iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** III **Month of publication:** March 2022

DOI: https://doi.org/10.22214/ijraset.2022.40106

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Econometric Analysis of the Determinants of Household Geographical Migration in the US

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I. INTRODUCTION

For several decades, the United States has witnessed a great rate of household mobility. Analysis of migration patterns by Brookings show that during the post-WWII period, the years 2008/2009 saw the lowest rate of mobility in the United States (Frey 2009). Data from Annual Social and Economic Supplement shows that 35.9 million Americans changed residence between the year 2012 and 2013 (Ihrke 2014). Taking into account the mobility rate of renters and homeowners, surveys demonstrate that renters are the most mobile compared to the homeowners. Similarly, findings from empirical studies shows all else fixed, home owners are 41.73 percent more likely to move compared to home-renters for the period 1993 to 2001 (Boehm and Schlottmann 2006).

Geographical mobility is an important factor in economics. In theory, migration occurs from areas with lower benefits to areas with higher benefits. Since mobility is costly, an individual will consider moving when the present value of benefits exceeds the present value of costs, both monetary and physic. In a recent survey by the U.S. Census Bureau, when asked about their reasons of moving, about 45 percent gave housing related reasons, 30 percent gave family related reasons, and 20 percent gave job related reasons (Ihrke 2014). With the current developments in communication and transportation technology, geographical mobility is expected to take several turns and shifts. Individuals and households will give diverse reasons on their decisions to change residence. This is because when transportation market is efficient and reliable there is increased access to opportunities. Technological advancement has a big influence on the everyday life of individuals. At the aggregate level, technological advancement in transportation industry reduces the cost of travelling to seek jobs, reduces congestion in residential areas and increases the geographical access in terms of opportunities available to movers (Green 2002; Cowan et al. 2012). This calls for a review of current literature to ascertain whether the determinants of mobility change over time or have remained constant. Using data from 2000, 2005 and 2010, this study examines whether the determinants of mobility have evolved over time. In particular, the focus is on the role played by location specific amenities and fiscal amenities, based on the current residence of the population. Specifically, separate regressions will be estimated for each year of data, and tests will be conducted to see if coefficients across models are statistically significantly different. This paper will also estimate regressions separately for those who move across states and those who move within states. By comparing the estimated coefficients from these models, it is possible to determine if the determinants of in-state moves are similar to the determinants of out-of-state moves.

Lastly, the study looks to explore the rate of mobility of women who are household heads. Mobility decisions of women has been tough to ascertain because of their role in the society as they are classified as secondary earners in the household. Women are traditionally tied movers and move because their husband's place of employment is changing. Therefore, by comparing female household heads to their male counterparts, we can see if the determinants of mobility are the same. If they are different, then that means that there remains gender differences concerning migration decisions.

Comparing the results from the three years (2000, 2005 and 2010), the findings show that most determinants of household mobility vary across the three time-periods, except Gender, education level, annual income and property crime rate. In the estimation for the difference in the determinants of interstate and intrastate mobility decisions, number of bedrooms, age of household head and property tax rate are statistically the same for intrastate and interstate migration. In the regressions for male and female household heads, the results show that the coefficients for the variables home ownership, Hispanic, Black, annual income and average temperatures are statistically the same. The coefficients for the variable property tax rate had unexpected sign all through the regression results.

The remaining part of this paper is planned as follows: Section 2 is the discussion of the existing literature for geographic mobility. In Section 3, the empirical model used for this study is outlined and analyzed. Data and results are outlined and discussed in Section 4 and lastly, Section 5 is the conclusion of the paper.

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II. LITERATURE REVIEW

Empirical analysis of household mobility has grown and evolved over time. Early studies focused on the industrialization in the 20th century that saw individuals move from the rural areas to the urban areas (White and Peter 1994). The study of mobility later shifted focus to household decisions to move with a view of maximizing utility from goods and services in a preferred destination as compared to their current location. Local housing conditions (like lack of air conditioning in houses for renters), increased income (that gives the ability to move into one's own house from a rented space or to rent a large space), changes in family size (leading to a desire for more or less space), good neighborhood (like low crime index areas) affect the decisions of households to relocate from one region to another (Ettema, Arentze and Timmermans 2011; Knapp, White and Clark 2001; Rabe and Taylor 2010).

Recent empirical studies on geographical mobility have been done on constrained mobility choices due to economic shocks. Linking their studies to the housing market crisis of 2007-2009, researchers argue that the decline in house values might have resulted in reduced mobility since housing prices across metro areas play a major role in mobility decisions. As moving involves acquiring a new home for home buyers, individuals were not able to sell off their homes and provide a down payment for new houses as they owed more than the actual value of their houses (Bucks and Bricker 2013; Chan, 2001; Ferreira, Gyourko and Tracy 2008; Zabel 2012).

Adverse economic shocks might cause involuntary mobility decisions by families. It was observed during the housing bubble that households changed their geographical location mainly as a result of foreclosure. In this period, households with negative home equity were less likely to move compared to those with positive home equity (Bucks and Bricker, 2013).

Economic shocks also motivated the study of labor and unemployment induced mobility. When local job opportunities are not forthcoming, job seekers expand their search by looking into other counties and states with the hope of getting employment. This type of mobility is higher among the less educated and less skilled individuals (Arntz, 2005). Goss and Schoening (1984) find high skilled individuals are less likely to move and get a job elsewhere, compared to the low skilled workers. This is because with higher education and specialization their skills are specific to certain industries and will stick to regions where their skills are most required. In their findings, search time is relevant when assessing unemployment migration decisions. As an individual spends more time looking for employment, they expand the search to other regions or move to other geographical locations. Zabel, (2012) echoing similar views argues that when individuals lose their jobs there is a likelihood that they will move to seek employment elsewhere. However, this depends with the occurrences in the housing market as those with negative equity in their homes will remain and seek employment in the same region.

Contrary to the findings and arguments above mobility decisions are affected by the occurrence in the housing and labor market. Molloy, Smith, and Wozniak (2011) argue that migration is not related to the household demographics, employment status and home ownership. Furthermore, negative home equity is not the main cause of house-lock, rather households base their mobility decisions on different factors such as family related reasons, need to attend college among others. In their conclusion, they state that though the housing bursts though affected households it had a meagre effect on their movement decisions. Though households may have different motives to change their geographical locations, studies focusing on real estate bubble period may not reflect the status of migration (Lee and Waddell, 2010).

Migration has also been argued to be of importance to the movers and the economy. It provides benefits and stability both to the individuals and housing and labor markets. Mobility helps in solving regional employment imbalance, when displaced workers move to where they can find employment. Additionally, as people move they create a vacancy chain and those who are looking for residential homes and houses can improve their house consumption in the process (Chan 2001; Van der Vlist, Gorter, Nijkamp and Rietveld 2002). In the most recent study on geographical mobility, Jolly (2015) focuses on the cost of job loss based on the migration status of individuals after layoffs. Based on his research findings he states that, for displaced workers, there is an incentive to move. This is because they experience less earning losses and less reduction in hours worked compared to immobile counterparts. However, this effect is short lived.

Other areas explored by a limited number of researchers include the role of fiscal, amenities and location specific variables, and the role of education to the distance moved in making migration decisions. Knapp et al. (2001) found that site characteristics such as police spending and sunshine influence the destination choice of households. Similarly, Rabe and Taylor (2010) argue that the odds of families moving out of a region is high when the crime rate rises.

Lastly, Wozniak (2009), and Ritsilä, and Ovaskainen (2001) in different research explore the role of education in relationship to mobility distance. They argue that the labor requirements of college graduates makes them more likely to migrate longer distances as compared to those without college education with the effect being higher when entering the labor market.

A common factor in the existing literature is that studies have covered various aspects of migration with the latest research focusing on particular pull and push factors of mobility and economic occurrences. While recent research has been important in broadening the literature and our understanding on the dynamics of household migration, they have focused on specific sets of variables such as fiscal factors, household characteristics, housing market behavior, location specific characteristics among others. In this paper, it is believed that as taste and preferences of household change over time, the drivers of mobility may change.

The above literature demonstrate that exhaustive research has been done on the determinants of household migration. The basis of this research is that consumers evolve over time and their taste and preferences change over time. This implies the drivers of geographical mobility may also change over time. In addition, the study seeks to explore the drivers of interstate and intrastate movements and to assess the mobility determinants of male and female household heads. This study adds to current literature of geographical mobility in the United States by using data sets for 2000, 2005 and 2010 to explicitly test to see if the determinants of mobility have changed over time.

III. METHODOLOGY AND DATA

A. Data

The main dataset used for this project is the American Community Survey (ACS). Data was gathered for the years 2000, 2005, and 2010 from the Integrated Public Use Microdata Series (IPUMS) database. The only variables not contained in the ACS are tax rate, crime rate, and average temperature. These variables were gathered from, Tax Foundation, Uniform Crime Reporting Statistics, and National Oceanic and Atmospheric Administration, respectively.

The data set was restricted to household heads currently in the labor force aged between 25 and 65 years old. According to the Census population reports (2014), individuals below 25 years mainly move because of reasons such as the parents relocating to another place or school related reasons for those attending college and a majority of them are not active in the labor force. While those above 65 years are mainly retiring from the labor, force and mostly change residence with the aim of moving to areas suitable for retirement. The resultant observations were 88,380 for the 2000 dataset, 678,317 for 2005 dataset and 709,998 for 2010 datasets. The 2000, 2005 and 2010 datasets are used to estimate determinants of mobility over time. The datasets for 2010 being the largest dataset is also used for interstate (640,221 observations) and intrastate (698, 509 observations) mobility and female (298,880 observations) and male (411,118 observations) mobility. Since the study involves the use of cross-sectional dataset, heteroscedasticity and multicollinearity may be the problems for the regression model. Additionally, the problem of autocorrelation is mainly a time series data set problem (Gujarati 2009). To correct for any presence of heteroscedasticity robust standard errors are used in the estimations. Summary statistics of the datasets are found in Table 1. The percentages of movers decreases from 13 percent in 2000, 12 percent in 2005 and 11 percent in 2010. Homeowners are more than the number of renters in the three data sets. The percentage of household heads who are male is 62 in 2000, 61 in 2005 and 58 in 2010, showing there are more household heads who are male compared to those who are female. More than half of household heads in the labor force have some college education with a mean age of slightly above forty.

The results for this study may be biased due to the measurement error in the data of the variables. This makes the coefficients of the independent variables to be biased and the results are equally biased. Measurement error in the dependent variables results to large standard errors and small t-statistics while measurement errors on the independent variables results to a smaller magnitude of the coefficients of the variables.

B. Methodology

The study of household mobility is based on the theory of utility maximization, where households are more likely to move to a place when the present value of benefits are greater than the present value of costs. From the literature, authors suggest that geographical mobility might be driven by job related factors (such as seeking better employment for those employed, looking for a job for the unemployed), housing related reasons (such as moving from a rented house to your own home), family related reasons (looking for a bigger space due to an increase in size of family), and seeking better neighborhoods (warm locations, safer neighborhoods). Therefore, when assessing the determinants of geographic mobility these factors are controlled for in this paper.

In this study, the aim is to explore the determinants of household mobility in the U.S. A logit model that consist of the factors that determine household mobility is used. The general form of the estimated equation is as follows:

$$MIG_i = \beta_1 + \beta_2(OWN_i) + \beta_3(BDRMS_i) + \beta_4(NCHLD_i) + \beta_5(GENDERr_i) + \beta_6(AGE_i) + \beta_7(AGE^2{}_i) + \beta_8(MAR_i) + \beta_9(HISPAN_i) + \beta_{10}(BLACK_i) + \beta_{11}(WHITE_i) + \beta_{12}(EDUC_i) + \beta_{13}(EMPSTAT_i) + \beta_{14}(INCTOT_i) + \beta_{15}(TAXRTE_i) + \beta_{16}(CRIMERTE_i) + \beta_{17}(AVGTEMP_i) + \varepsilon_i \quad (1)$$

The dependent variable, Migrate, is a binary variable that equals one if the person moves to a new location during the previous year and zero otherwise. The variable homeowner is binary variable for homeownership equal to one if the person owns his or her own home and zero otherwise. The coefficient associated with this variable is expected to be negative given that homeowners are less likely to move when compared to renters. Renters are likely to move compared to homeowners, as they can easily maximize their utility by moving to a new place without incurring major financial costs as compared to the homeowners. The variable number of bedrooms states the number of bedrooms within the housing unit. The sign for this variable is ambiguous. This is because individuals will likely move from smaller houses to bigger houses when they have more children or higher income. In other cases when the kids leave the home, individuals would want to move to a smaller house.

The variable number of children represents the number of children of the household head regardless of their age and marital status. It includes step and adopted children as well as biological children, individuals with no children presented a value of zero. GENDER is the variable showing whether an individual is male or female. In this paper, the variable is binary with female being the omitted category. Male household heads are more likely to move compared to female household heads. This is because females are considered tied movers and will mostly move when their spouses are moving. AGE shows the household heads age in reference to their last birthday and AGE^2 allows for the effect of age on migration to be non-linear. It allows modeling for the effect of differing ages, rather than assuming age has a linear relationship with the dependent variable Migrate for all ages.

Marital status is a dummy variable equaling one if the person is married with the spouse present or absent and zero otherwise. Married individuals are typically less likely to migrate when compared to single individuals. Hence, the coefficient associated with this variable is hypothesized to be negative. Their decisions to move is tied to the job and family, while single individuals are mostly tied to their jobs only.

Hispanic, Black, and White are dummy variables for race that equal one for the given race and zero otherwise. The omitted category includes all individuals who are neither Hispanic, Black, nor White. For these race variables, individuals who are of Hispanic and Black race are less likely to move compared to the other races, whereas those who are White are more likely to move compared to other races (Ihrke 2014).

Education is a dummy variable equaling one if the person has some college education and zero otherwise. Based on literature, the coefficient is expected to be positive, as people with a higher level of education are more likely to move than those who do not. Employment Status equals one if the person is employed and zero otherwise. In the survey individuals indicated whether they were employed, unemployed or not in the labor force. For purposes of this paper those who were not in the labor force were dropped. Those employed are less likely to move geographically compared to those who are unemployed. Annual income is a variable that shows an individual's pre-tax income or losses from all sources in the previous year in dollars. There is no prior expectation on the sign of the coefficient of this variable.

Tax rate measure the annual state taxes per state median home value measured in dollars. Individuals are expected to move from high tax rate areas to lower tax rate areas. Crime rate is a variable for property crime rate per state. The data is based on all reporting agencies and estimates for unreported theft cases per 100,000 population. It includes crime like burglary, larceny- theft, motor vehicle theft, arson and robbery. Individuals are expected to have moved from areas of high property theft to areas with lower property theft. AVGTEMP this is the average temperature for the year in every U.S. state based on data collected by weather stations throughout each state from 1971 to 2000 as provided by the NOAA National Climatic Data Center. An individual is more likely have moved if they reside in an area of lower temperatures one year ago to an area of higher temperatures. The variables Tax rate, crime rate and Average temperatures are based on an individual's current state of residence.

In this paper, data from the 2000, 2005, and 2010 American Community Survey (ACS) is used for the estimations. The variables, Migrate, Home ownership, Number of bedroom in the house/home, number of children, Gender, Age, Marital status, Hispanic, Black, White, Educational level, Employment status, and annual income are based on the previous calendar year. While those for Property Tax Rate, Property Crime rate, Average temperatures are data on the current calendar year. Equation 1 is estimated separately for each year's data. After estimating the models, hypothesis tests are conducted to see if the coefficients from each model differ from the other.

Thus far, the estimates from equation 1 indicate how the determinants of mobility may be changing over time. However, the determinants of mobility may be different for intrastate versus interstate moves. To investigate this, equation 1 is estimated two additional times using data from the 2010 ACS. All of the variables are defined as above. The difference is with the dependent variable, Migrate. When focusing on intrastate moves, the dummy variable equals one if the person moves within the same state and zero if the person is a non-mover. When focusing on interstate moves, Migrate equals one if the person moves between states and zero if the person is a non-mover.

In interstate movements, individuals are expected to move because of the temperatures, whereas in intrastate movements temperatures is not a factor of mobility as a state is expected to have relatively similar temperatures across all the counties. Individuals can move within the same state from areas of high property crime rates to areas of lesser property crime rates. Similarly, individuals will move within the same state from areas of high property taxes to those of lower taxes. Tax rate and crime rate, are therefore expected to influence intrastate mobility decisions and not interstate movements.

Finally, the paper is investigating whether the determinants of mobility are different for male versus female household heads. To this end, equation 1 is estimated two additional times using data from 2010. The first estimation only includes males, and the second estimation only includes females. In each case, the males and females are the heads of their respective households. All variables are defined as above. The only change made to equation 1 is that the Gender dummy variable is removed from the estimated equations. There is no prior expectations of the relationship of the dependent variables with the independent variables for each category.

IV. RESULTS

In the results section marginal probabilities from the regression tables (Tables 2, 4 and 6), and t-test results are reported (Tables 3, 5, and 7).

A. Over Time

The logit estimation results for determinants of mobility over time are provided in Table 2. The results shows that, while most of the variables have expected signs (like employment status, average temperatures and annual income), some have unexpected signs which is consistent across the three regressions (like age, age^2, property tax rate and education level), and others have different signs in three regressions (like White and Gender).

The number of bedrooms in a house was negative and statistically significant in the year 2000 (at 1 percent level) and statistically insignificant for the years 2005 and 2010 (both at 10 percent level). The number of children is negative and statistically significant at 1 percent level, implying that as the number of children increase in a house, householders become less mobile. In the three regressions, the coefficient of the variable age has a different sign from what was expected. Age is negative and statistically different from zero at the 1 percent level, while age-squared is positive and statistically different from zero at 1 percent level (all else fixed). This implies, as individuals grow older they are less likely to migrate up to a certain age when they start becoming mobile. Married household heads are less likely to migrate compared to single household heads. They are 2.2 percentage points, 1.8 percentage points and 1.3 percentage points less likely to migrate compared to single household heads all at 1 percent level (all else fixed). Hispanic and black household heads are less likely to have migrated at 1 percent level in 2005 and 2010 compared to non-Hispanics and non- Blacks respectively. The coefficient of the variable white is insignificant at 10 percent level in 2000 and 2005 (all else fixed), while in 2010 it is negative statistically significant at 1 percent level.

Individuals with college education are more likely to move compared to those without college education. In 2000 and 2010, they were 0.95 percentage points and 0.93 percentage points likely to migrate respectively, while in 2005 the effect is higher at 12 percentage points all at 1 percent level of significance (ceteris paribus). This is against our expectation, as stated in the literature, those without college education are more likely to move compared to those with college education. Additionally, employed household heads are less likely to migrate compared to unemployed individuals. In 2000, 2005, and 2010 they were 3.4 percentage points, 2.7 percentage points and 1.1 percentage points respectively less likely to move at 1 percent level of significance (all else fixed). Higher income increases the likelihood of households moving. Thus as income increases households look for regions where they can maximize their utility because of increased purchasing power. The results also show that property crime rate for the three regressions are positive and statistically significant all at one percent level. Average temperatures was likely to influence a household's decision to move for the years 2005 and 2010. In 2000, the coefficient of the variable is positive and statistically insignificant at 10 percent level. Property tax rate is negative in all the three regressions and statistically different from zero at 1 percent for periods 2000 and 2010, while in 2005 it is negative and statistically insignificant at 10 percent level. This is against the hypothesis that it has a positive relationship with the dependent variable. To test whether the results from the three regressions are statistically different a t-test is used. The null Hypothesis states that the coefficient of the variables are the same for 2000 and 2005, 2000 and 2010, and 2005 and 2010 (Table 3). The results for 2000 and 2005 shows that for the coefficients of the variables home ownership, number of bedrooms, property tax rate (p-values <0.01) and White(p-value < 0.1) we reject the null that the coefficients are statistically equal in the two years. All the remaining variables we fail to reject the null hypothesis implying they are statistically the same in the years 2000 and 2005.

Comparing the coefficients from 2000 and 2010, the findings show that more than half of the variables change over time. The coefficients of the variables home ownership, number of bedrooms, age, those who are white, employment status, and average temperature are statistically different for the two years (p-value < 0.01). Additionally, marital status and property tax rate (p-value < 0.05) and number of children (p-value < 0.1) are also statistically different for the two years. While most of the variables are statistically different when comparing coefficients for the year 2000 and 2010, when comparing the coefficients of 2000 to those of 2005 more than half statistically equal.

In the last section where the coefficients of the year 2005 is compared to those of 2010, it shows that most of the variables are statistically different for the two periods. The coefficients for the variables home ownership, number of children, age, marital status, Hispanic, White, Black, employment status, and property tax rate are not statistically the same. However, the coefficients for the variables, number of bedrooms, Gender, educational level, annual income, property crime rate and average temperatures are equal for the two periods.

The results in Table 3 shows that, over time most of the determinants of household mobility change. In the t-test results, the coefficients of the variables Gender, educational level, annual income and property crime rate are statistically equal for the three years. Those of homeownership, the race white and property tax rate are consistently different for the three years while the rest showed a different behavior in the t-tests.

The determinants of household mobility for the year 2000 and 2005 are statistically similar, in this period the economy was relatively stable. The changes in the determinants of mobility over time for the periods 2000 and 2010, and 2005 and 2010 can be attributed to the economic crisis of 2008/2009. During this time, the housing crisis that started in in 2007 affected the U.S financial sector affecting companies and businesses. Individual business and companies that relied on credit could not get adequate financing to operate. This recession spread through the labor market and affected employment and hence the labor market. This also affected American households as lay-offs, foreclosures and house locks hit the economy workers. The determinants of mobility for 2010 influenced by the occurrences in the housing market.

B. Type of Move

In the second logit regression Table 4, the results for intrastate and interstate migration determinants of mobility are presented. For both move types homeowners were less likely to change residence in the last one year (1.9 percentage points for interstate and 9.8 percentage points for intrastate all else fixed) compared to home renters. As the number of children in a household increase, individuals are less likely to make both interstate and intrastate movements. Similar to the findings from Table 2, individuals with college education are more likely to move compared to those without college education while employed household heads are less likely to migrate compare to unemployed heads. With high annual income, households are more likely to make both interstate and intrastate movements.

Individuals were more likely to move due to an increase in property crime rate for both interstate and intrastate moves. The coefficient for the variable average temperature is negative and significant for interstate movements, and positive and significant for intrastate movements. This is contrary to the hypothesis that a state has the same temperatures, therefore, individuals will move to a different state for temperature related reasons.

In the regression result, the coefficients of some variables possess different signs for the two regressions. While male household heads are more 0.15 percentage points more likely to move from one state to another, they are 0.14 percentage points less likely to move within the same state migrate both at 1 percent level compared to the female household heads. Similarly, married household heads are 0.3 percentage points more likely to make interstate moves and 1.7 percentage points less likely to move within the same state compared to single household heads both at 1 percent level(all else fixed). White household heads are more likely to make interstate moves and less likely to move within the same state compared to non-whites.

To ascertain whether the determinants of interstate migration are statistically different to those of intrastate migration a t-test is done. The null hypothesis is that the coefficients from the interstate and intrastate regressions are statistically equal. The results in Table 5 shows that the variables number of bedrooms in a house, the age of the household head, and property tax rate are statistically equal for the two regressions at a p-value of 0.10. This shows that, while some variables (homeownership, number of children, Hispanic, Black, educational level employment status, annual income, and property crime rate) are statistically different from zero in the regression results with the coefficient having the same sign for both interstate and intrastate movements (Table 4), they are statistically different across migration type (Table 5). Additionally, the coefficients of the variables Gender, white and average temperatures, have different coefficients for the regression results for the two regressions and are equally statistically different from the t-test (p-value < 0.01).

C. Gender

The determinants of male and female migration are expected to be different this is because women have always been considered as tied movers. Married women are less likely to move when compared to single women, their decisions to move is tied to the movements of their spouses unlike the single women who are mostly tied only to their jobs.

The results from male household heads regressions and female household heads regressions are presented in Table 6. From these results, several variables have similar signs for both male and female household heads. In the first variable of home ownership, the findings show that, male homeowners are 10.9 percentage points less likely to move compared to male home renters, while female homeowners were 13.3 percentage points less likely to move compared to female renters. With an increase in the number of children in the family, both male and female household heads are 0.7 percentage points less likely to change residence.

As age increases both genders are less likely to migrate up to a certain maximum after which they begin to change their geographical location. Married females are 2 percentage points less likely to migrate compared to the single females, while for married males are 0.9 percentage points less likely to migrate compared to the single men (p-value 0.001). As the income increases both female household heads and male, household heads are more likely to migrate. Education level also increases the chances of both female and male household heads changing their residence. Both female and male household heads of Hispanic and Black both race are less likely to change residence compared to the females and males from the other races.

The coefficients of some variables had different signs for the two regressions; these are number of bedrooms and White race. As the number of bedrooms increases, female household heads were 0.2 percentage points (p-value 0.01) less likely to move while the male household heads were 0.09 percentage points (p-value 0.05) more likely to change residence. Female household heads were 0.3 percentage points more likely to migrate compared to other females of other races, while white males were 1 percentage points less likely to change residence compared to male household heads of other races. Property tax rate is negative and statistically significant for both male and female household heads at one percent level. Lastly, the variable property crime rate and average temperatures are positive and statistically significant for both male and females household heads.

To determine if the coefficients of the variables from the two estimation are statistically equal a t-test is done. The null hypothesis states that the coefficients for the variables are equal. The results in Table 7, shows that the coefficients for the number of bedrooms in a home, number of children in the household, age, white individuals, education level (all at p-value < 0.01) employment status, property tax rate, property crime rate (at p-value < 0.05) are statistically different for the two estimations. Whereas the coefficients for the variables home ownership, Hispanic, Black, Annual income and average temperature are statistically similar at a p-value < 0.05.

V. CONCLUSION

This paper uses the logit regression model to examine the determinants of household mobility. The study aimed at answering whether the determinants of mobility changes over time, whether the drivers of intrastate migration are similar to those of interstate migration, and lastly it compared the mobility decisions of female household heads and assessed whether they are different for those of male household heads.

The data from ACS, which are one-year estimates, is used to answer the above questions. After sample selection process the number of observations was 88,380 for the 2000 dataset, 678,317 for 2005 dataset and 709,998 for 2010. From these dataset, one is able to find an individual's current state of residence and past residence in the last one year. I use each household heads state of residence in the last one year and match these to average temperature data, state property crime rates data and property taxes for each state. Using the data seven models are estimated to determine mobility over time, interstate and intrastate moves and mobility decisions of females and males.

The general findings in the models estimated is that, individuals with college education are more likely to have moved compared to those without college education. This is true for mobility decisions over time, interstate and intrastate movements and when comparing migration across genders. This differs from previous literature findings that states that, with higher education individuals specialize and they tend to stick in regions where their skills are required, unlike individuals without college education who are more likely to take up any job (Arntz 2005; Goss and Schoening 1984).

From the results, individuals with college education are more likely to make interstate moves compared to those without college education.

This is similar to existing literature, where individuals with college education will travel longer distances to get a job compared to those without college education (Ritsilä, and Ovaskainen 200; Wozniak, A. 2010). The expectations was that those with college education were less likely to make intrastate moves compared to those without college education.

Migration being expensive is only taken up by individuals when the benefits of moving surpasses the cost of staying in their current location (Ettema, Arentze and Timmermans 2011; Knapp, White and Clark 2001; Rabe and Taylor 2010). This explains why high income is a determinant of migration across all the findings in this paper.

On the determinants of female and male migration we find that white female household heads were more likely to move compared to white male household heads. All the coefficients of other variables were statistically different across the two genders except those of the variables home ownership, Hispanic, Black, Annual income and average temperature are statistically different at a p-value of 0.001.

I therefore conclude that determinants of household mobility changes with time. This can be because of changes in personal taste and attributes of an individual, changes in technology and the economic shocks at that specific point in time. For instance, the determinants of mobility over time for the years 2000 and 2005 are similar, while those for 2000 and 2010, and 2005 and 2010 are statistically different. This can be attributed to, the housing shocks of 2008/2009 that affected the economy and households. Additionally home ownership, education level, and personal income have a big role in whether a household will move or not.

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TABLES

Table 1: Descriptive Statistics

Variable	Descriptive statistics	2000	2005	2010
Migrate	Mean	0.130	0.123	0.114
	Standard deviation	0.337	0.328	0.318
Home Ownership	Mean	0.720	0.752	0.716
	Standard deviation	0.449	0.432	0.451
Number of Bedrooms in the home	Mean	3.802	3.911	3.931
	Standard deviation	1.033	0.985	1.135
	Minimum	1	1	1
	Maximum	6	6	19
Number of children	Mean	0.900	0.955	0.942
	Standard deviation	1.125	1.159	1.159
	Minimum	0	0	0
	Maximum	9	9	9
Gender	Mean	0.622	0.613	0.579
	Standard deviation	0.485	0.487	0.494
Age	Mean	43.215	44.736	45.499
	Standard deviation	10.173	10.368	10.779
Marital Status	Mean	0.607	0.611	0.585
	Standard deviation	0.488	0.487	0.493
Hispanic	Mean	0.070	0.092	0.110
	Standard deviation	0.255	0.289	0.313
Black	Mean	0.911	0.092	0.104
	Standard deviation	0.288	0.290	0.306
White	Mean	0.845	0.824	0.812
	Standard deviation	0.362	0.381	0.391
Educational level	Mean	0.663	0.595	0.622
	Standard deviation	0.473	0.491	0.485
Employment status	Mean	0.967	0.956	0.925
	Standard deviation	0.178	0.205	0.263
Annual income	Mean	47,197.67	53,075.73	56,327.4
	Standard deviation	51,316.55	57,003.43	60,086.93
	Minimum	-17,798	-19,998	-15,870
	Maximum	786,000	1,179,000	1,071,000
Property Tax rate	Mean	1,011.096	1,114.405	1,440.045
	Standard deviation	337.563	395.156	495.424
	Minimum	342	394	539
	Maximum	1,948	2,206	3,106
Property Crime Rate	Mean	3,585.746	3,427.183	2,939.431
	Standard deviation	804.587	774.519	600.436
	Minimum	2,153	1,767	1,780.2
	Maximum	5,768.6	4,890	4,761.4
Average Temperature	Mean	53.910	54.792	54.906
	Standard deviation	8.203	8.023	8.038
	Minimum	26.6	26.26	26.6
	Maximum	70.7	70.7	70.7

Number of observations is year 2000 = 88,380, 2005 = 678,317 and 2010 = 709,998

Table 2: Logit Regression Results for mobility over time Dependent variable; Migrate

Variables	2000 Marginal Effects	2005 Marginal Effects	2010 Marginal Effects
Home Ownership	-0.09998*** (0.024187) [0.0000]	-0.10971*** (0.0008469) [0.000]	-0.11625*** (0.000722) [0.000]
Number of Bedrooms in the home	-0.00515*** (0.0011896) [0.0000]	0.00015 (0.0004293) [0.713]	-0.0001811 (0.0003168) [0.568]
Number of children	-0.01032*** (0.0010973) [0.000]	-0.00887*** (0.0003669) [0.000]	-0.006595*** (0.00031) [0.000]
Gender	-0.00007 (0.0021024) [0.973]	0.00203*** (0.0007318) [0.005]	0.00024 (0.0006209) [0.698]
Age	-0.01225*** (0.0008158) [0.000]	-0.01041*** (0.0002775) [0.000]	-0.00777*** (0.0002364) [0.000]
Age^2	0.00009*** (0.00000964) [0.000]	0.00007*** (3.23e-06) [0.000]	0.00005*** (2.72e-06) [0.000]
Marital Status	-0.02220*** (0.0023162) [0.000]	-0.01819*** (0.0008017) [0.000]	-0.01369*** (0.0006903) [0.000]
Hispanic	-0.00734* (0.0039188) [0.061]	-0.00515*** (0.0012491) [0.000]	-0.00834*** (0.0009576) [0.000]
Black	-0.01128** (0.0049082) [0.021]	-0.01165*** (0.001596) [0.000]	-0.01447*** (0.0012648 [0.000]
White	0.00577 (0.0039461) [0.143]	-0.02 (0.001243) [0.108]	-0.00585*** (0.00010032) [0.000]
Educational level	0.00954*** (0.0021646) [0.000]	0.1200*** (0.0007326) [0.000]	0.00928*** (0.0006437) [0.000]
Employment status	-0.03385*** (0.0047334) [0.000]	-0.02717*** (0.0014511) [0.000]	-0.01146*** (0.0010202) [0.000]
Annual income	5.56e-8** (2.28e-08) [0.019]	8.19e-09*** (6.86e-09) [0.000]	5.82e-08*** (6.03e-09) [0.000]
Property Tax rate	-0.00001*** (3.40e-06) [0.0000]	-1.02e-06 (1.05e-06) [0.330]	-4.37e06*** (7.09e-07) [0.000]
Property Crime rate	0.00001**** (1.51e-06) [0.000]	0.0001*** 5.89e-07 [0.000]	9.57e-06*** (7.23e-07) [0.000]
Average temperatures	0.00006 (0.0001572) [0.694]	0.00023*** (0.0000532) [0.000]	0.00020*** (0.0000506) [0.000]
	$R^2 = 0.1226$	$R^2 = 0.1249$	$R^2 = 0.1622$

Robust Standard errors are in parenthesis
P-values are in brackets
*Significant at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

Table 3: Statistical Difference overtime

Variables	2000 and 2005	2000 and 2010	2005 and 2010
	P-values	P-values	P-values
Home Ownership	0.0000***	0.0000***	0.0000***
Number of Bedrooms in the home	0.0000***	0.0001***	0.5135
Number of children	0.4296	0.0822*	0.0449**
Gender	0.3208	0.8676	0.928
Age	0.1618	0.0041***	0.0022***
Marital Status	0.2381	0.0444**	0.0898*
Hispanic	0.6499	0.4417	0.0050***
Black	0.8359	0.1798	0.0119**
White	0.0578*	0.0015***	0.0041**
Educational level	0.1646	0.3529	0.3501
Employment status	0.3120	0.0001***	0.0000***
Annual income	0.2097	0.4812	0.1950
Property Tax Rate	0.0006***	0.0239**	0.0020***
Property Crime rate	0.1617	0.7548	0.1151
Average Temperature	0.2632	0.0076***	0.9557

***Reject H_0 (at p-value < 0.01)
**Reject H_0 (p-value < 0.05)
*Reject H_0 (p-value < 0.10)

Table 4: Logit Regression Results for Interstate and Intrastate Movements

Variables	Marginal effects (Interstate)	Marginal Effects (Intrastate)
Home Ownership	-0.01937***	-0.09776***
	(0.002411)	(0.000675)
	[0.000]	[0.000]
Number of Bedrooms in the home	-0.00011	-0.00015*
	(0.0000889)	(0.000293)
	[0.237]	[.0617]
Number of children	-0.0015375***	-0.00467***
	(0.0000975)	(0.000283)
	[0.000]	[0.000]
Gender	0.00154***	-0.00136**
	(0.00001789)	(0.0005737)
	[0.000]	[0.018]
Age	-0.00088***	-0.00663***
	(0.0000671)	(0.0002195)
	[0.000]	[0.000]
Age^2	6.15e06***	0.00004***
	(7.78e-07)	(2.53e-06)
	[0.000]	[0.000]
Marital Status	0.0030***	-0.01684***
	(0.00001937)	(0.0006396)
	[0.000]	[0.000]
Hispanic	-0.00399***	-0.00329***
	(0.0003758)	(0.0007514)
	[0.000]	[0.000]
Black	-0.00229***	-0.01112***
	(0.0003758)	(0.0011451)
	[0.000]	[0.000]
White	0.00071**	-0.00593***
	(0.0002857)	(0.0009152)
	[0.013]	[0.000]
Educational level	0.00525***	0.00417***
	(0.0002035)	(0.0005912)
	[0.000]	[0.000]
Employment status	-0.00451***	-0.00563***
	(0.0002717)	(0.0009466)
	[0.000]	[0.000]
Annual income	2.61e-08***	1.35e-08**
	(1.31e-09	(6.09e-09)
	[0.000]	[0.027]
Property Tax Rate	-8.09e-07***	-4.41e-06***
	(1.98e-07)	(6.21e-07)
	[0.000]	[0.000]
Property Crime rate	2.45-06***	7.10e-06***
	(1.94e-07)	(5.74e-07)
	[0.000]	[0.000]
Average Temperature	-0.0001895***	0.00041***
	(0.0000138)	(0.0000445)
	[0.000]	[0.000]
	$R^2 = 0.1554$	$R^2 = 0.1552$

Robust Standard errors are in parenthesis. P-values in brackets.
*Significant at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

Table 5: Statistical difference for Interstate and Intrastate mobility

Variable	P-values
Home Ownership	0.0000***
Number of Bedrooms in the home	0.3876
Number of children	0.0000***
Gender	0.0000***
Age	0.6422
Marital Status	0.0000***
Hispanic	0.0000***
Black	0.0692*
White	0.0000***
Educational level	0.0000***
Employment status	0.0000***
Annual income	0.0000***
Property Tax Rate	0.3919
Property Crime rate	0.0000***
Average Temperature	0.0000***

***Reject the null H_0 (at p-value < 0.01)
**Reject the null H_0 (p-value < 0.05)
*Reject the null H_0 (p-value < 0.10)

Table 6: Logit Regression results for Female and Male

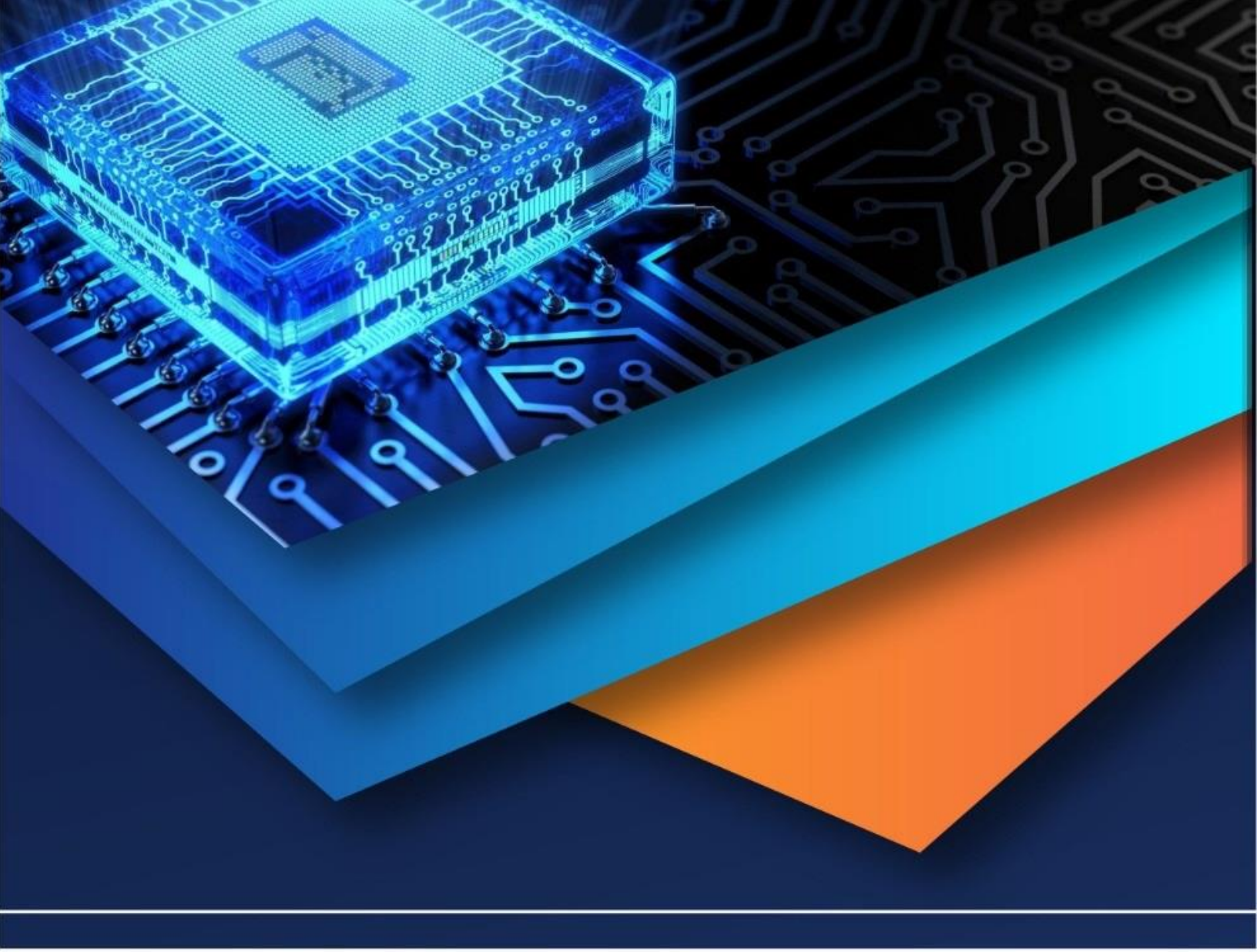
Variables	Female Marginal effects	Male Marginal effects
Home Ownership	-0.13273*** (0.0011945) [0.000]	-0.10937*** (0.0009025) [0.000]
Number of Bedrooms	-0.00186*** (0.00055) [0.001]	0.00086** (0.0003807) [0.023]
Number of children	-0.00670*** (0.000509) [0.000]	-0.00695*** (0.0004054) [0.000]
Age	-0.00790*** (0.0003857) [0.000]	-0.00766*** (0.0002999) [0.000]
Age^2	0.00005*** (4.48e-06) [0.000]	0.00005*** (03.44e-06) [0.000]
Marital Status	-0.02029*** (0.0011398) [0.000]	-0.00873*** (0.0008978) [0.000]
Hispanic	-0.00835*** (0.00015874) [0.000]	-0.00820*** (0.0011907) [0.000]
Black	-0.01334*** (0.0020516) [0.000]	-0.01153*** (0.0016577) [0.000]
White	0.00296* (0.0017572) [0.093]	-0.01024*** (0.001195) [0.000]
Educational level	0.00597*** (0.0010753) [0.000]	0.01158*** (0.0008) [0.000]
Employment status	-0.01568*** (0.00162) [0.000]	-0.00842*** (0.0013342) [0.000]
Annual income	5.51e-08*** (1.45e-08) [0.000]	5.02e-08*** (6.33e09) [0.000]
Property Tax Rate	-6.33e-06*** (1.16e-06) [0.000]	-2.38e-06*** (8.44e-07) [0.005]
Property Crime rate	0.0000125*** (1.14e-06) [0.000]	7.20e-06*** (9.66e-07) [0.000]
Average Temperature	0.000183** (0.0000777) [0.019]	0.00025*** (0.000064) [0.000]
	$R^2 = 0.1583$	$R^2 = 0.1633$

Robust Standard errors are in parenthesis.
*Significant at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

Table 7: Statistical Difference for Female and Male

Variables	P-values
Home Ownership	0.1318
Number of Bedrooms in the home	
Number of children	0.0000***
Age	
Marital Status	0.0079***
Hispanic	
Black	0.0028***
White	
Educational level	0.0000***
Employment status	
Annual income	0.4100
Property Tax Rate	
Property Crime rate	0.7652
Average Temperature	
	0.0000***
	0.0000***
	0.0224**
	0.6691
	0.0302**
	0.0287**
	0.2411

***Reject the null H_0 (at p-value < 0.01)
**Reject the null H_0 (p-value < 0.05)
*Reject the null H_0 (p-value < 0.10)



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