in the same region may

be correlated, clustered standard errors were computed using the 50 U.S. States and the

District of Columbia as clusters (Cameron and Miller, 2014). This same concern also

exists for correlation of the same region across two time periods and is accounted for by

using clustered standard errors.

Table 6 appearing in the Appendix reports the logistic regression estimates. The

coefficient for household income is 0.0146 and is statistically significant at 1% indicating

that higher income increases the probability of homeownership. Number of children

under the age of 18 in the household has a coefficient of 0.0378 and is statistically

significant at 1% meaning that more children also increases the probability of

homeownership. The 2014 survey year dummy has a value of -0.3054 and is statistically

significant at 1% signifying that homeownership probability has decreased from the

base year of 2005. The coefficients for each of the age groups in the age group category

are relative to the base age group of 18-24 years and increase from 0.5803 for age

group 25-34, 1.2432 for age group 35-44, 1.7647 for age group 45-54, 2.2206 for age

group 55-64 and 2.5893 for age group 65+. They're all statistically significant at 1%.

Therefore, the probability of homeownership for each of the age groups is not only

higher than the base group but also increases with age. The estimate of the marriage

coefficient is 0.8023 and statistically significant at 1% revealing the positive effect

marriage has on the probability of homeownership. The race category levels are all

relative to the base White level and statistically significant at 1%. The coefficients range

from -0.6043 for Hispanic, -0.6744 for Other and -0.7704 for Black indicating a decrease

in the probability of homeownership for non-Whites compared to Whites. Less than a

high school education is the base level for the education category with the coefficient

for a high school education equal to 0.3408, some college equal to 0.3371 and college or

advanced equal to 0.2648. They are all statistically significant at 1% and have similar

increases in homeownership probability compared to the base level.

The base level in the logistic regression for the occupation's category is

management. There are seven occupations with positive coefficients relative to the

base level that are statistically significant at 1% with coefficients varying from 0.0814 to

0.2310 and one coefficient at 0.0608 that is statistically significant at 5%. This group of

occupations has higher probabilities of homeownership than the base management

group. There are 13 occupations that have negative coefficients relative to the base

management level and statistically significant at the 1% level indicating a lower

probability of homeownership when compared to the base level. Only two occupations

were not statistically significant when compared to the base management level.

The marginal effects (MFX) results for the control variables are listed in Table 3

below for review. The marginal effects in the table represent percentage point changes

in the probability of homeownership given a unit increase in a continuous variable and a

level change in a categorical variable. Since income is in thousands of real dollars, then

a $10,000 increase in household income equates to a 2.6 percentage point increase in

the probability of homeownership at the household income mean of 78,268 dollars. It's

statistically significant at 1%. This same interpretation can also be used for number of

children in the household. One additional child equates to a 0.66 percentage point

increase in the probability of homeownership at the mean of 1.3 children per household

and is statistically significant at 1%.

The remaining control variable marginal effects coefficients are all relative to a

base level within their categories. For example, in 2014 the probability of owning a

home decreases by 5.3 percentage points as compared to 2005 and is statistically

significant at 1%. In the race category, the levels are relative to the base White

category. If you are Black, then the probability of owning a home drops by 14.9

percentage points compared to being White and is statistically significant at 1%. For

Hispanics, the probability drops by 11.2 percentage points and is statistically significant

at 1% while for "Other" it drops by 12.8 percentage points. "Other" is also statistically

significant at 1%. In the age groups category, we can see that the 25-34 age group has a

14.4 percentage point increase in probability over the base age group of 18-14 and is

statistically significant at 1%. The 35-44 age group has a 29.5 percentage point increase

in probability over the base group and is statistically significant at 1%. The 45-54 age

group has an increase in probability of 38.9 percentage points over the base group and

is statistically significant at 1%. The 55-64 age group has an increase of 45 percentage

points and is statistically significant at 1% with the 65+ age group showing an increase of

48.6 percentage points and significant at 1%. The results for the age group category

show that not only are the age group levels statistically different than the base age

group, but that the probability of homeownership increases with age. Marriage also

influences the probability of homeownership with a 14.5 percentage point increase in

probability and it's statistically significant at 1%. The base for the education category is

set at "less than a high school education" and the increase in the probability of

homeownership over the base for a high school education is 6.3 percentage points and

statistically significant at 1%. The increase in probability with some college is 6.3

percentage points and it's statistically significant at 1%. Having college or an advance

degree equates to a 5 percentage point increase in probability that is statistically

significant at 1%. Education is interesting in that if you have a high school education or

above the probability of owning a home controlling for occupation versus someone with

less than a high school education is approximately the same.

Table 3. Control Variable Marginal Effects using Pooled
2005 and 2014 Sample

		MFX	Clustered Std. Err.	P>|z|
Household Income		0.0026	0.0000	< .001
No. Children < 18		0.0066	0.0009	< .001
Survey Year				
	2014	-0.0533	0.0042	< .001
Age Groups				
	25-34	0.1440	0.0085	< .001
	35-44	0.2951	0.0077	< .001
	45-54	0.3886	0.0060	< .001
	55-64	0.4495	0.0069	< .001
	65+	0.4858	0.0087	< .001
Married		0.1445	0.0059	< .001
Race				
	Black	-0.1489	0.0143	< .001
	Hispanic	-0.1124	0.0282	< .001
	Other	-0.1275	0.0186	< .001
Education Level				
	High School	0.0632	0.0084	< .001
	Some College	0.0625	0.0085	< .001
	College	0.0500	0.0069	< .001

These control variables all align with the expected effects on homeownership probability. Higher income, marriage, increasing age and the number of children in the household all increase the probability of homeownership while race follows the expected pattern with nonwhites having lower homeownership probabilities when compared to whites. Interestingly, even though increased education improves the probability of homeownership, the results indicate that education beyond high school does not appear to significantly increase the probability of homeownership over a high school education. Although this study used education levels versus years of education, the results correlate with Robst, Dietz and McGoldrick (1999) who show similar results at the break between less than high school and high school and beyond. Fisher and Gervais (2011) also show a slight decrease in homeownership probability for advanced education that likely explains the slight drop in probability observed for the college and advanced level. All these effects agree with previous research concerning demographics and homeownership (Robst, et al., 1999).

Unlike the within category marginal effects for the control variables over the pooled sample, the occupational marginal effects were looked at for each occupation between the year 2005 and 2014. The equation describing the occupational marginal effects is annotated below where $\bar{x}$ is equal to the means of the control variables from the pooled regression, i refers to the individual SOC codes, j refers to the six individual age groupings and yr is equal to the survey year.

$$MFX_{ij} = P(H|x = \bar{x}, yr = 2014, SOC = i, age = j) -$$

$$P(H|x = \bar{x}, yr = 2005, SOC = i, age = j)$$

Using the above equation, the marginal effect for an occupation is simply the difference between the probability of homeownership in 2005 and the probability of homeownership in 2014 by age group. The full tables listing all six age groups are available in Table 7 of the Appendix. However, the 35-44 age group was extracted and is listed below in Table 4 for discussion and easy reference.

Table 4. Marginal Effects by Occupation between 2005 and 2014 (Ages 35-44)

SOC Occupation Titles	SOC	MFX	Clustered Std. Err.	P>|z|
Management Occupations	11	-0.062	0.0050	< .001
Business and Financial Operations Occupations	13	-0.059	0.0048	< .001
Computer and Mathematical Occupations	15	-0.065	0.0053	< .001
Architecture and Engineering Occupations	17	-0.058	0.0054	< .001
Life, Physical, and Social Science Occupations	19	-0.067	0.0052	< .001
Community and Social Service Occupations	21	-0.068	0.0047	< .001
Legal Occupations	23	-0.066	0.0046	< .001
Education, Training, and Library Occupations	25	-0.058	0.0044	< .001
Arts, Design, Entertainment, Sports, and Media Occupations	27	-0.070	0.0049	< .001
Healthcare Practitioners and Technical Occupations	29	-0.059	0.0046	< .001
Healthcare Support Occupations	31	-0.068	0.0045	< .001
Protective Service Occupations	33	-0.059	0.0044	< .001
Food Preparation and Serving Related Occupations	35	-0.072	0.0052	< .001
Building and Grounds Cleaning and Maintenance Occupations	37	-0.068	0.0052	< .001
Personal Care and Service Occupations	39	-0.066	0.0047	< .001
Sales and Related Occupations	41	-0.063	0.0049	< .001
Office and Administrative Support Occupations	43	-0.062	0.0048	< .001
Farming, Fishing, and Forestry Occupations	45	-0.066	0.0063	< .001
Construction and Extraction Occupations	47	-0.060	0.0054	< .001
Installation, Maintenance, and Repair Occupations	49	-0.055	0.0050	< .001
Production Occupations	51	-0.057	0.0050	< .001
Transportation and Material Moving Occupations	53	-0.063	0.0050	< .001
	Min Value	-0.072		
	Max Value	-0.055		
	% Diff	30.358		

It's immediately apparent that all the marginal effects for occupations are negative and highly significant from 2005 to 2014. The fact that they're all negative is

expected when you recall that homeownership has declined steadily from 68.9% in 2005 to 64.5% in 2014 (Census, 2014). Additionally, the difference between the marginal effects for the occupations allows us to compare which occupations have experienced the greater impact as a result of the housing collapse. To assist in evaluating this change across the age groups, the difference between the marginal effects for the occupations is quantified by calculating the percentage difference from the smallest and largest marginal effect for the occupations within an age group. In Table 7 of the Appendix, it can be seen that the percentage difference in marginal effects between occupations increases with age group beginning with age group 35-44.

The percentage difference between occupations varies from a low of 6.5% for age group 25-34 to a high of 72.1% for the 65+ age group. Age groups 18-24 and 25-34 have the two smallest percentage changes between occupational marginal effects, but starting with age group 35-44 and on, the percentage difference between the marginal effects becomes more pronounced and steadily increases. It's this separation that allows us to view how the different occupations have responded to the housing collapse since 2005 and is the focus of the following discussion.

CHAPTER IV

DISCUSSION

Given the observable divergence in the marginal effects between occupations

beginning with the 35-44 age group, there is an expectation that occupations displaying

higher employment tenures and community attachments should fare better than

occupations with lower tenures and little community attachments. This is based on past

studies indicating higher homeownership is often associated with these stabilizing

characteristics; therefore, these types of occupations would likely show less of a decline

in the probability of homeownership. The opposite is that those occupations that have

higher mobility, lower wages and little community attachments will have suffered more

significant declines in the probability of homeownership. It's these occupations that

may have been seduced into the easy homeownership afforded by the bubble

regardless of the life cycle fit and after the bubble burst began returning to more

traditional expectations.

Examining the first two age groups in Table 7 of the Appendix, you'll note that

the negative marginal effects across all the occupations indicates that the probability of

homeownership has generally decreased by around 7.2 percentage points, but that

there is very little variation in the marginal effects across the occupations. This would

indicate that the impact of the housing collapse on these age groups was similar across

all the occupations. This similarity across occupations is likely due to the fact that for

these age groups all the occupations share a high degree of employment uncertainty. Chen and Rosenthal (2008) note that "between ages 20 to 35, regardless of marital status, highly-educated households tend to move to places with high quality business environments" and for the less educated employee, Connolly and Gottschalk (2006) "observe that less educated workers may invest less in human capital and consequently have less to lose by changing jobs." Because of the employment uncertainty across all the occupations for these age groups, the low variation in marginal effects across occupations seems plausible.

In the next age group of 35 - 44 year olds, a significant separation in the marginal effects between the occupations begins to emerge and continues to expand with the older age groups. Although the older age groups display significant movement across the occupations, the occupational patterns are very similar. For this reason, the remaining analysis focuses on the 35-44 age group since they are very likely established in an occupation and are targets for homeownership. As such, they represent an ideal group to review with respect to how different occupations responded to the housing collapse.

In an effort to provide a framework for examining the occupational groups in the 35-44 age group, two groups were created using the average of the marginal effects as a break between groups. This creates an arbitrary but useful grouping of occupations with one that had better than the average declines in homeownership probability and one with worse than average declines in homeownership probability. These groupings provide a convenient means for comparing occupational traits and homeownership.

Table 5 below list these occupations according to these groupings and includes the median occupational tenure for the year 2014 and the annual mean wage for the year 2015. It's immediately apparent that the occupations with less than average declines also have significantly higher median occupational tenures than the group with greater than average declines in probability. This association will be more thoroughly discussed moving forward.

Table 5. Above and Below Average Changes in Homeownership Probability Ages 35-44

Less than Average Decline in Homeownership Probability (35-44)

	SOC	MFX	Median Occ Tenure (2014)	Annual Mean Wage (2015)
Management Occupations	11	-0.062	6.9	$115,020
Business and Financial Operations Occupations	13	-0.059	5.0	$73,800
Architecture and Engineering Occupations	17	-0.058	6.4	$82,980
Education, Training, and Library Occupations	25	-0.058	6.2	$53,000
Healthcare Practitioners and Technical Occupations	29	-0.059	5.2	$77,800
Protective Service Occupations	33	-0.059	6.5	$44,610
Office and Administrative Support Occupations	43	-0.062	4.6	$36,330
Construction and Extraction Occupations	47	-0.060	3.2	$26,360
Installation, Maintenance, and Repair Occupations	49	-0.055	5.4	$45,990
Production Occupations	51	-0.057	5.2	$36,220

Greater than Average Decline in Homeownership Probability (35-44)

	SOC	MFX	Median Occ Tenure (2014)	Annual Mean Wage (2015)
Computer and Mathematical Occupations	15	-0.065	5.0	$86,170
Life, Physical, and Social Science Occupations	19	-0.067	5.0	$71,220
Community and Social Service Occupations	21	-0.068	5.0	$46,160
Legal Occupations	23	-0.066	5.4	$103,460
Arts, Design, Entertainment, Sports, and Media Occupations	27	-0.070	3.4	$56,980
Healthcare Support Occupations	31	-0.068	3.5	$29,520
Food Preparation and Serving Related Occupations	35	-0.072	2.2	$22,850
Building and Grounds Cleaning and Maintenance Occupations	37	-0.068	4.3	$27,080
Personal Care and Service Occupations	39	-0.066	2.9	$25,650
Sales and Related Occupations	41	-0.063	3.4	$39,320
Farming, Fishing, and Forestry Occupations	45	-0.066	3.2	$26,360
Transportation and Material Moving Occupations	53	-0.063	3.8	$35,160

Looking at occupations that have greater than average marginal effects declines in homeownership probability, we notice that 8 of the 12 are below the BLS annual mean wage for all occupations in 2015 of $48,320 and are also all on the low side for median occupational tenure. This corresponds with the finding by Munasinghe and Sigman (2004) that low wages are associated with high job mobility implying higher earnings risk.   Fisher and Gervais (2011) found that high earnings risk resulted in lower homeownership. The traits of these eight occupations correspond closely with previous findings. Also, as was mentioned earlier, these types of low income occupations were targets for reduced lending standards (Barakova, et.al., 2014) artificially increasing homeownership rates. The above results show that these low income occupations have had an expected higher than average marginal effects reduction in the probability of homeownership since the housing collapse.

The remaining four occupations in the greater than average marginal effects declines group have higher than average incomes, but like their eight counterparts in the group they have lower occupational tenure rates than the less than average marginal effects declines group. The low job tenures exhibited by the greater than average declines in marginal effects group implies higher job mobility and more employment uncertainty. Kan (2002) found that homeownership is more unlikely if there is uncertainty about future job locations. Again, the low job tenure rates are closely associated with a greater than average marginal effects decline in homeownership probability after the housing collapse.

Looking at the occupations that have lower than average marginal effects

declines in homeownership probability we see that 8 of the 10 occupations all have higher occupational tenure rates than the greater than average marginal effects group. In this case, higher job tenure appears to be associated with stronger homeownership and lower marginal effects declines in the probability of homeownership after the housing collapse. This result agrees with Kim's (2014) finding that homeownership increase with job tenure.

Although this group has high job tenures, five of the occupations are below the annual mean wage for all occupations of $48,320. A quick look at a couple of these occupations helps provide a better background for understanding why they faired better during the housing collapse even though they had incomes below the national average.

Protective Service (33) occupations are comprised mostly of public sector employment equating to police and fire. These occupations have very high tenure rates when compared to the other occupations even though their wages are less than the BLS annual mean. This agrees with Kronenberg and Carree's (2012) observation that the impact of one's salary in the public sector on the likelihood of relocation is smaller than for employees in the private sector.

Installation, Maintenance, and Repair (49) and Production (51) occupations are related when it comes to job tenure since tenure for these occupations often equates to seniority and better wages. This means the option of relocating is often associated with a reduction in seniority and benefits. The strength of these job related ties is a significant factor in changing jobs (Kronenberg and Carree, 2012) and; therefore, acts to

strengthen homeownership (Boehm, 1991).

By observation, like the aforementioned occupations, it would appear that several of the occupations with lower than average marginal effects declines appear to have sub-occupations with strong employment links to the community such as a local healthcare practice, tenured teacher or local certified public accountant. The association between strong community ties and a lower than average decline in homeownership probability coincide with Boehm's (1991) finding that increased neighborhood ties and job stability increase residential tenure.

The above discussion highlighted the strong association between occupational tenure and homeownership probability. Comparing the BLS 2014 median tenure rates to the occupational marginal effects reveals a 0.62 correlation between them. This illustrates that occupational tenure is closely linked with homeownership probability and agrees with Kim's (2014) finding that job mobility has a significant influence on residential mobility. Additionally, a brief review of how community aspects associated with certain occupations provides support for homeownership. Occupations that exhibited strong employment tenure and community connections resulted in were less impacted by the housing collapse than those with higher employment mobility and low community affiliations.

CHAPTER V

CONCLUSION

The investigation revealed that many of the occupations with lower incomes and higher job mobility have had steeper declines in homeownership probability than occupations with higher incomes and more stable job tenures. Even occupations with higher incomes but subject to high job mobility suffered steeper declines in homeownership probabilities. The indications are that easy credit and quickly appreciating home values during the bubble appear to have seduced not only buyers who were financially questionable but also buyers with appropriate financial resources who were facing uncertain job tenures. As the market returned to more normal lending standards and less frenzied price fluctuations, both occupational types have reduced their probabilities of homeownership more quickly than occupations with higher occupational tenures.

Although the relationships discussed above are comparable to previous research results, it's necessary to identify possible limitations in the analysis. The ability to buy a home for most homebuyers depends on qualifying for a mortgage. The mortgage qualification process accounts for not only income but also debt to income ratios. Unfortunately, the ACS data set does not contain the detailed debt data needed to include this as part of the specification. Therefore, the occupational results may be

subject to omitted variable bias and may overestimate the effects since debt is likely negatively correlated with stable occupations.

Even so, the above examination and prior research have demonstrated that employment tenure and low wages are linked and they play a significant role in homeownership. Policies that assist with improving either should result in stronger homeownership. Assuming a broad restructuring of welfare programs could be achieved, a fresh look at the concept of a negative income tax may be appropriate. A negative income tax would provide unbiased and uniform income support across the social spectrum as compared to the disparate social programs that currently exist. It could also eliminate much of the wage turmoil that exists for employers with lower wage employees; hopefully, resulting in improved employment tenure. Stabilizing lower wage employees and strengthening employment tenure would provide stable homeownership opportunities for a broader segment of the population resulting in increased social and economic benefits for communities.

Table 6. Homeownership Logistic Regression for Pooled (2005 and 2014) Sample

Standard Occupation Classification Titles	Variables	Coef.	Clustered Std. Err.	P>|z|
	Household Income	0.0146	0.0006	< .001
	No. Children < 18	0.0378	0.0045	< .001
	Survey Year Dummy			
	2014	-0.3054	0.0228	< .001
	Age Groups			
	25-34	0.5803	0.0343	< .001
	35-44	1.2432	0.0440	< .001
	45-54	1.7647	0.0437	< .001
	55-64	2.2206	0.0462	< .001
	65+	2.5893	0.0530	< .001
	Married	0.8023	0.0211	< .001
	Race			
	Black	-0.7704	0.0656	< .001
	Hispanic	-0.6043	0.1309	< .001
	Other	-0.6744	0.0819	< .001
	Education Level			
	High School	0.3408	0.0324	< .001
	Some College	0.3371	0.0344	< .001
	College	0.2648	0.0290	< .001
Standard Occupation Classification Titles	SOC Codes			
Business and Financial Operations Occupations	13	0.0814	0.0148	< .001
Computer and Mathematical Occupations	15	-0.1453	0.0218	< .001
Architecture and Engineering Occupations	17	0.1352	0.0355	< .001
Life, Physical, and Social Science Occupations	19	-0.2076	0.0304	< .001
Community and Social Service Occupations	21	-0.2510	0.0468	< .001
Legal Occupations	23	-0.1652	0.0372	< .001
Education, Training, and Library Occupations	25	0.1155	0.0214	< .001
Arts, Design, Entertainment, Sports, and Media Occupations	27	-0.3551	0.0822	< .001
Healthcare Practitioners and Technical Occupations	29	0.1086	0.0307	< .001
Healthcare Support Occupations	31	-0.2665	0.0578	< .001
Protective Service Occupations	33	0.1065	0.0271	< .001
Food Preparation and Serving Related Occupations	35	-0.4549	0.0198	< .001
Building and Grounds Cleaning and Maintenance Occupations	37	-0.2490	0.0254	< .001
Personal Care and Service Occupations	39	-0.1727	0.0327	< .001
Sales and Related Occupations	41	-0.0684	0.0133	< .001
Office and Administrative Support Occupations	43	0.0025	0.0140	0.858
Farming, Fishing, and Forestry Occupations	45	-0.1901	0.0594	0.001
Construction and Extraction Occupations	47	0.0608	0.0302	0.044
Installation, Maintenance, and Repair Occupations	49	0.2310	0.0221	< .001
Production Occupations	51	0.1610	0.0206	< .001
Transportation and Material Moving Occupations	53	-0.0389	0.0258	0.131
Military	55	-1.0887	0.0873	< .001
Other	99	-0.5098	0.0409	< .001
	Constant	-1.907	0.0459	< .001

Pseudo R2 = 0.2297

Obs. = 1,908,338

Std. Errors Adjusted for 51 Clusters for States and D.C.

Table 7. Marginal Effects between 2005 and 2014 by Occupation using a Pooled Sample

SOC Occupation Titles	SOC	Age Grp (18 - 24)			Age Grp (25- 34)			Age Grp (35- 44)		
		MFX	Clustered Std. Err.	P>|z|	MFX	Clustered Std. Err.	P>|z|	MFX	Clustered Std. Err.	P>|z|
Management Occupations	11	-0.074	0.0057	<.001	-0.075	0.0055	<.001	-0.062	0.0050	<.001
Business and Financial Operations Occupations	13	-0.075	0.0058	<.001	-0.074	0.0053	<.001	-0.059	0.0048	<.001
Computer and Mathematical Occupations	15	-0.073	0.0056	<.001	-0.076	0.0056	<.001	-0.065	0.0053	<.001
Architecture and Engineering Occupations	17	-0.076	0.0055	<.001	-0.073	0.0057	<.001	-0.058	0.0054	<.001
Life, Physical, and Social Science Occupations	19	-0.071	0.0055	<.001	-0.076	0.0056	<.001	-0.067	0.0052	<.001
Community and Social Service Occupations	21	-0.071	0.0057	<.001	-0.076	0.0056	<.001	-0.068	0.0047	<.001
Legal Occupations	23	-0.072	0.0062	<.001	-0.076	0.0055	<.001	-0.066	0.0046	<.001
Education, Training, and Library Occupations	25	-0.076	0.0058	<.001	-0.073	0.0052	<.001	-0.058	0.0044	<.001
Arts, Design, Entertainment, Sports, and Media Occupations	27	-0.069	0.0070	<.001	-0.076	0.0059	<.001	-0.070	0.0049	<.001
Healthcare Practitioners and Technical Occupations	29	-0.075	0.0057	<.001	-0.073	0.0054	<.001	-0.059	0.0046	<.001
Healthcare Support Occupations	31	-0.070	0.0063	<.001	-0.076	0.0056	<.001	-0.068	0.0045	<.001
Protective Service Occupations	33	-0.075	0.0057	<.001	-0.073	0.0053	<.001	-0.059	0.0044	<.001
Food Preparation and Serving Related Occupations	35	-0.066	0.0055	<.001	-0.076	0.0058	<.001	-0.072	0.0052	<.001
Building and Grounds Cleaning and Maintenance Occupations	37	-0.071	0.0056	<.001	-0.076	0.0056	<.001	-0.068	0.0052	<.001
Personal Care and Service Occupations	39	-0.072	0.0061	<.001	-0.076	0.0055	<.001	-0.066	0.0047	<.001
Sales and Related Occupations	41	-0.074	0.0057	<.001	-0.075	0.0055	<.001	-0.063	0.0049	<.001
Office and Administrative Support Occupations	43	-0.075	0.0058	<.001	-0.075	0.0054	<.001	-0.062	0.0048	<.001
Farming, Fishing, and Forestry Occupations	45	-0.072	0.0052	<.001	-0.076	0.0057	<.001	-0.066	0.0063	<.001
Construction and Extraction Occupations	47	-0.075	0.0055	<.001	-0.074	0.0057	<.001	-0.060	0.0054	<.001
Installation, Maintenance, and Repair Occupations	49	-0.076	0.0056	<.001	-0.072	0.0055	<.001	-0.055	0.0050	<.001
Production Occupations	51	-0.076	0.0056	<.001	-0.073	0.0055	<.001	-0.057	0.0050	<.001
Transportation and Material Moving Occupations	53	-0.074	0.0056	<.001	-0.075	0.0055	<.001	-0.063	0.0050	<.001
	Min Value	-0.076	Min Value		-0.076	Min Value		-0.072	Min Value	
	Max Value	-0.066	Max Value		-0.072	Max Value		-0.055	Max Value	
	% Diff	14.859	% Diff		6.535	% Diff		30.358	% Diff	

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Table 7 Continued. Marginal Effects between 2005 and 2014 by Occupation using a Pooled Sample

SOC Occupation Titles	SOC Code	Age Grp (45 - 54)			Age Grp (55-64)			Age Grp (65+)		
		MFX	Clustered Std. Err.	P>|z|	MFX	Clustered Std. Err.	P>|z|	MFX	Clustered Std. Err.	P>|z|
Management Occupations	11	-0.047	0.0041	<.001	-0.034	0.0031	<.001	-0.026	0.0022	<.001
Business and Financial Operations Occupations	13	-0.044	0.0039	<.001	-0.032	0.0028	<.001	-0.024	0.0020	<.001
Computer and Mathematical Occupations	15	-0.051	0.0046	<.001	-0.038	0.0035	<.001	-0.029	0.0026	<.001
Architecture and Engineering Occupations	17	-0.043	0.0044	<.001	-0.031	0.0032	<.001	-0.023	0.0022	<.001
Life, Physical, and Social Science Occupations	19	-0.053	0.0044	<.001	-0.040	0.0033	<.001	-0.030	0.0024	<.001
Community and Social Service Occupations	21	-0.054	0.0037	<.001	-0.041	0.0026	<.001	-0.031	0.0017	<.001
Legal Occupations	23	-0.052	0.0039	<.001	-0.039	0.0030	<.001	-0.029	0.0023	<.001
Education, Training, and Library Occupations	25	-0.043	0.0035	<.001	-0.031	0.0025	<.001	-0.023	0.0017	<.001
Arts, Design, Entertainment, Sports, and Media Occupations	27	-0.057	0.0048	<.001	-0.044	0.0044	<.001	-0.034	0.0037	<.001
Healthcare Practitioners and Technical Occupations	29	-0.044	0.0036	<.001	-0.031	0.0025	<.001	-0.023	0.0017	<.001
Healthcare Support Occupations	31	-0.054	0.0037	<.001	-0.041	0.0029	<.001	-0.032	0.0023	<.001
Protective Service Occupations	33	-0.044	0.0034	<.001	-0.032	0.0024	<.001	-0.023	0.0017	<.001
Food Preparation and Serving Related Occupations	35	-0.060	0.0046	<.001	-0.047	0.0036	<.001	-0.036	0.0027	<.001
Building and Grounds Cleaning and Maintenance Occupations	37	-0.054	0.0045	<.001	-0.041	0.0034	<.001	-0.031	0.0025	<.001
Personal Care and Service Occupations	39	-0.052	0.0041	<.001	-0.039	0.0032	<.001	-0.029	0.0024	<.001
Sales and Related Occupations	41	-0.049	0.0040	<.001	-0.036	0.0029	<.001	-0.027	0.0021	<.001
Office and Administrative Support Occupations	43	-0.047	0.0039	<.001	-0.034	0.0029	<.001	-0.026	0.0021	<.001
Farming, Fishing, and Forestry Occupations	45	-0.052	0.0059	<.001	-0.039	0.0047	<.001	-0.030	0.0036	<.001
Construction and Extraction Occupations	47	-0.045	0.0045	<.001	-0.033	0.0033	<.001	-0.024	0.0023	<.001
Installation, Maintenance, and Repair Occupations	49	-0.040	0.0039	<.001	-0.029	0.0028	<.001	-0.021	0.0019	<.001
Production Occupations	51	-0.042	0.0040	<.001	-0.030	0.0028	<.001	-0.022	0.0020	<.001
Transportation and Material Moving Occupations	53	-0.048	0.0040	<.001	-0.035	0.0029	<.001	-0.026	0.0021	<.001
	Min Value	-0.060	Min Value		-0.047	Min Value		-0.036	Min Value	
	Max Value	-0.040	Max Value		-0.029	Max Value		-0.021	Max Value	
	% Diff	49.058	% Diff		62.971	% Diff		72.055	% Diff	

Table 8. Summary Statistics

Variable	2005 Mean	2005 Std. Dev.	2014 Mean	2014 Std. Dev.
Homeownership	0.74	0.44	0.69	0.46
Real Household Income (1000's)	79.09	48.11	77.46	48.67
Children under age 18 in household	1.38	2.11	1.23	2.05
Age Groups				
18-24	0.05	0.22	0.04	0.20
25-34	0.17	0.38	0.17	0.37
35-44	0.24	0.43	0.20	0.40
45-54	0.26	0.44	0.23	0.42
55-64	0.18	0.39	0.23	0.42
65+	0.09	0.29	0.13	0.34
Married	0.59	0.49	0.56	0.50
Race				
White	0.76	0.43	0.72	0.45
Black	0.09	0.29	0.10	0.30
Hispanic	0.05	0.22	0.08	0.27
Other	0.09	0.29	0.10	0.30
Education				
Less than High School	0.10	0.30	0.08	0.27
High School	0.27	0.44	0.24	0.43
Some College	0.30	0.46	0.31	0.46
College or Advanced	0.33	0.47	0.37	0.48

Table 8 Continued. Summary Statistics

Standard Occupational Classifications	SOC Code	2005		2014	
		Mean	Std. Dev.	Mean	Std. Dev.
Management Occupations	11	0.12	0.33	0.13	0.34
Business and Financial Operations Occupations	13	0.05	0.21	0.06	0.23
Computer and Mathematical Occupations	15	0.03	0.16	0.03	0.18
Architecture and Engineering Occupations	17	0.03	0.16	0.02	0.16
Life, Physical, and Social Science Occupations	19	0.01	0.10	0.01	0.10
Community and Social Service Occupations	21	0.02	0.13	0.02	0.13
Legal Occupations	23	0.01	0.12	0.01	0.12
Education, Training, and Library Occupations	25	0.05	0.23	0.06	0.23
Arts, Design, Entertainment, Sports, and Media Occupations	27	0.02	0.13	0.02	0.14
Healthcare Practitioners and Technical Occupations	29	0.05	0.22	0.06	0.24
Healthcare Support Occupations	31	0.02	0.13	0.02	0.13
Protective Service Occupations	33	0.02	0.15	0.03	0.16
Food Preparation and Serving Related Occupations	35	0.03	0.16	0.03	0.17
Building and Grounds Cleaning and Maintenance Occupations	37	0.03	0.18	0.03	0.18
Personal Care and Service Occupations	39	0.02	0.14	0.02	0.15
Sales and Related Occupations	41	0.10	0.31	0.09	0.29
Office and Administrative Support Occupations	43	0.12	0.32	0.11	0.32
Farming, Fishing, and Forestry Occupations	45	0.01	0.09	0.01	0.09
Construction and Extraction Occupations	47	0.07	0.25	0.06	0.23
Installation, Maintenance, and Repair Occupations	49	0.04	0.21	0.04	0.19
Production Occupations	51	0.08	0.27	0.07	0.25
Transportation and Material Moving Occupations	53	0.07	0.25	0.07	0.25
Military	55	0.00	0.06	0.00	0.06
Other	99	0.00	0.03	0.00	0.04

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