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The Determinants of Rural Outmigration in the United States: 2010-2014

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THE DETERMINANTS OF RURAL OUTMIGRATION IN THE UNITED STATES: 2010-2014

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the Master of Science degree in Economics and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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ABSTRACT

THE DETERMINANTS OF RURAL OUTMIGRATION IN

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This study focuses on both economic and noneconomic determinants of geographical migration out of rural areas in the United States. In line with existing studies on individual's decision to migrate from rural to urban areas, our analysis compares expected returns in rural to those in urban areas. Using annual U.S. county-level count data spanning the period from 2010 to 2014, Fixed Effect and Negative Binomial methods are used to evaluate the effects of both economic and noneconomic variables on geographical outmigration from rural to urban areas. Determining factors investigated include distance between place of origin and potential destination, median household income, educational attainment, the poverty rate, the unemployment rate, a natural amenity index, the prevalence of primary healthcare providers and social associations.

Findings suggest that higher expected returns in urban compared to rural areas contribute to releasing people out of rural areas in the United States. A large distance between origin and destination associated with high migration costs demotivate rural people to migrate to urban areas. On the other side, relatively high median household incomes, low unemployment rates, high level of education, a high presence of natural amenities, high level of access to primary healthcare providers in urban destination areas encourage rural people to migrate to urban areas. The poverty rate and social associations

did not significantly affect rural outmigration decisions in the United States during the period studied.

Chapter 1 Introduction

Introduction

The population in many parts of rural areas of the United States has declined considerably over the past decades. The expansion of suburban areas, increasing unemployment and poverty in rural areas have resulted in migration of people out of rural to urban areas (U.S. Department of Agriculture, 2016). People in rural areas of the United States also migrate to urban areas in search of improved economic opportunities. Rural outmigration trends and its determinants have achieved significant attention as economic and social phenomena for several decades. Investigating the determinants associated with recent geographical migration, and in particular, rural to urban migration in the United States is the main focus of this thesis. This thesis reports on economic and noneconomic driving forces of rural outmigration in the United States and does not seek to answer why some individuals do decide to migrate to urban areas while others do not under similar conditions.

This thesis emphasizes geographical migration from rural to urban counties in the United States between 2010 and 2014. Geographical migration is linked to, but different from, occupational or sectoral migration such as migration from the agricultural sector to non-agriculture. The latter involves migration from one sector to another and is directly associated with a change in occupation, even though it may also involve a geographical move. Some variables used as a determinant of geographical migration may not be directly related to occupational migration, such as having access to natural amenities.

Problem Identification

Rural areas have long experienced population loss in the United States. According to USDA (2016), 1,320 rural counties in the United States, with a population totaling over 647,000 people, experienced a population loss, while 656 of rural counties gained a total of 511,000 people between 2010 and 2015. Consistent with these trends, population growth rates in rural areas are also below those in urban areas. According to the Bureau of Census' yearly data, between 2006 and 2015, the annual population change rate in rural areas dwindled from 0.7 percent to below zero while the rate fell from 1 percent to 0.9 percent in urban areas.

Rural population decline is associated with higher rural death rate compared to lower rural birth rate and migration of people from rural to urban areas. Migration may occur due to a limited number of job opportunities in rural areas as well as various other factors. Technological innovation in farming limits the demand for farm labor in many rural areas that depend on farming activities. People living in those rural areas have few alternative employment opportunities such as in the manufacturing and service sectors (Kusmin, 2015).

The demand for labor varies between rural and urban areas. A large number of labor demand in an area is generally associated with employment growth. Employment in rural areas of the United States increased by one percent in 2014, compared to more than two percent in urban areas (Kusmin, 2016). The lower employment growth in rural areas relative to urban areas may release people out of rural areas and provide incentives for people to move to urban areas.

Objectives

The main objective of this thesis is to investigate both economic and non-economic determinants of U.S. county-to-county rural outmigration between 2010 and 2014. The specific objective is to investigate whether and the extent to which (1) median household income, (2) education attainment, (3) unemployment rate, (4) poverty rate, (5) natural amenities, (6) access to health care providers, (7) social associations and (8) distance, representing the cost of migration, affect rural outmigration.

Justification

Findings of this research may help to improve the understanding of recent geographical migration patterns in the United States and may inform the policy process related to rural areas. The results of this study will also help to understand the driving forces of rural population loss of the United States between 2010 and 2014. Many rural areas are experiencing a shortage of labor and human capital due to rural outmigration, therefore, findings of this thesis may help inform rural leaders as they seek to develop policies that encourage people to stay in rural areas.

The novelty of this research is that it includes access to health care providers and social associations as possible determinants of U.S. rural outmigration, along with variables used in previous rural outmigration studies, such as income, the unemployment rate, educational attainment, natural amenities and distance. An additional contribution of this study is that it provides an analysis of recent migration patterns.

Structure of the thesis

This thesis contains six chapters. The next chapter relates this research to the existing literature relevant to rural outmigration. Chapter 3 introduces the theoretical and empirical models of rural outmigration. Chapter 4 provides a description of the data used in the migration model and the data sources. Chapter 5 presents the empirical findings of the rural outmigration model. The final chapter presents the conclusions as well as recommendations for future study on rural outmigration.

Chapter 2 Literature Review

In the United States, the number of rural residents employed in the agricultural sector has been declining for over a century. As a result, reduced employment opportunities in rural areas contributed labor migration from rural to urban areas to become an inevitable phenomenon in the process of economic growth during the same time. One of the factors contributing to geographical outmigration is a "pull" factor embodied by the traditionally large income gap between rural and urban areas. In addition, "push" factors associated with high unemployment rates in rural areas encourage people to migrate from rural to urban areas. The following literature review emphasizes the determinants of labor migration from rural to urban areas in the United States.

Migration as an investment decision

Sjaastad (1962) explained migration from one place to another as an investment in human capital. The author compared the cost involved with migration to other economic investments and noted that it is an important factor in making migration decisions. In modeling migration, he suggested that when the returns after migration is greater than the costs, then the migration decision can be considered as a rational investment. The author examined differences in earnings across locations to calculate the value of the economic opportunity available at each potential location and compared these values with those at the place of origin. The author did not include nonmonetary advantages of migration such as being surrounded by a desirable social or political environment, or living in a better climate than at the place of origin. According to Sjaastad, a migrant chooses the location where the value of a person's lifetime's returns is maximized. The author used distance

between the origin and the potential destination location as a way to represent the cost of migration. That is, the greater the distance, the greater are migration costs. In addition to transportation costs, there are pecuniary costs of migration which vary with distance, such as losses from selling a car or a house before moving, a loss of a job at the origin, as well as employment benefits associated with the job at the origin. Finally, Sjaastad assumed that information from friends, relatives, and advertisement about job vacancies at a potential destination also affect the migration decision.

Migration decisions and expected returns

Todaro (1969) modeled a household's migration decision as a utility maximization problem. The author developed a model to compare the utility from being at a person's place of origin to the utility achieved at the person's potential destination, both of which are a function of wages, income, and hours of work. The author asserted that the migration decision is based on whether the expected utility after migration at a new place is higher than the utility achieved at the origin. Along with a person's income and the probability of getting a job, the cost of migration must also be taken into account in a mover's utility function. Todaro used two utility functions, one for stayers and another for movers. If the movers' utility exceeds the stayers' utility, then in the aggregate a household would take the decision to migrate from the origin to a potential destination.

Nakosteen and Zimmer (1980) used the income differential between origin and destination as a variable to estimate the returns of migration between different states. According to the authors, income varies from state-to-state as a result of difference in productivity, wages, educational attainment, employment and investments. The authors

found that the income differential is an important determinant in explaining U.S. state-to-state migration. That is, the greater the predicted income differential between the origin and the potential destination, the greater is the probability of migration.

Push factors influencing rural outmigration

Goetz and Debertin (1996) argued that the reasons behind rural outmigration in U.S. are the relatively higher unemployment in rural areas and better job opportunities in urban areas. People are demotivated to stay in rural areas if they have fewer opportunities to get employed in rural areas than in urban areas. As a result, they tend to migrate to cities for improved job opportunities. The authors also noted that the relocation of manufacturing firms to urban areas and the decline in the use of human capital in agricultural production in rural areas are reasons for rural labor outmigration.

Barkley (1990) pointed out that rural workers migrate to urban areas because there are few earning opportunities associated with the extensive use of capital in agriculture. The author noted that the increasing use of new technology in agriculture and rising nonfarm labor returns are associated with a decline of agricultural employment. This is evidenced by the decline in the number of rural agricultural workers between 1940 and 1985 in the United States.

One of the contributing factors of rural outmigration is employment loss in the agricultural sector. Due to the decline in the number of farms over the past century, the country experienced long-term agricultural labor outmigration, which in turn contributed to rural outmigration and a decline in the rural population. As a consequence, these forces led to an overall decline in economic activities in rural areas (Shepard and Collins, 1988).

Pull factors influencing rural outmigration

Migration from rural to urban areas has been the most observable path of domestic migration throughout the world. This trend has continued in spite of several reversals during the last four decades, including the period between 1995 and 2000. Lucas (2004) found that rural outmigration occurs because of rapid productivity growth in urban areas, specifically in human capital-intensive sectors. The author used a two-sector (rural and urban) model of the economy, with a fixed total number of households. Lucas also pointed out that there are more jobs available for unskilled workers in urban areas than in rural areas. The author modeled the forces of the skill differential between urban and rural workers that continuously bring new migrants. Lucas concluded that workers move to cities where the skill level is high, so that they can accumulate their own skills and increase the returns to their investments.

Harris and Todaro (1970) developed a two-sector model where urban and rural areas were connected through labor migration. Their model assumed that an additional job in the industrial sector in urban areas would increase the willingness of moving to urban areas. Laborers would be driven to migrate from rural to urban areas because the opportunities of labor in the industrial sector were assumed to be greater than those in the agricultural sector. The authors found that improvements in manufacturing productivity tend to increase urban wages, which drive low-paid or underemployed labor to migrate from rural to urban areas.

Fuguitt and Beale (1996) and Beale (1998) recognized that a rural household might migrate in response to the expansion of an individual's economic choices and increasingly diverse opportunities. The authors used U.S. county-to-county migration

data to test their model and incorporated risk as an explanatory variable. The authors showed a positive relationship between the income differential between rural and urban counties of the United States and the shares of outmigration between 1995 and 2000.

Educational attainment is another reason for rural labor outmigration. According to Huang, Wohlgemuth, and Orazem (2002), people with at least high school degree tend to be most likely to move to urban areas because they generate a lower return in rural compared to urban areas. As rural education levels increase, people tend to migrate to urban areas to achieve their goals and utilize their knowledge.

Marre (2009) found that educational attainment, home ownership, and labor market characteristics play a significant role in rural outmigration. The expected higher returns to educational attainment in urban areas than in rural areas and also the lack of jobs that match with the skills of individuals with a postgraduate degree in rural areas increase the propensity of young people to move out of rural areas. The author also noted that the poverty rate is higher in rural areas than in urban areas and is positively correlated with rural outmigration. That is, the greater the poverty rates in rural areas, the fewer economic opportunities, and the greater is rural outmigration. According to the author, U.S. rural areas lost an average of 10 percent of the total population between 1990 and 2000 due to outmigration associated with high levels of poverty.

The determinants of rural outmigration can also be found by examining the effects of the associated loss of population on the rural economy. Because people migrate from rural areas to improve their living standards, rural outmigration tends to improve the economic status of migrants themselves. Rodger and Rodger (1997) investigated the effects of labor migration from rural to urban areas on the economic status of the

migrants in the United States. The authors measured the effect of migration by the difference between one's observed economic status up to six years after migrating and the estimated economic status the individual would have had without migration. According to the authors, the economic status of the individuals improved on average as people migrated from rural to urban areas. In other words, the individuals who moved to urban areas achieved greater benefits due to migrating than did the stayers in rural areas. However, it must be noted that studies such as these are plagued by self-selection bias.

Mills and Hazarike (2001) conducted a study on the outmigration of young adults at the age of fourteen from rural U.S. counties. The authors found that high initial earnings at the destination location in metropolitan areas influenced young people to join the labor force and move to metro areas, suggesting that high income expectations at the destination location create incentives for young workers to move to metro areas. That is, the probability of migration among young people increases if the ratio of their earnings after migration to the initial earnings at their place of origin increases.

Knapp and Graves (1989) found that an area's natural amenities such as the area's average temperature in January, average hours of sunlight, average temperature in July, average relative humidity in July, land surface area of the county and the percentage of the county's area made up of water have a positive relationship with in-migration. That is, the choice of a migrant's potential destination can be influenced by the presence of such natural amenities. The authors mentioned that because households care about the environment and atmosphere of their living places, they may choose to live in a location with superior natural amenities. Similar findings were reported by Arzaghi and

Rupasingha (2011), who noted that natural amenities are positively correlated with outmigration from rural counties in the United States.

Based on these pull and push factors discussed in this review of existing studies, potential variables such as difference in income, poverty rates, unemployment rates, educational attainment and natural amenities between the origin and destination locations are identified as possible determinants of rural outmigration in the United States. Various studies have analyzed the determinants of rural outmigration in the United States in earlier periods, but few studies have investigated recent trends in rural outmigration and their causes. Thus, the goal of this study is to analyze the determinants of U.S. county-to-county rural outmigration between 2010 and 2014. A key reason for re-examining rural outmigration pattern of the United States is to explore whether these historical determinants are still valid.

Chapter 3 Methodology

This study explores the determinants of rural labor outmigration in the United States based on the notion that an individual's migration decision depends only on its economic opportunities. To analyze the research question, we consider geographical migration, as opposed to sectoral migration. In our model, each individual is assumed to choose between staying in a rural area or migrating to an urban area. An individual's decision to migrate to an urban area is based on his or her expected utility in each location. If the expected utility is higher in the urban than in the rural area after migration, then the individual would decide to migrate.

The model used in this thesis includes two regions. We consider rural areas as the individuals' origin and urban areas as possible destination. We denote rural areas as Region 1 (R_1) and urban areas as Region 2 (R_2).

Geographical migration involves costs, so an individual is assumed to spend a certain portion of his or her income on the act of migration, if the person chooses to do so. The costs of migration involve transportation expenses, new housing costs, sending money to family members staying at the place of origin, and changing identification information (Arzaghi and Rupasingha, 2011). We denote these collective migration expenses as S.

Following Arzaghi and Rupasingha (2011), we consider two logarithmic utility functions in this model. One is the expected utility function of stayers in rural areas (R_1), and the other is the expected utility function of movers to urban areas (R_2). We consider the wage rate as being equal to consumption.

The expected utility function of a stayer in R_1 is:

$$U_1 = E\,[\ln W_{1t}], \quad (1)$$

where U_1 is the utility function of a stayer in R_1, and W_{1t} is the expected wage rate of a stayer at time *t* in R_1. The expected utility function of a stayer at the origin is assumed to be a function of the wage rate in that region and the total number of hours spent at work, so the expected utility function of a mover in R_2 is:

$$U_2 = E\,[\ln W_{2t}] - S \quad (2)$$

In this utility function, W_{2t} is the expected wage rate after migrating to R_2 at time *t* and *S* is the total expenses of migration. U_2 is the utility function of a mover to R_2. Thus, this utility function of moving to R_2 is assumed to be a function of the wage rate in that region and the total migration costs.

Individuals have to choose between living in rural areas and deriving utility U_1 and living in urban areas and deriving utility U_2. Their decision on whether or not they will move will be based on the location at which they can achieve highest expected utility. That is, they will decide to migrate to R_2 if the expected utility is higher in R_2 than in R_1. Their decisions of choosing between staying and moving will be based on this utility function:

$$U = E\,[\max\,\{\ln W_{2t}, \ln W_{1t}\}] - S\,, \quad (3)$$

where *U* is the expected utility. For any rational individual, the expected utility will increase after migration if the post-migration wage rate is higher than the wage rate before migration. A higher wage rate increases the individual's consumption and improves his or her standard of living. Labor migration may be the result of a disequilibrium in the labor market. Theoretically, a labor market equilibrium occurs at the intersection point of the demand and supply curves of labor. Individuals may decide to

migrate when there is a wage gap between rural and urban areas. That is, after covering all the migration costs, the utility derived from the higher urban wage rate must be higher than the utility associated with the lower rural wage rate, net of the migration costs, in order for an individual to consider moving.

In the case of regional migration, laborers will likely decide to migrate when they find suitable economic opportunities in the alternative place. These laborers might belong to various professional sectors, e.g. the agricultural, manufacturing or service sectors. In this thesis, we assume that the total rural labor force consists of agricultural workers, manufacturing workers and service workers. Their earnings vary from one another and the returns to labor can also vary from region to region. For example, rural workers in the agricultural sector would be expected to decide to migrate to urban areas if the economic opportunities in urban areas exceed those in rural areas. The returns associated with working in a new place must be higher than those from working at the place of origin minus the migration costs.

As mentioned in the literature review, rural labor outmigration can also be the result of agricultural labor outmigration. Because of improvements in technological systems used in agriculture, farmers may choose to use low-cost capital and machinery as a substitute for labor. Thus, labor's contribution to agricultural output has undergone a longstanding decline, so the move of agricultural labor to nonagricultural sectors may also take the form of migration from rural to urban areas (Barkley, 1990).

The main challenge faced by these movers is that they have to deal with the probability of not being able to secure jobs. Uncertainties of getting a preferred job with higher earnings in urban areas than in rural areas also influence the migration decision, so

workers may try to ensure their job holdings before migrating. The appropriate choice of a region to move to can help them to reduce the probability of being unemployed after migration. That is, the right selection of urban areas plays an important role in the migration decision. Areas experiencing economic growth usually provide job seekers with a high probability of securing employment with a desirable salary. Prior to migration, the rural laborers have to do research and acquire information about job openings in sectors where they can utilize their past experiences and earn a higher income than in their previous job. In principle, high levels of economic growth in any specific area reflect a high chance of job opportunities.

Another big concern for a rural laborer in making a migration decision is job competition after moving. The proportion of highly-educated and experienced people is higher in urban than in rural areas which creates competition for the rural migrants. High levels of education may enable individuals to obtain relevant information and technical support associated with job openings in urban areas. In spite of these practical and realistic concerns, the heterogeneity of the labor force based on a migrant's own ability is disregarded in this paper. Instead, we consider the unemployment rate as a proxy for the probability of not successfully obtaining employment in an urban area.

Young people are generally more likely to migrate to urban areas to improve their education and their employment conditions than people of a more advanced age. Young people moving to urban areas may leave family members in rural areas, while others migrate to urban areas with their families to improve their children's education (Marre, 2009). According to the Kusmin (2016), the unemployment rate among individuals with a graduate degree in rural areas increased from 1.3 percent in 2007 to 2.0 percent in 2014,

providing an indication that these highly educated individuals had an incentive to migrate from rural to urban areas. Because the unemployment rate in rural areas is a potentially important reason for the outmigration of young rural workers, it is incorporated in the model as a possible determining factor.

The stylized empirical model

The indirect utility function of a migrant *i* after migrating to location *d* is denoted as

$$U_{odi} = U\,(X_i, Y_d, Z_{od})\ ;$$

where X_i includes characteristics of migrants such as education, Y_d is the vector of characteristics of the potential destination such as income, unemployment rate and natural amenities, and Z_{od} is the vector of migration costs from origin *o* to location *d* such as distance between *o* and *d*.

The indirect utility function of a stayer *j* is:

$$U_{ooj} = U\,(X_j, Y_o)\ ;$$

where *o* is the origin, X_j is the vector of the stayer's characteristics and Y_o is the vector of the origin's characteristics. Naturally, this utility function of the stayer does not include migration costs.

In our model, we assume that individuals make their migration decision in terms of utility maximization. Individuals are assumed to choose their location based on variables included in their utility function, such as distance between the place of origin and the potential destination, median household income, the unemployment rate, the number of people with a bachelor's degree as a share of total population, the poverty rate,

and a natural amenity index associated with each location. These variables were also used in previous studies investigating rural-to-urban migration in the United States.

Along with these variables, I introduce two other variables: the prevalence of primary health care providers, and the number of social associations as possible determinants of rural outmigration. According to the American Academy of Family Physicians (2015), for every 100,000 residents, urban areas have 53.3 primary physicians, whereas rural areas have only 39.8 physicians. The North Carolina Rural Health Research Program (1997) reported that people in rural areas have less access to health care than the urban population due to the relatively limited number of health care providers, hospitals and medical clinics in these rural areas. Also, the number of residents without health insurance is higher in rural than in urban areas; according to the same report, more than one-third of rural residents do not have health insurance compared to one-quarter of urban residents. The purpose of using this variable in my model is to assess whether the number of health care providers has a significant effect on rural outmigration.

The social association variable reflects people's membership in bowling centers, golf clubs, fitness centers, sports organizations, business organizations, religious organizations, labor organizations, political organizations, and professional organizations which help to build a strong social life. Urban areas have more options of social associations compared to rural areas. People generally prefer to stay in a place where they can have access to variety of entertainment options, which tends to be limited in many rural areas. Therefore, the number of social associations may have an effect on rural outmigration.

Using all potential dependent variables motivated above, the empirical model of the rural outmigration of my thesis is:

outmig = β_0+ β_1*dist + β_2*edu + β_3*povst + β_4*un + β_5*medin + β_6*ame + β_7*hp + β_8*sa + ε,

where *outmig* denotes the county-to-county outmigration flow, *dist* denotes the distance between place of origin and a potential destination, *edu* denotes the number of people with a bachelor's degree and higher, *povst* denotes the poverty rate, *un* denotes the unemployment rate, *medin* is the median household income, *ame* represents the natural amenity index, *hp* denotes the number of primary health care providers, *sa* denotes the number of social associations, and ε is the error term.

The model utilizes count data, based on observations that take on non-negative integer values. Possible regression methods for count data include Fixed Effect, Random Effect, Poisson, Negative Binomial, Zero-inflated and Zero-truncated models.

One consideration is to choose between a Fixed-Effect and a Random-Effect model in analyzing the count data (Hausman, Hall and Griliches, 1984). The estimated parameters of my model may suffer from omitted variables bias because I do not include all possible factors that may contribute to rural outmigration flows. The Fixed Effect model can be used to deal with the problem of omitted variables bias because it controls for this bias, whereas the Random Effect model provides unbiased results if there is no omitted variable or if the omitted variable is uncorrelated with the other independent variables (Williams, 2015). Another justification for using the Fixed Effect method is that the model's observations are not taken from a random sample. In particular, the data pertain to all rural U.S. counties and are not based on randomly chosen U.S. counties.

Hausman test confirms the appropriateness of using the Fixed-Effect method in this model.

The count data method also suggests considering the Poisson Regression model and Negative Binomial Method. However, the data set violates the assumption of the Poisson Regression model, which is that the variance of the dependent variable is equal to the mean. Therefore, the Negative Binomial Method is the preferred model of these two choices. Hence, I will use both Fixed-Effect and Negative Binomial Method for regression analysis and will compare the results to check the robustness of my model.

A summary of all the variables names included in the model, definitions and their expected signs is given in Table 3.1. Educational attainment data is taken from counties of origin to indicate the characteristics of migrants. On the other hand, median household income, unemployment rate, poverty rate, natural amenities, number of primary health care providers, and social associations data are taken from destination counties which indicate the characteristics of potential destination.

Table 3.1: Summary of main variables and definitions

Variables	Definitions	Expected sign
outmig	County-county outmigration (number)	
dist	Distance between origin and destination (miles)	-
edu	People with a bachelor degree and higher (average)	+
povst	Poverty rate of people of all (average)	-
un	Unemployment rate (average)	-
medin	Median household income (average)	+
ame	Natural amenity index (scale)	+
hp	Primary health care providers (number)	+
sa	Social associations (number)	+

Chapter 4 Data Description

The rural outmigration model of this thesis is based on previous empirical studies of migration flows which assume individuals make migration decisions based on utility maximization. In particular, migrants are assumed to choose to live in the location with the highest expected returns and economic opportunities. Independent variables of the migration model reflect the effects of individual characteristics such as educational attainment and the effects of a potential destination's attributes such as incomes and the unemployment rates at the potential destination on migration. Another important factor in the migration decision is the costs of migration, which in this study is represented by the distance between a migrant's place of origin and the person's potential destination.

This study only focuses on geographical outmigration from nonmetropolitan areas to metropolitan areas in the United States. It is worth to define metropolitan and nonmetropolitan areas. According to USDA-ERS (2013), "In 2013, OMB defined metropolitan (metro) areas as broad labor-market areas that include:

1. Central counties with one or more urbanized areas; urbanized areas (described in the next section) are densely-settled urban entities with 50,000 or more people.
2. Outlying counties that are economically tied to the core counties as measured by labor-force commuting. Outlying counties are included if 25 percent of workers living in the county commute to the central counties, or if 25 percent of the employment in the county consists of workers coming out from the central counties—the so-called "reverse" commuting pattern.

Nonmetro counties are outside the boundaries of metro areas."

In this chapter, I will discuss the data used to analyze rural outmigration and their sources. The data pertain to U.S. county-to-county rural outmigration. All data concern county-level data between 2010 to 2014. Data on rural outmigration, distance, education, poverty rate, unemployment rate, median household income, natural amenities, access to health care, and social associations and their sources are described in the following section.

County-level migration data

Following the development of the Rural-Urban Continuum Codes to classify counties by Brown, Hines, and Zimmer (1975), the U.S. Department of Agriculture (USDA) developed such codes for each decennium. These codes distinguish metro counties by their population size and non-metro counties by adjacency to a metro area or areas and the degree of urbanization. The 2013 Rural-Urban Continuum Codes are listed in Table 4.1.

This study utilizes the 2013 Rural-Urban Continuum Code. According to the Office of Management and Budget (2013), the 2013 Rural-Urban Continuum Code scheme includes a total of 1,976 non-metro and 1,167 metro counties (USDA, 2013).

Table 4.1: Rural-urban continuum codes and descriptions for 2013

Metro counties	
Code	**Description**
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 populations
Non-metro Counties	
Code	**Description**
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban populations, adjacent to a metro area
9	Completely rural or less than 2,500 urban populations, not adjacent to a metro area

Source: U.S. Census Bureau (2013).

The U.S. Census Bureau releases U.S. county-to-county migration flows for every 5 years based on the American Community Survey (ACS) and the Puerto Rico Community Survey (PRCS). The survey reports the name of the respondent's current

living place as well as that of the previous year. For analysis purposes, I am using the data for the 5-year period between 2010 and 2014. Because the goal of this thesis is to analyze rural to urban migration flows, I use migration flows from non-metro to metro counties within same states as well as between different states.

Migration data from the U.S. Census Bureau based on the American Community Survey (ACS) are appropriate for this thesis because they show the total number of migrants from one county to another in the United States. The data include information on both the place of origin and a migrant's destination county.

Migration costs

Distance is the only variable to represent the cost of migration. I use U.S. county-to-county data from the U.S. Census Bureau based on the American Community Survey (ACS) to estimate distance. The data include both the county of origin and potential destination county. The National Bureau of Economic Research releases data on the distance between U.S. counties by applying the 'Haversine formula' based on longitudes and latitudes of the area.[1] I use the U.S. county-level distance data of 2010 expressed in miles.

Distance is expected to have a negative relationship with rural out-migration, so a large distance between two counties is associated with high migration costs, which discourage people to migrate (Davies, Greenwood, and Li, 2001). More specifically, the greater the distance between rural and urban counties, the lower is the migration flow out of rural areas.

[1] The Haversine formula is used to determine the distance between two regions on a sphere given their longitudes and latitudes.

Median household income data

The U.S. Census Bureau's Small Area Income and Poverty Estimate (SAIPE) program releases annual median household incomes by county for each year. The median household income at destination counties between 2010 and 2014 is used in the rural outmigration model. Median household income at potential destination is expected to have a positive relationship with rural outmigration, so migrants would be expected to move to a place where median household income is high (Jackman and Savouri, 1992). Median household income can be considered as reflecting economic opportunities available at the potential destination.

According to Kusmin (2016), in 2012 the median household income in non-metro areas was 8.4 percent lower than its pre-recessionary peak in 2007, whereas the median income had risen slightly in metro areas in 2012 relative to 2007. Even though the cost of living in metro areas generally exceeds that in non-metro areas, lower incomes in rural compared to urban areas would be expected to provide an incentive for rural people to migrate to urban areas.

Unemployment data

The Local Area Unemployment Statistics (LAUS) program of the Bureau of Labor Statistics releases quarterly county-level estimates of unemployment. The levels of unemployment at destination county reflect economic opportunities of migrants at that destination. According to the Hertz et al, (2014), after the recession that started in 2007, unemployment rates rose to 10.3 percent and 9.9 percent in nonmetro and metro areas, respectively, during the first quarter of 2010 and declined slightly after that. By

comparison, in the second quarter of 2016, unemployment had fallen to 5.4 percent in non-metro areas while the rate had declined to 4.8 percent in metro areas. One of the reasons for the declining unemployment in both non-metro and metro areas since 2010, is a reduction in the size of labor force participation rate (Hertz et al, 2014)

The migration literature suggests that the unemployment rate at the potential destination has a negative relationship with rural outmigration (Jackman and Savouri, 1992). Thus, migrants would be expected to choose to move to a place where the unemployment rate is low.

Poverty data

The poverty rate prevailing at a potential destination provides another potential motive for a person's migration decision. Poverty rate data were taken from the U.S. Census Bureau's American Community Survey (ACS). The ACS provides Small Area Income and Poverty Estimates (SAIPE) based on family income of the prior 12 months.

Individuals with annual pre-tax incomes below the poverty threshold as determined by the U.S. Census Bureau each year are considered poor, i.e. an individual is defined as poor if he or she has an annual cash income less than $12,071 in 2014 (USDA, 2017). The number of poor people as a percentage of the total population is low in rural areas compared to urban areas in the United States. According to USDA (2017), in 2012 the non-metro poverty rate was 18.2 percent while it was 15.5 percent in metro areas.

The level of deep poverty in non-metro areas continued to rise after the start of the recession in 2007, and reached a high of 7.8 percent in 2013, while deep poverty in metro areas was 7.0 percent in 2011 and underwent a slight reduction to 6.9 percent in

2013 (USDA, 2017).[2] The poverty rate at the destination location is expected to have a negative impact on rural outmigration.

Educational attainment data

Educational attainment can be a significant driving force of rural outmigration. U.S. county-level data on educational attainment were taken from the U.S. Census Bureau's American Community Survey (ACS) for the 2010-2014 period. These data include the total number of people with less than a high school diploma, people with a high school diploma only, those with some college or an associate's degree, and individuals with a bachelor's degree or higher. According to Kusmin (2016), there is large gap in college and postgraduate educational attainment between metro and non-metro areas. In this thesis, I use the number of people with at least a bachelor's degree as the indicator of educational attainment. Educational attainment at the place of origin is expected to have a positive relationship with rural outmigration because migrants are expected to move to a place where they will be able to best utilize their own education.

Natural amenity data

The USDA - Economic Research Service (2013) provides information on a U.S. county-level natural amenities scale developed by McGranahan (1999). This scale consists of six components, including the average temperature in January, average hours of sunlight, average temperature in July, average relative humidity in July, land surface area of the county and the percentage of the county's area made up of water (USDA,

[2] The U.S. Census Bureau defines "deep poverty" as having a total household cash income below 50 percent of the relevant poverty threshold.

2016). A high ranking on the natural amenities scale is positively related with in-migration (Knapp and Graves, 1989), so it is expected that a migrant will choose a place where he or she can enjoy better natural amenities than at their place of origin.

Primary health care providers data

U.S. county-level data on primary health care providers between 2010 and 2014 were taken from "The Area Health Resource File" which collects data from the American Hospital Association, the U.S. Census Bureau, the American Medical Association, the Centers for Medicare & Medicaid Services, and the National Center for Health Statistics for each year. The data on primary health care providers include non-federal, practicing physicians for each county, specializing in general-practice medicine, internal medicine, family medicine, and pediatrics.

Access to primary health care includes both financial coverage and access to medical health care professionals. According to the Rural Health Information Hub (2014), U.S. non-metro areas had a 60% shortage in primary health care professionals in 2014. This means that if a rural area needs 100 doctors, there are only 40 doctors available, so rural people have less access to healthcare than their counterparts in urban areas. Therefore, it is expected that the availability of primary healthcare providers at the potential destination has a positive relationship with rural outmigration.

Social associations data

Data on the number of social associations for each U.S. county between 2010 and 2014 were taken from the Rural Health Information Hub. The data include the number of associations per 10,000 people in each county. As noted in Chapter 3, social associations

include bowling centers, golf clubs, fitness centers, civic organizations, religious organizations, political organizations, sports organizations, labor organizations, and business organizations, all of which can help to create a strong social community life.

The number of social associations at the potential destination is expected to have a positive relationship with rural outmigration. In other words, the higher the level of social association in urban areas, the greater the number of people who might move out of rural areas.

All the variables, except primary health care providers and social associations associated with the migration model of this thesis have also been analyzed in previous studies. The relative impact of these variables on rural outmigration remains of interest, because the effect of the independent variables on rural outmigration may change over time. Thus, the main concern of this study is to evaluate the driving forces of rural outmigration in United States during the recent time period between 2010 and 2014.

Chapter 5 Results

This chapter reports on the empirical results of the migration model. The analysis is based on county-to-county rural outmigration in the United States between 2010 and 2014.

Table 5.1 shows the results of the regression analysis using the Fixed-Effect method. To gain a preliminary understanding of rural outmigration, I first estimate the model containing the independent variables of previous studies of U.S. rural outmigration, including distance, median household income, the unemployment rate, poverty estimates, educational attainment, and the natural amenity index, referred to as Specification 1. Then I estimate the overall main rural outmigration model including the variables representing the presence of primary healthcare providers and social associations, in addition to the other explanatory variables, referred to as Specification 2. In addition to the Fixed Effect model, I also analyze the data using the Negative Binomial method, whose results are listed in Table 5.2. Comparing the results of both Fixed-Effect and Negative Binomial approaches allows for checking the robustness of the migration models.

Empirical results of the Fixed-Effect method

Overall, the results are in line with previous research findings, except for the parameter estimate of the poverty variable. Poverty rate is not statistically significant in this model. Distance between the place of origin and the potential destination, reflecting the migration costs, has a negative coefficient and is statistically significant at the 5% level in both Specifications 1 and 2. This result is similar to previous research findings by Davies, Greenwood, and Li (2001); and Arzaghi and Rupasingha (2011). The negative

coefficient of the distance variable confirms the negative relationship between migration costs and the incidence of rural outmigration. The parameter estimate indicates that a one unit increase in the distance between the place of origin in rural areas and the destination location in urban areas slows down rural outmigration by around 0.07 unit according to both Specification 1 and 2. In other words, the further the destination place, the higher is the cost associated with migration, and high migration costs to urban areas discourage rural people to move away from rural areas.

Educational attainment has a positive and significant impact on the migration decision according to both Specifications 1 and 2. The positive coefficient of educational attainment shows that a one unit increase in the number of people having at least a bachelor's degree is associated with an increase in the migration flow out of rural areas by around 0.03 unit according to both Specification 1 and 2. High levels of education indicate high earnings opportunities, especially in competitive and progressive sectors such as the software and other technological industries and are associated with a low probability of being unemployed. In addition, people interested in pursuing further study are more likely to move to the urban areas because of the relatively greater predominance of educational institutions in urban areas compared to rural areas. According to Kusmin (2016), the gap in the share of people with a college degree is growing between rural and urban areas in the United States. Kusmin further noted that median earnings of college graduates in urban areas were 83% above those of high school graduates in urban areas in 2013, whereas the median earnings of college graduates were 54% higher than those of high school graduates in rural areas. This suggests that many relatively highly qualified

people could improve their wellbeing and more properly utilize their qualifications if they would move to urban areas rather than staying in rural areas.

The unemployment variable is negative and statistically significant at the one percent level in both Specifications, which is similar to previous findings by Arzaghi and Rupasingha (2011), and Goetz and Debertin (1996). The negative coefficient of unemployment indicates that individuals are less attracted to a potential destination where unemployment is high. The unemployment coefficient implies that each one unit increase of the unemployment rate at the destination in urban areas is associated with a reduction in the migration flow out of rural areas by around 0.07 unit, according to both Specifications 1 and 2, respectively. The unemployment rate reflects the probability of successfully obtaining employment at potential destinations. Therefore, a high unemployment rate at the urban destination would indicate a low probability of getting a job, and would thus discourage individuals to move from the rural place at origin.

The coefficient of the median household income is positive and statistically significant at the five percent level in Specification 1 but only at the 10 percent level in Specification 2. The median household income coefficient implies that a one unit increase in the median household income at the urban destination is associated with an increase in the migration flow out of rural areas by around 0.08 unit according to both Specifications 1 and 2. These results confirm that people tend to move to places with high median household incomes. Median household incomes at the destination places reflect the economic opportunity at those locations, so high levels of income in urban areas are associated with high economic opportunities, and thus encourage rural people to move to urban areas.

The results also show that the poverty estimate has a negative relation with rural outmigration, but the parameter is not statistically significant in neither Specification 1 nor 2. This result does not match with the previous research finding by Rodgers and Rodgers (1997), Fisher (2005), and Marre (2009) who showed that poverty has significant impact on rural outmigration in the United States. The reason for the insignificance of the poverty estimate in the rural outmigration model may be due to the increase in the poverty rates in both rural and urban areas between 2009 and 2014 as a result of the 2008 recession and slow economic recovery. In particular, Kusmin (2016) reported that the overall poverty rate was 15.5 percent in metro areas and 17.7 percent in rural areas in 2012, thus indicating that the rural-urban difference in poverty rates is relatively small. It is possible that the rural-urban difference in poverty rates are at least partially offset by costs of living differences and introduce levels of uncertainty, so people might default to relying on their own existing network and not take on additional risk by moving. Though the poverty rate is higher in rural areas compared to urban areas, the rise in urban poverty rates between 2009 and 2014, as stated earlier, may have demotivated individuals to migrate out of rural areas. Thus, the poverty estimate does not explain the rural outmigration between 2010 and 2014.

The presence of natural amenities has a positive and significant impact on rural outmigration according to both Specifications 1 and 2. The positive coefficient of the natural amenity variable implies that the greater the presence of natural amenities (as reflected in a high score on the amenities scale) in urban areas, the higher the migration flow out of rural areas.

The coefficient of the primary healthcare providers is positive and statistically significant at the 10 percent level in Specification 2. The coefficient implies that a one unit increase in the number of primary healthcare providers in urban destination areas is associated with an increase in the migration flow out of rural areas by around 0.06 unit. This result confirms my prediction about the impact of primary healthcare providers in rural outmigration decision. This finding is a key contribution of my thesis because no other studies have previously considered using the access to primary healthcare providers as a determinant of rural outmigration in the case of United States. Hence, the shortage of primary healthcare providers in rural areas compared to urban areas documented in chapter 3 contributes to releasing people out of rural areas in the United States in efforts to improve their wellbeing.

The coefficient of the social associations variable is positive but not statistically significant. The positive coefficient would imply that an increase in the number of social association in the urban areas would be associated with a rise in migration out of rural areas, but the insignificance of the social associations variable in the model suggests that rural outmigration is not affected by the number of association in the urban areas. One way to explain this result is that while urban areas may provide a larger number of social associations than rural areas, what may matter more is the amount and quality of an individual's existing social network. Furthermore, giving up social linkages in rural areas and replacing them with new network in urban areas involves additional costs that may not be fully captured in the current study.

Empirical results of the Negative Binomial method

Table 5.2 shows the results of the Negative Binomial model. I applied this method to compare its results with those of the Fixed-Effect method and to check for the robustness of the results. The findings of Negative Binomial method differ somewhat from those of the Fixed-Effect method. The distance variable has a negative coefficient and is statistically significant at the one percent level in both Specifications 1 and 2 as opposed to the Fixed-Effect findings. The coefficient of educational attainment is only statistically significant at the 10 percent level in Specification 1 and at the 5 percent level in Specification 2.

Similar to the Fixed-Effect findings, the coefficients for the median household income and the natural amenity variables are positive and are statistically significant in both Specifications. The results of the Negative Binomial model confirm the insignificance of the poverty rate parameter estimate in the rural outmigration model.

The results of the Negative Binomial model also confirm the significant impact of the primary healthcare providers variable and the insignificant impact of the social associations variable in the rural outmigration model.

The correlation coefficients in Table 5.3 shows there is no multicollinearity concern which strengthen the robustness of the results. The correlation table confirms that the distance between place of origin and destination, the poverty rate and the unemployment rate at the urban destination have negative relationship with rural outmigration. On the other side, median household income, the presence of natural amenities, access to primary health care providers and social associations at potential urban destination have positive relationships with rural outmigration.

Chapter 6: Conclusions and Recommendations

Rural and urban counties may be compared based on their availability of economic opportunities and high standards of living that individuals presumably value. Expectations of achieving desirable economic opportunities and improved standards of living may lead people to engage in geographical migration from rural to urban areas. In this study, the decision among rural people migrate to urban areas is primarily based on maximizing their expected returns. The findings of this study confirm that the rural people tend to migrate to urban areas if the expected returns in urban areas exceed the returns in rural areas. These finding are similar to the major conclusions regarding the determinants of migration in the United States conducted by Davies, Greenwood and Li (2001) and Arzaghi and Rupasingha (2011).

Rural outmigration is explained by way of a number of variables, including distance between origin and destination, median household income, unemployment rates, the poverty rates, educational attainment and a natural amenity index. These variables were also used in previous rural outmigration studies and were used here to re-examine their validity regarding the extent to which they determined rural outmigration in the United States between 2010 and 2014. Regression analysis using both Fixed-Effect and Negative Binomial methods confirm the validity of those traditional variables in explaining rural outmigration, except for the poverty rates. In particular, the degree of poverty is not found to be a significant determining factor in individuals' decision to migrate out of rural areas. One of the major contributions of this thesis is to introduce and confirm the crucial role that access to primary healthcare providers plays in rural

outmigration, which is a thought-provoking finding. The findings reveal that rural people migrate to urban areas where the availability of primary healthcare providers is high.

The empirical results of this thesis leave scope for many improvements and new research ideas. Possible future work may focus on verifying the validity of the finding that access to primary healthcare providers is a contributing factor to rural outmigration by using alternative measures and model specifications. Because the determinants of rural outmigration are not consistent over time, one can use alternative model specification for projecting future rural outmigration flows and their consequences, which would allow for timely development and policy adjustments.

Based on the significant role of access to health care providers at urban destination areas in rural outmigration decision, government policies could consider increasing access to primary physicians by increasing their salaries and expanding health Information Technology (IT) in rural areas to improve the quality of life of the people staying in those areas. In addition, improved development policies are needed to increase employment opportunities in rural areas to encourage rural people to stay in rural areas.

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Table 5.1: Empirical results of the Fixed-Effect method

	Specification 1		Specification 2	
	Coefficient	t	Coefficient	t
dist	-0.07	5.26**	-0.07	7.11**
edu	0.03	0.37**	0.03	0.18**
un	-0.07	9.14***	-0.07	0.18***
medin	0.08	0.16**	0.08	0.16*
povst	-0.03	0.05	-0.07	0.03
ame	0.04	0.18*	0.07	1.06*
hp			0.06	0.42*
sa			0.09	0.04
R^2 within	0.32		0.45	
R^2between	0.07		0.22	
R^2overall	0.02		0.31	
N	1976		1976	

Level of significance: '***'= P ≤ 0.01, '**'= P ≤ 0.05, '*'= P ≤ 0.10.

Table 5.2: Empirical results of the Negative Binomial method

	Specification 1		Specification 2	
	Coefficient	z	Coefficient	z
dist	-0.04	0.21***	-0.05	0.15***
edu	0.02	0.01*	0.02	0.14**
un	-0.03	0.15***	-0.05	0.12***
medin	0.07	0.17**	0.03	0.01*
povst	-0.01	0.02	-0.01	0.01
ame	0.04	0.22*	0.07	0.10*
hp			0.06	0.28*
sa			0.05	0.02
N	1976		1976	

Level of significance: '***'= P ≤ 0.01, '**'= P ≤ 0.05, '*'= P ≤ 0.10.

Table 5.3: Correlation coefficients

	outmig	dis	edu	povst	un	medin	ame	hp	sa
outmig	1								
dis	-0.37	1							
edu	0.23	0.10	1						
povst	-0.14	0.05	-0.11	1					
un	-0.60	0.15	-0.07	0.18	1				
medin	0.38	-0.03	0.06	-0.12	-0.09	1			
ame	0.56	0.01	0.01	0.13	0.03	0.11	1		
hp	0.45	-0.03	0.02	-0.02	0.04	0.01	0.04	1	
sa	0.15	0.14	0.01	0.04	0.02	0.04	0.01	0.06	1