ECOLOGICAL ECONOMICS 68 (2008) 240–248

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ANALYSIS

The role of natural resource amenities in attracting retirees: Implications for economic growth policy

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ARTICLE INFO

Article history:
Received 26 June 2007
Received in revised form
28 December 2007
Accepted 26 February 2008
Available online 18 April 2008

Keywords:
Natural resource amenity
Retiree growth
Retiree economy
US counties

ABSTRACT

Increasing criticism of resource-extractive and polluting heavy duty industries in urban areas, as well as continuing declines in timbering, farming and mining in rural areas, have created challenges for planners and policy makers seeking sustainable rural economies. Earlier studies have concluded that a "retiree economy" is a viable approach for rural economic sustainability. Using specific measures of natural amenities that are variant over time; this study examined the role that natural amenity resources have played in attracting retirees. Results reveal that the rural and biologically rich counties with substantial land use diversity, water amenities, and other man-modified natural and recreational attractions have great potential for attracting retirees. The findings from this study can be useful for local and regional agencies to identity their latent potential to promote retiree economy, and also to predict the future amenity demands. In addition, we draw other policy implications regarding regional economic growth and ecological concern in rural America.

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1. Introduction

Historically, federal resources have been allocated to help rural communities finance their infrastructure development such as roads, schools, electrification, and sewers (Whitener, 2005). Unlike the traditional approach of federal funding for local development, more sustainable and collaborative strategies are being emphasized currently to focus on rural development through mobilizing the local resources (Layzer, 2006). Using local resources for development could gain more local public support, reduce local dependency on federal and state resources, and, therefore, be more sustainable in the long run.

Nevertheless, most local governments are continuing to follow traditional economic development strategies such as raising tax rates or attracting industries or heavy manufacturers for their economic base. These approaches have been criticized, however, for their detrimental impact on the environment and quality of life (Reeder, 1998). With increasing environmental and health awareness of urban and suburban residents, these approaches are not likely to gain social support in the future (Kim et al., 2005; Castle, 1993; Buttel, 1995). This suggests that governments in urban and suburban areas will have limited reliance on such traditional growth engines in the future.

On the other hand, rural counties that primarily rely on extractive use of natural resources such as farming and mining have experienced continuous declines in business during recent decades (Reeder, 1998; Das and Rainey, 2007). For example, the nation experienced a loss of more than 15% manufacturing jobs between 2000 and 2003 (Kusmin, 2006). Even though, the wage rates within some selected industries are considerably higher or

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doi:10.1016/j.ecolecon.2008.02.022

stable in some regions, the employment and real earnings from these industries is decreasing. This can affect the economic dependency of local government in such industries. For example, the Rocky Mountain region observed higher mining wage rates but declining wages for service and trade industries. But the number of farming and mining dependent counties in the region declined by 47% and 18% respectively whereas the service trade counties in the area increased by about 60% in recent decades (Vias, 1999,pp. 19). Given the volatility of these job markets and also the citizen demand for a cleaner environment, policy makers and local governmental officials might be interested in identifying resources and innovative income-generating activities that are environmentally friendly and sustainable. This paper is a national study using a county level dataset to examine the role of natural resource amenity to attract retirees, which as earlier studies suggested, could have important implications for fueling local economies.

Natural resources and nature-based amenities have been considered an integral part of growth and development in previous studies (Carlino and Mills, 1987; Clark and Murphy, 1996; Green, 2001; Kim et al., 2005; Deller et al., 2001; Rupasingha and Goetz, 2004; Nzaku and Bukenya, 2005). These studies employed modern growth or development theory to explain the growth in population, income, and employment in relation to various amenities including natural resources. However, understanding general population growth in relation to county amenities might not be as economically appealing as explaining the potential of such amenities to attract economically prosperous retirees. So, policy makers could draw few implications from earlier studies to adopt any specific economic growth strategy.

Recent studies have suggested that attracting retirees can be a potential growth engine for rural America (Reeder, 1998; Deller, 1995; Shields et al., 2001; Federick, 1993; Keith and Fawson, 1995; Stallman and Siegel, 1995; Haas and Serow, 1990; Skelley, 2004; Das and Rainey, 2007). The studies revealed that educated and economically prosperous retirees for permanent migration bring a tremendous potential for rural economic development. They revealed that economically prosperous retirees provide multiplier effects to local economies. A few of these benefits include, but are not limited to: increased tax revenue, local retail expenditure and cash flow; and increased service based jobs, donations, and community services (Haas and Serow, 1990; Siegel and Leuthold, 1993; Fagan and Longino, 1993). A few counties predominantly located in rural settings have already benefited from the retirees in recent years (Reeder, 1998), and similar non-metro counties possess great potential to attract retirees in the future for their economic development (Serow, 2003).

Moreover, the retiree population is projected to increase significantly in the near future, with the aging of the 76 million baby boomers, which account for more than 28% of the US population (Duncombe et al., 2001; US Census Bureau, 2006). LRDC (2006) projects that there will be 72 million people of retiree age nationwide by 2030. A recent paper by Oehmke et al. (2007) argues that there are three different types of migration among the retiree age population. The first type of move is by elderly people who move to their families for daily living assistance. Secondly, the elderly move to a long-term care facility. The third type of move is that the physically and financially healthy retirees migrate to amenity rich location for better quality of life. The focus of current paper is on third type of retiree migration, which is more important from an economic development point of view.

While not all retirees move to new destinations, there is no clear evidence on what portion of retirees would be mobile (i.e. migrating to new destinations) and what portion of them would be stationary (i.e. staying in their current locations). However, surveys in earlier studies concluded that portion of retirees who migrate to new destinations could be as high as 38% of total retiree population (Governors Task Force, 1994). Similarly, Park and Clark, (2007) suggested that more than 400,000 retirees will choose to migrate out of their state border in next two decades, and this number is likely to grow in the future (Skelley, 2004). As these physically and financially healthy retirees are looking for their retirement destination (Oehmke et al., 2007), attracting them would be an important agenda for local governments to foster economic growth and community services.

Earlier studies such as Schneider and Green, (1992), Duncombe et al. (2001, 2003) revealed the effect of place characteristics on residential choice among the retirement age population. However, the focus of their study was more on state and local fiscal factors and government expenditures rather than the natural amenities, which may also have significant influence on retirees' relocation decisions. Importantly, many local government agency officials may not be aware of the specific natural resources or amenities they have to attract retirees (Reeder, 1998; LRDC, 2006). Identifying such valuable and attractive amenities is important for the local agencies. As Duncombe et al. (2003) suggested, marketing such amenities would be even a better strategy for attracting retirees than providing fiscal incentives such as tax exemptions. Further, lacking specific information, many local agencies might waste their efforts to attract retiree even though they do not have such amenities to offer (Reeder, 1998). All of these facts provided the motivation for a study that explores the specific amenities that retirees value (Gustafson et al., 2005). The objective of our study is to examine the role played by specific natural resources amenities on retiree growth in U.S. counties. We hypothesize that the counties with high levels of natural amenities and man-modified nature-based recreational amenities possess a significant advantage in attracting retirees. The findings from this study will provide policy insights to local government and regional planners to identify their potential for economic growth by attracting retirees and also justify the efforts to preserve natural amenities.

Previous studies used both the stated and revealed preference-based assessments to study the migration pattern of retirees. For instance, some of the studies used stated preference approaches in which individual retirees were surveyed about their relocation decisions (Haigood and Crompton, 1998; Bennett, 1993; Haas et al., 2006). Alternatively, Graff and Wiseman (1990); Duncombe et al. (2001) and (2003); Oehmke et al. (2007) used the revealed preference approach in which the migration of retirement age population was analyzed with respect to variables of interest. The current study also used the revealed preference approach to examine the retirement inmigration pattern in relation to the availability of natural amenity resources. A revealed preference approach was used because 1) it avoids the possible errors and bias involved in the survey process, 2) it is easier and much faster to work and can incorporate a broader geographical coverage, and 3) the developed model can easily be used to predict the future migration pattern of retirees.

2. Empirical model

The growth of retirees in a county was explained as a function of the socioeconomic characteristics and availability of natural as well as other life amenities. Following the definition of the USDA Economic Research Service (ERS), the dependent variable, which is the retiree growth[1] in a county between 1990 and 2000, was measured as a percentage increase in the population of age 60 and higher due to inmigration during the period. Following Deller et al. (2001), it was assumed that the households are free to migrate and in doing so, they maximize utility that is derived from the consumption of market goods, services, and natural resource amenities. As some of the explanatory variables can be endogenous to retiree growth, we jointly estimated the following model in a simultaneous equation approach (Greene, 2003).

$$Y_i = \alpha X_i + \beta P_i + \varepsilon_i \quad (1)$$

$$P_i = \lambda Y_i + \delta R_i + \upsilon_i, \quad (2)$$

where the term Y_i represents percentage growth in the number of retirees in county i, and X_i is the vector of exogenous socioeconomic factors, natural amenities and human-modified recreational amenities. The P_i is the vector of endogenous variables in the model and the term R_i represents the vector of factors that influence the endogenous variables. Terms ε_i and υ_i are the terms capturing errors whereas α, β, λ, and δ are the parameters to be estimated.

The Durbin–Wu–Hausman test (Wooldridge, 2003, pp. 483) was used to check endogeneity of suspected explanatory variables. In a theoretical manner, two variables i.e. housing value and hospitals were considered highly likely to be interdependent with or influenced by the retiree growth and hence checked for endogeneity. For example, since housing affordability can affect retirees' locational choice, but at the same time counties can experience a considerable boom in housing market following the initial inmigration of prosperous retirees into the area. Similarly, another basic feature retirees may consider in their migration decision is the availability of medical facilities in a new destination. On the other hand, an increase in the retiree population might require more health care facilities in the area, as well as more hospitals. Given the fact that the uniqueness of the functional form is rather arbitrary, the choice of the instrumental variable is difficult. However, distance to the city, median household income, percentage of college graduate in the county, vacancy rate of housing, median age and rent of houses, percentage of population under poverty level were chosen as unique instrumental variables[2] for housing value and hospital equations.

Although it is fairly common to use two-stage least squares to estimate the above defined system of equations, the estimates would not be efficient if the error terms among the equations are correlated. In such case, the estimates would be unbiased and consistent, but not efficient. The model was estimated with a three stage least square estimator (Zellner and Theil, 1962), which was essential in this study for three reasons. First, the correlation among the error terms across the equations in our model was significant at the 1% level; secondly, the equations in the system were over identified (Witte et al., 1979); and third, the study used several thousand observations. Using a three stage least square in such case ensures the asymptotic efficiency of the estimates (Greene, 2003).

The retiree growth Eq. (1) included variables measuring the socio-demographic and economic factors, neighborhood quality, taxation, and other policy effects. A variable capturing the proportion of retirement age population in the county at the base year (1990) was included in the retiree growth equation. This was assumed to control for situations where counties already consisting of large numbers of retirees may not be capable of receiving more retirees. Following Duncombe et al. (2001), the median housing value, population density, property tax per unit of property, and percentage of African-Americans were included to capture the socioeconomic characteristics and policy factors in the county. Availability of seasonal homes was also included to capture the availability of housing in the area that might attract outside recreationists (Beale and Johnson, 1998).

Similarly, following Duncombe et al. (2001), number of hospitals per thousand population was included to capture the medical services in the county, whereas the reported crime incidents per thousand population was included to take into account of general neighborhood quality. A dummy variable measuring whether or not the county was rural, but adjacent to a metropolitan area in 1990 was included to determine if retiree migration differs from typical population spillover in metro surroundings. Distances to the interstate and state highway networks and nearest airport were also included to capture effects of various transportation facilities on retiree growth. Furthermore, regional dummy variables were also included to control for variation in the retiree's locational choice for migration, i.e., Northeast (reference), Midwest, South and West.

[1] There is not a clear consensus on who should be counted as retiree. Hass et al. (2006) presented three different definitions of retirees. First is traditional age based definition, which defines retirees as migrants aged 60 or older who resided in another state 5 years ago. Second and third are retirement based definition which include the individuals aged 50 or older based on their length of residence in another state, their working hours, presence in labor force and receipt of government assistance. Duncombe et al. (2001) defined migrant populations of 65 years and older age as retiree. However, the current study follows the definition of USDA, Economic Research Service.

[2] Even though, instruments are not always as good as we would like, the chosen variables should meet two desired criteria (Wooldridge, 2003). The first is relevance, which means that the instruments should be partially correlated with the endogenous variable. Following Stock and Watson rule of thumb, two separate F tests rejected the hypothesis that the joint effect of the instrument is zero at 1% significant level for both the housing value equation (F-statistic of 1652.34) and hospital equation (F-statistic of 20.44); and confirmed that the instruments are relevant and have reasonable predictive power. The second criterion is validity, which means that the chosen variable should be uncorrelated with the error term of structural equation. To check this, we regressed the error term against the exogenous variables. A Chi-square test accepted the null that the instruments are uncorrelated with the error term at 1% level (Chi square statistic of 5.51 and critical value of 15.09); and suggested that the instruments used in the equations are valid.

In addition, two sets of variables capturing the natural amenities and man-modified natural amenity in the county were added following earlier literature on retiree migration (Haigood and Crompton, 1998; Reeder, 1998; Duncombe et al., 2001). The natural amenity variable set comprised of the climatic factors including average annual temperature and mean daily sunlight hours (Oehmke et al., 2007); land-based amenities including percentage of county area under forests, cropland, and pastureland; and water-based amenities including percentage of the county under water bodies, mileage of scenic river weighted by the county area, and whether or not the county was coastal. Likewise, a topographical index that represents the topographical variation within the county was also included. Topographical variation is considered a natural attraction in the landscape and is believed to attract nature-based recreationists (Whitener, 2005) and retirees (Pampel et al., 1984).

Man-modified natural and recreational amenities included attractions that are either based on natural resources but developed with some human investment, or recreational and entertainment attractions connected in some way with the

Table 1 – Variable definition, descriptive statistics and data sources

Variables	Description	Mean (Standard deviation)	Data source[b]
Socioeconomic factors			
Retiree age population	Population of 60 and more years age as a proportion of county population in 1990	0.19 (0.05)	US Census Bureau
Median housing value[a]	Median value of all type of county housing in dollars	80,478.49 (41,677.60)	US Census Bureau
Population density	Number of people per square mile	206.70 (1489.46)	US Census Bureau
Tax rate	Collected property tax sum divided by the number of properties in county	1.43 (1.22)	US Census Bureau
African-American	Percentage of African-American in county population	8.56 (14.34)	US Census Bureau
Seasonal house	Percentage of seasonal and recreational housing units in county	6.39 (8.98)	US Census Bureau
Crime	Number of reported crime incidence of all kinds per thousand populations	27.00 (126.28)	FBI, Uniform Crime Report
Hospital[a]	Number of hospital per thousand populations	0.05 (0.08)	US Census Bureau
Metro adjacency	Binary variable, if the county is rural and shares border with a metro county 1, 0 otherwise	0.32 (0.46)	USDA, ERS
Distance to highways	Distance in kilometers to inter/state highway from county center	38.67 (37.45)	ESRI
Distance to airport	Distance in kilometers to airport from the county center	53.9673 (31.45)	ESRI
Northeast	Binary variable, 1 if county is in north eastern region, 0 otherwise (reference type)	0.07 (0.25)	US Census Bureau
Midwest	Binary variable, 1 if county is in mid western region, 0 otherwise	0.34 (0.47)	US Census Bureau
South	Binary variable, 1 if county is in southern region, 0 otherwise	0.44 (0.49)	US Census Bureau
West	Binary variable, 1 if county is in western region, 0 otherwise	0.07 (0.25)	US Census Bureau
Natural amenities			
Temperature	Average annual temperature in Fahrenheit degrees	54.67 (8.25)	NOAA
Sunlight hours	Average number of sunlight hours in January	151.51 (33.29)	NOAA
Forestland	Forestland acres as a percentage of county area	29.28 (35.04)	NORSIS
Cropland	Cropland acres as a percentage of county area	28.22 (26.44)	NORSIS
Pastureland	Pastureland acres as a percentage of county area	9.93 (10.88)	NORSIS
Water area	Water body acres as a percentage of county area	5.60 (9.17)	NORSIS
Scenic river miles	Mileages of scenic river within county weighted by county area	0.02 (0.04)	NORSIS
Coastal	Dummy variable, If county shares border with coast 1, 0 otherwise	0.09 (0.29)	NORSIS
Topographic index	Continuous categorical index for topographical steepness of county land, starting from 1 for flat plains to 21 for high mountains	8.89 (6.59)	USGS
Man-modified natural and recreational amenities			
State park	Dummy variable, if the county has a state park 1, 0 otherwise	0.48 (0.49)	NORSIS
Fishing camps	Number of fishing camps in the county	0.07 (0.76)	NORSIS
Amusement	Number of amusement places in the county	2.24 (6.09)	NORSIS
Sports	Dummy variable, if the county has a sport attraction 1, 0 otherwise	0.07 (0.26)	NORSIS
Arts and culture	Dummy variable, if the county has a historical, heritage arts or cultural attractions, 0 otherwise	0.09 (0.29)	NORSIS
Distance to national park	Distance in kilometers from the county center to the national park entrance	59.08 (53.63)	ESRI
Golf courses	Number of golf courses per thousand populations in county	0.01 (0.06)	NORSIS

[a] Indicates an endogenous variable.

[b] Data are at county level. Abbreviations: FBI, Federal Bureau of Investigation; USDA,-ERS, US Department of Agriculture- Economic Research Service; ESRI, Environmental and Scientific Research Institute; NOAA, National Oceanic and Atmospheric Administration; NORSIS, National Outdoor Recreation Supply Information System.

outdoor and cultural values of the locality. The variables in this category included number of fishing camps, number of amusement places, a dummy capturing whether or not the county has a sports attraction, and a dummy capturing whether or not the county has arts and cultural attractions. Also included in this category were the distance to national parks, presence of state recreation park, and golf courses per thousand residents. It should be noted that golf courses are not natural amenities in themselves, but they are popular human-built recreation facilities for retirees, of which the open space, scenic quality, and natural landscape are integral elements. A detailed definition, descriptive statistics and data sources of explanatory variables are presented in Table 1. Variables included in the retiree growth equation were checked for multicollinearity using the variance inflation factor (VIF). A common rule of thumb is that multicollinearity is a problem if the VIF index for any variable exceeds 10 (Gujarati, 1995). Computed VIF for variables in our model were far less than this threshold (Table 2), suggesting that multicollinearity was not the problem.

3. Data and study area

Data used in this study came from a variety of sources. Data on retiree population growth came from the Inter-University Consortium for Political and Social Research, and were originally derived from the US Census data of 1990 and 2000 (Voss et al., 2005). Demographic and housing value data were obtained from the 1990 US Census. Tax data and number of hospital were obtained from the US Census Bureau's City and County Data Book for 1998. The crime incidence data for 1991 were obtained from the Federal Bureau of Investigation's Uniform Crime Report. The distance from counties to national parks, inter/state highways, and the airport were computed in the ArcGIS 9.2 using a dataset from the Environmental and Scientific Research Institute (ESRI, 2006). The dummy variable for rural counties adjacent to metropolitan areas in 1990 was created using the USDA-ERS county typology and ESRI dataset in ArcGIS 9.2. A non-metro county was marked as rural-adjacent to a metro area if it shared a border with a metro area of at least 250,000 population. Information identifying whether or not a given county belongs to one of the four U. S. geographic regions (Northeast, South, Midwest and West) came from the standard classification by the US Census Bureau.

Average annual temperature and mean sunlight hours in January, that were originally developed by National Climatological Data Center of NOAA based on long-term observations, were obtained from USDA-ERS (McGranahan, 1999). Topographical index was obtained from U.S. Geological Service. The index value increases with general steepness of the county land surface. Measures of land use and water-based amenities were obtained from the National Outdoor Recreation Supply Information System (NORSIS) of the USDA Forest Service (Betz, 1997). NORSIS maintains periodic information about outdoor recreation amenities in the U.S. at various levels of geographical aggregation. The county level land cover data managed by NORSIS were originally developed from the National Land cover Dataset of US Geological Service The total mileage of designated national and state scenic rivers was obtained from NORSIS and weighted by county area to obtain a measure of density stated as miles per unit of county area. Similarly, the data for all the variables in man-modified natural and recreational amenities set were obtained from the NORSIS dataset as well. The geographical coverage of this study was conterminous United States and the counties were the individual unit of analysis. However, a few counties from the conterminous USA were excluded from the analysis due to data limitations, reducing the total number of counties in the analysis to 3064.

Table 2 – Three stage least square estimates from the retiree growth equation

Variables	Coefficient standard error	Elasticity	VIF
Intercept	−195.313*** (11.204)	–	–
Socioeconomic factors			
Retiree age population	46.319*** (4.953)	1.847	1.57
Ln(Median housing value)	18.078*** (1.115)	3.658	2.64
Population density	−0.001*** (0.000)	−0.038	1.23
Ln(Tax rate)	−5.626*** (0.573)	−1.138	1.95
African-American	−0.136*** (0.019)	−0.232	2.04
Seasonal house	0.300*** (0.028)	0.388	1.65
Ln(Crime rate)	−0.012 (0.011)	−0.002	1.80
Hospital	50.790*** (14.448)	0.571	1.38
Metro adjacency	1.240*** (0.444)	0.081	1.10
Ln(Distance to highways)	−0.379** (0.171)	−0.076	1.30
Ln(Distance to Airport)	−0.599* (0.348)	−0.121	1.60
Midwest	8.636*** (1.028)	0.601	6.01
South	8.151*** (1.104)	0.741	7.73
West	10.870*** (1.221)	0.295	3.97
Natural amenities			
Temperature	0.315*** (0.041)	3.491	3.28
Sunlight hours	0.033*** (0.007)	1.037	1.64
Forestland	0.076*** (0.012)	0.437	3.31
Cropland	0.028** (0.013)	0.151	3.39
Pastureland	0.098*** (0.020)	0.197	1.58
Water area	0.095*** (0.026)	0.108	1.91
Scenic river miles	7.933* (4.454)	0.038	1.18
Coastal	−0.929 (0.781)	−0.018	1.73
Topographic index	−0.008 (0.045)	−0.015	2.66
Man-modified natural and recreational amenities			
State park	1.254*** (0.378)	0.123	1.15
Fishing camps	0.433* (0.248)	0.005	1.14
Amusement	−0.172*** (0.037)	−0.078	1.68
Sports	1.280* (0.742)	0.019	1.27
Arts and culture	−0.047 (0.668)	−0.000	1.30
Ln(Distance to national park)	−0.160* (0.088)	−0.032	1.48
Golf courses	13.889*** (2.069)	0.227	1.21
Chi-square statistic	1662.47***		
R-square	0.31		
No. of observations	3064		

Note: ***, ** and * indicate the significance of parameters at 1%, 5% and 10% level respectively.

4. Results and discussion

The Wald test suggested that the Chi-square statistic of 1662.47 (critical value 135.80), which is significant at less than 1%,

justified the simultaneous estimation of model using the three stage least square estimator. Moreover, the Durbin–Wu–Hausman test of endogeneity rejected our hypothesis at the 5% level that median housing value and hospitals per thousand capita are exogenous. Therefore, the model treated these variables as endogenous to retiree growth. Regression result shows that most of the variables (26 out of 30) were statistically significant, including 19 at the 1% level, 2 at 5%, and the remaining 5 at the 10% level. The coefficient, standard error, and elasticity of each variable on retirees' choice of counties have been reported in Table 2. The variable capturing the proportion of the retiree age population in 1990 was positively related at the 1% level, corroborating the earlier findings of Duncombe et al. (2001); Fuguitt and Beale, (1996). As expected, most of the other socioeconomic variables, including population density, proportion of African-American residents, and property tax rate were negatively related to retiree growth and were significant at the 1% level. Since, the higher population density indicates a higher congestion that negatively affects the local environment and transportation, its negative effect is quite intuitive. It reveals that retirees prefer low-density residential counties (Duncombe et al., 2001) and they are very sensitive to property tax rate at potential destinations (Duncombe et al., 2001, 2003). This supports some states' policies to provide tax breaks for seniors in order to retain or attract them as residents (Reeder, 1998; Mackey and Carter, 1994).

Although crime rate per thousand residents was found to be negatively related, it was not statistically significant. As expected, hospitals per thousand residents had a positive and significant effect on retiree growth, suggesting that health care and medical facilities are important considerations for retirees in selecting their destinations (Oehmke et al., 2007). Consistent with our expectations, adjacency of the county with a metropolitan area, had a positive and significant effect on retiree growth, corroborating the argument of Reeder (1998) that the rural areas adjacent to urban areas experienced greater than average retiree growth during the 1990s. This may be because the retirees want to live in close proximity to regional shopping centers, and other social and health amenities, while finding a place to live that also has natural and open areas. It reveals that some metropolitan areas located next to naturally rich communities may have advantage from the influx of retirees. This is consistent with some earlier observations such as Siegel and Leuthold's (1993) study, which found that the Knoxville Metropolitan area in Tennessee benefited from the economic impact of retirement growth in nearby communities including Tellico Village; and Renkow, (2003) that the economic growth and development in the urban–rural fringe areas are influenced by the spatial spillover of population and employment growth in adjacent urban and rural counties. Further, coefficients on distance to highways and airport suggested that the counties with immediate access to major transportation facilities might have an advantage in attracting retirees.

Among the natural resource amenities, climatic variables, including average annual temperature and mean January sunlight hours, were positively and significantly related to retiree migration at the 1% level. Clearly, warmer climates and relatively long sunny winter days offer a more desirable environment and more outdoor opportunities (Reeder, 1998). The estimated elasticity indicates that a 1% higher average annual temperature in the county can increase retiree growth by 3.5%, ceteris paribus. In a similar interpretation, the ceteris paribus effect of a 1% increase in mean sunlight hours in January was 1% increase in county's retiree growth. Among the land-based natural amenities, percentage of forestland, cropland, and pastureland were positively and significantly related with retiree growth at the 1% level. Elasticity estimates revealed that a 10% increase in the percentage of county area under forest increased retiree growth by 4.3%, ceteris paribus. Assuming all other things constant, a similar increase in cropland and pastureland will separately contribute to retiree growth in the county by 1.5% and 1.9%, respectively. The strong effect of these natural land use types might be explained by open and green space, which provide more recreational and amenity values in the area. Further, such land uses might have important indirect benefits to maintain a stable microclimate or offer invaluable ecosystem services, such as aesthetic beauty and quality of life. Importantly, the size of the marginal effects of these three landuse types reflect an ordering of importance of open space types, with highest for natural and wild forest areas, followed by pastureland, and lowest for cropland, which is often considered an intensive land use practice. Although we expected that mountains, vistas, and valleys as captured by topographical index could typically add scenic value in the landscape (Pampel et al., 1984), the effect was insignificant.

The water resource amenities, including the percentage of county area in waterbodies and scenic river miles per unit of land area also exhibited positive and significant relationships with retiree growth. The results indicated that a 10% increase in percentage of county land area in water bodies such as lakes, streams contributed to an increase in retiree growth by 1%, ceteris paribus. Similarly, assuming other things constant, a 10% increase in designated river miles per square mile area contributed 0.3% growth in retiree inmigration. The positive effect of these resources is understandable because water-based amenity resources provide scenic values and recreational opportunities (e.g., boating, rafting, swimming). The insignificant effect of coastal locations, however suggests that the retiree growth during 1990s occurred in the inland counties. It may reflect a movement away from coastal counties due to excessive property values, increasing insurance costs due to hurricanes and flooding, and the general trend for retirees to leave coastal areas and move to more seasonable climates. Also, the counties in east and west coasts might have already been crowded and may no longer are the preferred destination for retirees.

Most of the variables among the human-modified natural and recreational amenities were significantly related with the retiree growth. The presence of a state park in the county had a positive effect that was significant at the 1% level, suggesting that the local agencies could invest in such recreational parks to attract retirees. Likewise, the number of fishing camps, number of sports attractions in the county were positively and significantly related with the retiree growth at the 10% level. Apparently greater availability of fishing opportunities and also other sporting events in a county is likely to attract retirees. Similarly, the golf courses in the county had a positive effect that was significant at the 1% level, indicating a strong

attraction to retirees. Contrary to our expectation, the availability of amusement places was negatively related with the retiree growth in the county. One explanation behind this however, is that the amusement attraction might be more popular for family vacation destinations, where the primary recreationists are children rather than the elderly people.

Distance to national parks was negatively and significantly associated with the retiree growth in the county at the 10% level. It reveals that counties in closer distances to a national park entrance are associated with higher retiree growth rate. The casual observation behind this is that such counties are advantaged with many outdoor opportunities, wilderness attractions, and environmental qualities. This is consistent with Johnson and Beale (2002), who mentioned that the counties around national parks experienced higher than average inmigration recently. Although this observation may be encouraging evidence for economic growth in counties near national parks, it is also possible that greater concentrations of retirees and others in the vicinity of national parks may threaten the natural integrity of a park in the long run.

5. Conclusion

Extending the earlier studies that focused on general population growth and relied heavily on complex amenity measures, this study examined retiree growth specifically and identified more direct measures of natural amenities that might attract and retain retirees. While much of the retiree growth in recent decades has occurred in rural counties close to metropolitan areas and transportation corridors, it has occurred in rural counties endowed with natural amenities as well. While recent studies in regional economics suggest that a growing retiree population offers potential economic growth, this study has shown that warm and sunny climates, open lands, scenery, and water are important natural resource amenities to attract retirees. Not as attractive to retirees are highly populated and congested areas, coastal areas, and areas with high property tax rates. Our findings suggest that policies specifically encouraging nature-based recreational facilities, natural parks and wilderness areas, fishing spots, along with golf facilities and sporting events, can add to the amenity attractiveness of a locality for retirees.

There are several implications from this study for local and regional economic development policy, real estate marketing, outdoor recreation and tourism providers, and natural resources conservation. First, our results offer fresh empirical evidence on migration pattern of retirees in relation to natural amenities. Local and state agencies can better identify the potential to attract retirees as a stimulus to a county economy. At the same time, counties without natural amenities can assess and perhaps limit their level of effort toward a retiree economy strategy. For amenity rich counties, identifying natural land and water-based amenities and their long-term protection may be needed before they are over developed. Local agencies may see benefits in preserving natural amenities and also by introducing other nature-based recreation facilities, such as natural parks, golf courses, fishing camps, and other recreational sites.

Second, in addition to careful management of natural amenities, local agencies may benefit by adopting creative complementary initiatives that would also contribute to quality of life for retirees. These might include tax restructuring favoring the retiree age population and strengthening health care. Further, as our findings support that retirees like amenity rich counties adjacent to metro areas, it supports any policy that establishes regional cooperation among adjacent metro and non-metro governmental agencies to attract retirees in their territories by jointly marketing each other's amenities (Reeder, 1998). Third, this study used variables describing natural amenities that are periodically updated. Thus the models resulting from use of these variables (from sources such as NORSIS, NRI, US Census) can also be periodically updated, allowing regional planners, economists, and social scientists update estimates of the retiree growth effects of natural amenities and forecast possible future concentrations of retirees and likely economic growth effects.

Fourth, as the retiree's locational choice seems heavily motivated by the availability of natural amenities, its direct and indirect effect on the natural integrity of rural America is critical with the impending retirement of baby boomers. Specifically, our study reveals that counties close to national parks and containing natural areas and recreation parks experienced a significant growth of retirees in recent decades, and that growth is likely to continue with the seemingly endless desire of people to live close to nature. Further concentration of retirees, particularly in and around parks and other natural areas, may be problematic in that one of their unique aspects is that they are undeveloped. Too many people wishing to live near public lands may eventually become a threat. Even in counties far from the national parks, the mounting demand for open space and natural areas, housing sites, outdoor recreation, and expansion of utility services can result into ecological issues such as habitat fragmentation (Ritters et al., 2000). In addition to providing guidance for stimulating economic growth for local and state policy makers, this study also can provide some information on the drivers of growth. Growth is not simply determined by proximity to highways and shopping. As far as retirees are concerned, their choice of residence location is also driven by natural amenities—forests, open land, water, scenery and recreation opportunities. In addition to providing stimulus to local rural economies, perhaps strategies to provide close substitutes for nature-based outdoor recreation opportunities in metro counties may be needed. A balance toward what Reeder (1998) suggested as making retirement in metro counties equally desirable. Those counties that have already experienced a substantial growth of retirees may need to focus on devising variants of equity-based policy instruments to mitigate or prevent environmental damage or pollution.

Nonetheless, compared to some other alternatives, the "retiree economy" seems a viable option to drive rural economic development while limiting environmental and social impacts. At least initially, retiree immigration is a more passive employment of natural resources. It seems a collaborative regional approach would be needed to account for local interests while minimizing the ecological effects of growth on the primary resource of interest in the first place, natural amenities.

Acknowledgement

The authors are thankful to Christian Vossler for his valuable comments.

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