International Scholars Journals

African Journal of Demography and Population Studies, Vol. 2 (4), pp. 001-012, April, 2017. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Spatial relationship between human well- being and community capital in the Black Belt region of Alabama

Buddhi Raj Gyawali[1]*, Rory Fraser[2], James Bukenya[1] and Swagata "Ban" Banerjee[1]

[1]Department of Agribusiness, P. O. Box 323, Alabama A&M University, Normal, AL 35762, Alabama, USA.
[2]Center for Forestry and Ecology, P.O. Box 323, Alabama A&M University, Normal, AL 35762, Alabama, USA.

Accepted 5 October, 2016

This paper examines the relationship between human well-being and forms of community capital in the eight Black Belt counties in the west- central region of Alabama. This region is one of the poorest in the United States with high proportion of African- American populations. Cross-sectional spatial regression models were estimated using the data from the U.S. Population and Economic Census, Geographic Information System, and satellite imageries of 2000. The results indicate that geographic space is highly segregated in these counties and African Americans are less likely to be found in areas high in built, natural, and political capital. Service-providing entities such as financial, industrial, and social capital are located more in urbanized centers. The results suggest that social capital is strongly correlated with human well-being. The findings provide spatially-explicit empirical insights and suggest targeting rural development policies to create more social capital and address specific needs of the region, especially of African-American populations.

Key words: African Americans, census data, land cover, proximity, rural, social capital, spatial.

INTRODUCTION

The west-central Black Belt region of Alabama has not only undergone transformation in land use and land cover, but has also experienced changes in different forms of community capital. Community capital includes tangible and intangible assets or resources that exist in a community, which are capable of producing new resources (Flora and Flora, 2004; Hancock, 2001). They exist in the form of social and cultural organizations, government or financial agencies, infrastructures and other entities to strengthen or retain community capability and provide resilience for various socioeconomic, political, and infrastructural developments (Emery and Flora, 2006; Ostrum, 1990) . These institutions are grouped into the major forms of community capital that include cultural, human, social, political, financial, built, industrial and natural (Emery and Flora, 2006; Flora and Flora, 2004) .These forms of capital are involved with creating and controlling natural resources and goods and services, while helping to enhance the relationships between people and the land, as well as other natural resources (Bullard, 1990; Myrdal, 1998; Schulman, 1991; Zabawa, 1991).

Recent studies have used a community capital framework to study community resilience, rural development and ecosystem management (Adger, 2000; Costanza et al., 1998; Emery and Flora, 2006; Flora and Flora, 2004; Putnam, 2000). Formation and retention of community capital is a prerequisite for the socioeconomic development of a community, its resilience and sustainable ecosystem management (Costanza, 2004; Deller et al., 2001; Flora and Flora, 2004). The resiliency of the community to respond to changes in the larger environment depends in part on the resources available in a community. Communities that have higher levels of community capital have more resilience and more economic, environmental, and cultural stability (Harris et al., 2000).

Researchers such as Donoghue and Sturtevant (2007) and Emery and Flora (2006) have advocated for a balance of foundational and mobilizing capital in a community. Foundational capital includes primary resources such as physical, natural, and financial capital. Mobilizing capital activates and mobilizes foundational

*Corresponding author. E-mail: buddhi.gyawali@aamu.edu. Tel: (256) 372-5870. Fax: (256) 372-5917.

capital into productive use by the community. Such capital includes human, social, and political capital. As Appleton (1999: 61) posits, "what brings about transformation is the people who can create innovative and creative ways," an indicator of human capital. Rupasingha and Goetz (2003) in their study of rural communities, found evidence of human capital or education, becoming increasingly important for economic growth. Investment in human capital enhances the community's attractiveness for more businesses (Johnson, 2002).

Utilization of cultural and social capital for maximum utilization of human capital and for economic development in rural regions is widely supported by empirical evidence (Robinson and Siles, 1999; Terluin, 2003). Communities that invest in such policies and practices empower citizens' values, attitudes, and beliefs about their potential and future opportunities and earn higher economic well-being. Cultural capital creates a favorable and an inclusive climate in which all of the citizens, irrespective of their race, gender, or religion become able to maximize their potentials and benefit from their labor (Florida and Gates, 2001).

The distinct socio-cultural, economic and natural resource characteristics and prevalence of persistent poverty in the Black Belt region justify that it is a good hotspot to study the relationship between community capital and poverty. The historical eras of slavery, reconstruction, the civil rights movement, and affirmative action created various institutions in the west-central Black Belt region of Alabama. Evidence of the formation of cultural, social, and political capital in the region arose in response to reconstruction efforts, the lack of voting rights (Myrdal, 1998; Schulman, 1991), race and class-based discrimination (Mitchell, 2001), and the loss of land ownership (Gilbert et al., 2001; Zabawa, 1991) . The organization of political, cultural and social capital (civic institutions and informal networks) in communities was initiated in response to government agencies' non-inclusion of African Americans in the political processes and granting ownership rights to land (Bliss et al., 1998; Mitchell, 2001; Schelhas and Zabawa, 2000). The Black Belt communities' tradition of communal action through local churches and clubs, family gatherings, town meetings, community organizations, and cooperatives is legendary. However, many of these institutions, organizations and networks have disappeared under the continuation of biased policies and efforts from the late 19th and the early to mid-20th century, as well as a result of the degradation of civic engagement in community activities in the latter stages of the 20th century (Ayers, 1992).

Political, economic, and social institutions have continued to have a role in the formation of community capital in specific locations. This in turn has improved these communities' well-being. Yet, the creation and development of community capital have rarely been used as a policy tool in economic and social development (Fey et al., 2006). This is a shortcoming of both past and current research in the South (Durlauf, 2002; Glaeser, 2001; Rupasingha et al., 2006). Studies by Robinson and Siles (1999), Flora and Flora (2004), Putnam (1996), and others have shown the important role community capital plays in community development. However, they have not yet provided adequate insights as to why community capital is concentrated in specific places and why there are significant cross-sectional variations in community capital across a region (Durlauf, 2002).

Despite major efforts to alleviate poverty and bring about economic development, persistent poverty exists among many African Americans in the west-central Black Belt communities of Alabama. Social, economic, political, and natural resource factors have been used to explain this phenomenon (Bliss and Bailey, 2005; Joshi et al., 2000). However, these explanations have not examined the role of spatial patterns of the distribution of community capital and how it is connected to the well-being of people. Community capital (primarily cultural, political, and social) has helped African Americans withstand slavery, segregation and Jim Crow law; by reinforcing community resilience and cohesiveness in Alabama (Schweninger, 1997). Now, many of these modes of capital have been dissipated or isolated. At the same time, new forms of capital (such as financial, infrastructural, and built) have been formed in response to changes in population dynamics, land cover, land ownership and these have had differential impacts on rural development (such as changing patterns of urbanization and quality of life) across different ethnic groups and locations in the Black Belt region of Alabama.

The objectives of this paper are: (1) Identify the specific forms of community capital in the west-central Black Belt region of Alabama; (2) Identify their spatial patterns of distributions across the region, and (3) Examine the relationship between human well- being and different forms of community capital available in the region.

The main null hypothesis of this study is that there is no significant relationship between the human well-being index and the spatial pattern of distribution of community capital. Alternatively, this study hypothesizes that socioeconomic development issues in the study area may be better understood if the spatial context of the distribution of different forms of community capital and its relationship with human well-being index are examined.[*]

MATERIALS AND METHODS

Study area

The west-central Black Belt region of Alabama lies within the Gulf

[*] Explanation of the hypothesized relationship is provided in the *Empirical model* section.

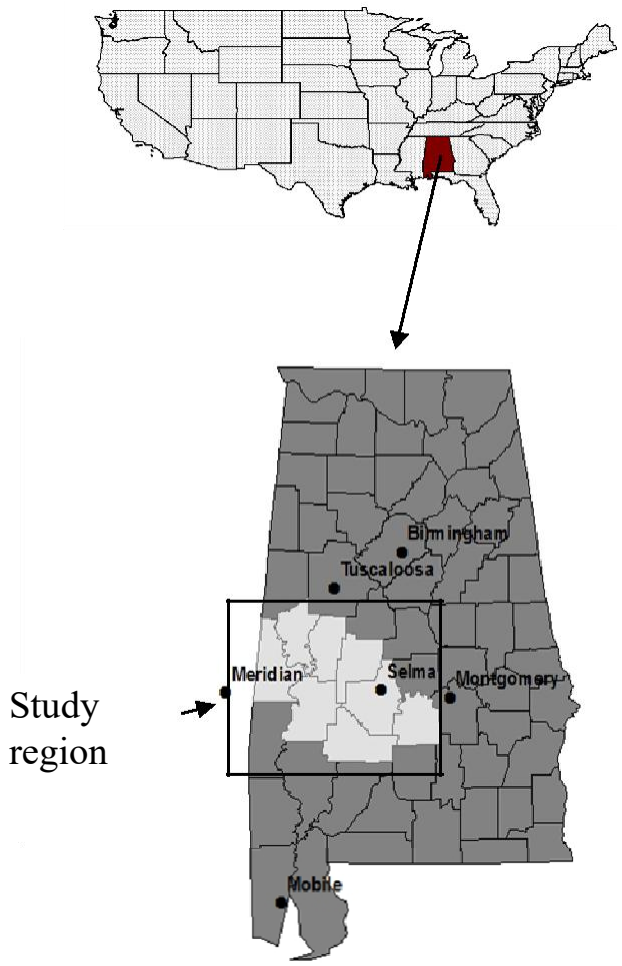

Figure 1. Study area showing eight black belt countries in the west-central region of Alabama in the United States.

south's coastal plane, 25-30 miles wide and stretching 300 miles from Eastern south-central Alabama into Northwestern Mississippi (Figure 1). The study site (-86.4° to -88.4° East, 31.13° to 33° North) consists of eight counties (Dallas, Green, Hale, Lowndes, Marengo, Perry, Sumter, and Wilcox). The area covers 6,479 mi^2 (16,781 km^2). The total population of the region is 149,378, of which 65% are African Americans (U.S. Department of Commerce, 2007). The population density is 22 people per square mile. Thirty-two percent of the people live with incomes below the national poverty line (Bukenya and Fraser, 2004).

This region contains vast amounts of forest resources and fertile agricultural land. The physical landscape characteristics are highly differentiated by soil type, forests, locations of industries, and demographic attributes, such as income, race and land-based income-earning activities. The region is mostly affected by a sub-tropical climate and is generally warm and humid. The mean annual temperature is 66°F (19°C), with a winter average of 49°F (9°C) and summer average of 81°F (27°C). The amount of precipitation is about 52 inches (1,320 mm). The African-American population is concentrated in the agricultural lands and in small towns. The socio-economic and land cover maps of the region clearly depict clustered patterns in terms of forests, ethnic population distributions, incomes, and poverty.

Data preparation

Data preparation and analysis were conducted using data from the U.S. Population Census 2000, the U.S. Economic Census 2002, U.S. TIGER Road and urban data, and land cover data derived from the classification of Landsat ETM+ for 2000 at the Census Block Group (CBG) level. There are 161 Census Block Groups (CBGs) in the eight Black Belt counties in the west -central region of Alabama (U.S. Department of Commerce, 2007). The CBG is the smallest unit for which the U.S. Census Bureau makes Census data available to the public in the form of average values of various attributes of the population residing in an area. Typically, CBGs range between 600 and 3,000 people, with an average size of 1,500 people (U.S. Department of Commerce, 2007). CBGs tend to be relatively homogeneous with respect to demographics, economic status, and living conditions. A geographically-tiered spatial database of the demographic and socioeconomic indicators, land cover types, and different forms of community capital - including layers representing the biophysical, infrastructural, and administrative boundaries - were created at the CBG level for 2000. The selection of the variables was based largely on earlier studies and the availability of data at the CBG level.

Demographic and socioeconomic data were obtained from the Time-Series Research Package released by Geolytics Inc. (2004a). These data are available for each Census Block Group (Geolytics, 2004a). The Census data provide the aggregated average value for each variable for each CBG (Geolytics, 2004b). The raw data were standardized by converting them into percentages (raw data of a variable divided by its total in a CBG). The percentage values were then considered as an average value for a CBG.

A human well-being index (HWBI) was created using income, education, and employment (UNDP, 2005). These measures incorporate the basic material for a good life and health - two factors considered important in the millennium ecosystem assessment (MEA) concept of human well-being (MEA, 2003).[§] The measure of education is the percentage of persons over 24 years who graduated from high school and the percentage of the same population who graduated from college. The measure of income is the per capita income in dollar value, and the employment measure is represented by the percentage of people, 16 years and older who are employed. Indexes of income (I_{in}), high school (I_{hs}), graduate education (I_{ge}), and employment (I_{em}) were created as per Bukenya and Fraser (2004). For instance, the per-capita income index was created using the following equation:

$$I_{in} = \left(\frac{(X_{in} - MinimumX_{in})}{MaximumX_{in} - MinimumX_{in}} \right) \quad \text{.....(1)}$$

where X_{in} is the average per-capita income for a CBG, and $MaximumX_{in}$ and $MinimumX_{in}$ are the highest and lowest average per-capita income, respectively, for all CBGs. These index values are computed in order to normalize the values of the variables that are included in the human well-being index (HWBI), so that all values fall between 0 and 1. Then, the four indexes were averaged to obtain the HWBI for each CBG (Bukenya and Fraser, 2004; UNDP, 2005; Vemori and Costanza, 2006).

[§] Well-being is at the opposite end of a continuum from poverty, which has been defined as a "pronounced deprivation in well-being. The constituents of well-being, as experienced and perceived by people, are situation dependent, reflecting local geography, culture, and ecological circumstances (MEA 2003, p. 3)

Table 1. Definitions and indicators of different forms of community capital*.

Capital	Definition and indicators
Human	Intellectual, professional, and technical preparation of population that helps to make a community energetic
Financial	Financial resources available to invest in the community for business or infrastructure development, civic and social enterprise and wealth accumulation
Cultural	Entities that represent how people perceive the world including heritage, values, history, and identity, and entities such as art, language, symbols, and customs
Political	Resources and tools, local governments and other institutions that engage citizens and businesses in community development
Social	Collective norms, networks of reciprocity, and mutual trust that are utilized for mutual benefits, building trust and fulfilling shared needs
Built	Physical infrastructure that enhances other forms of community capital, such as roads, airports, railways, office buildings, schools, utilities, sewers and water systems
Natural	Assets occurring naturally for a long time in a particular community from which much of the economic wealth is derived. Examples are water, soil, minerals, plants, animals, biodiversity, aesthetic or scenic resources, mines and quarries, parks, and natural amenities
Industrial	Manufacturing base in the community that provides employment, food, fiber, and shelter for the people in a community. Examples include factories and facilities such as paper mills, sawmills, automobile plants, catfish and meat processing plants, lumber and cotton gin factories

*Definitions and indicators adopted from Flora and Flora (2004).

$$HWBI_X = \frac{I_{in} + I_{hs} + I_{ge} + I}{4} \quad \text{..... (2)}$$

Land cover (forest cover) data were derived from the Landsat ETM$^+$ imageries for 2000. These terrain-corrected (geographic, radiometric, and topographic correction) data with less than 10% cloud cover were acquired from USGS/EROS data center, Sioux Falls, South Dakota. A hybrid classification approach using both unsupervised and supervised techniques was employed to derive accurate and reliable land cover classes (Campbell, 1996). Anderson's Level II classification scheme was primarily employed to classify the study region into the nine major land cover classes using ERDAS 8.7 Image processing software (Anderson et al., 1976; Leica Geosystem, 2005) . The ArcGIS 9.1 (ESRI, 2005) software was used for extracting area covered by each land cover type in each CBG in 2000. The three subgroups of forests (evergreen, deciduous, and mixed) were combined into a single "forest-cover" class (Gyawali et al., 2009).

Community capital data were obtained from the U.S. Economic Census 2002, compiled as a directory of all credit-approved establishments in Alabama. Information on different forms of businesses, industrial establishments, government offices, built infrastructures, and private and non-governmental organizations (NGOs), and cultural entities in each CBG were obtained. There were 5,308 of such establishments in the study region in 2002. North American industrial codes (NAIC) were used to categorize these entities into the proxies to represent eight different forms of community capital. The methodology adopted by Rupasingha et al. (2006) for creating proxies was followed. The identification of the proxies was based on literature (Flora and Flora, 2004). A total of 1,048 establishments met the criteria developed by Rupasingha et al. (2006) to represent the eight different forms of community capital (Table 1). Twenty-five CBGs did not have any such establishments; therefore, these CBGs were excluded from the analysis keeping 136 CBGs with at least one establishment to represent one of the eight forms of community capital. The data were standardized by computing the number of community capital establishments per 1,000 people in a CBG, (that is, the number of establishments for each type of capital available in a CBG was divided by the total population of a CBG and multiplied by 1,000) . CBGs that contained at least one count of any community capital in 2000 were used in the analysis.

Empirical model

The major objective of this paper was examined by factoring the HWBI in a CBG with the proxies of the different forms of community capital (human, cultural, social, political, built, industrial, financial, and natural) and other control variables as suggested by related literature (Flora and Flora, 2004; Green and Haines, 2002; Johnson 2002; Rupasingha et al., 2002) (Table 2). Communities may have different forms of capital in different amounts and such differences may relate to the well-being of those communities. Different forms

Table 2. Variables description for the relationship between human well-being and forms of community capital in 2000.

Variables	Measures of the variables	Expected sign
Human well-being	**A composite index of education, income, and employment indices (between 0 and 1)**	**Dependent variable**
A. Community capital Human capital	No. of establishments per 1000 population in a CBG Professional service sectors, such as schools, libraries, lawyers, doctors	+
Financial capital	Banks, insurance, finance, investments	+
Built capital	Electric, water, sewers, transportation, natural gas Federal agencies, conservation, legislative bodies/political offices	+
Political capital		+
Social capital	Civic and social organizations, business clubs, NGOs, advocacy groups	+
Natural capital	Natural amenities such as parks, mining, historic sites	+
Industrial capital	Manufacturing and Processing plants such as pulp and paper mills, sawmills, cotton gin	+
Cultural capital	Cultural entities such as barber shops/beauty salon, church	+
B. Demographic (control)		
Population density	Population per acre in a CBG	+
African Americans	Percentage of AA population in a CBG	-
Age-dependency ratio	Ratio of % of persons <15 years and > 64 years to % of persons in the economically productive (16-64 years) years (ranges from 0 to 1) in a CBG	-
Homeownership	% of owner-occupied housing units (out of total occupied housing units)	+
Urban areas	Binary 0 or 1 (1 = Urban CBGs, with 1 person in 2 acres of land)	+
C. Landscape variables (control)		
Total forestlands	Percent of total forests in a CBG	+
Roads	Density of major roads (meters/acre) in a CBG	+
D. Spatial variables		
Spatial Lag	Neighborhood and autocorrelation effect	+

CBG = Census block group; AA = African Americans; NGOs= Non-government organizations.

of community capital will have additive effects on community well-being. The increasing proportion of community capital may generate significant positive effects on the human well-being of a community and help to reduce poverty. Also, a balance among these forms of capital is necessary for the sustenance of the desirable level of community well- being (Coleman, 1988; Flora and Flora, 2004). A cross-sectional spatial regression model was specified to examine the relationship between human well-being and community capitals in the year 2000. The counts (per 1000 population in a CBG) of establishment of each of the eight forms of community capital in a CBG were used as independent variables. The regression model includes other socioeconomic, landscape, and spatial variables to control for confounding factors (Equation 3). These variables are grouped into: (1) Demographics (population density, race, age structure, rural or urban areas, and homeownership); (2) Landscape variables (amount of forest land

and road networks), and (3) Spatial factors (neighborhood effects). The following spatial regression model explains the functional relationship between human well- being and vectors of both independent and control parameters:

$$HWBI_{2000} = \alpha + \beta_0 CC_{2000} + \beta_1 DV_{2000} + \beta_2 LV_{2000} + \rho WHWBI_{2000} + \varepsilon \quad (3)$$

where *HWBI* is the human well-being index in a CBG in 2000, *CC* is a vector of different forms of community capital, and *DV* and *LV* are vectors of demographic and landscape variables in 2000, respectively. $WHWBI_{2000}$ is the spatially lagged dependent variable for a spatial weights matrix for 2000 (Anselin, 2003), Scalar is the spatial lag to be estimated and is a vector of error terms with normality and homoscedasticity. The spatial factor *W* for $HWBI_{2000}$ in a CBG is the spatially-weighted average of all other adjacent CBGs' HWBI in 2000. The weight matrix *W* is constructed using first-order binary "rook contiguity" by assigning a weight of 1 to all adjacent CBGs that are contiguous to the CBG or share a common border, and a weight of 0 is assigned to all other CBGs which are not contiguous to the CBG (Rey and Montouri, 1999). The spatially-lagged endogenous variable ($WHWBI_{2000}$) for the dependent variable accounts for all forms of spillover effects from neighboring CBGs (Anselin, 1988, 2003; Janikas and Rey. 2005; Lim, 2003).

The control variables are used to account for their effects on human well-being. Those effects are either their direct contribution to the dependent variable or their indirect contribution through their interaction with community capital (Flora and Flora, 2004). These variables may significantly affect the formation, disappearance or stability of community capital, which ultimately will have effects on sustaining the human well-being indices of the communities.

Demographic Variables (DV) such as population density and characteristics are important factors that influence the relationship between human well-being and community capital. This variable may have direct or indirect (through interaction with different forms of community capital) effects or human well-being. For instance, as population increases, more demands for community capital will be created. Such demands are for roads, parks, jobs, schools, shopping centers, and open space for a growing population (Reynolds, 2001). On the other hand, cheap or uneducated or untrained labor force may be in high demand for newly opened manufacturing capital that may not require skilled labor. The behavior of people (profit-maximizing activities, or ambition for social recognition, community service or political positions) and a person's social qualities to associate with other community members may be related to the formation of more social or political capital (Flora and Flora, 2004; Putnam, 1996).

A larger population of a community helps to create or maintain collective voice, action, and community unity. These strength help to ensure the sustainability of community capital (such as built, financial, social, and political) and efficient and high quality services (such as equal access to income-earning activities, government subsidies, loans, training, and tax breaks), which are related to the community's well -being. It is found that the loss of community capital (or lower human well-being) is usually evident more in periphery and rural areas (where a loss of human population is most likely to happen) than in urban areas (Flora and Flora, 2004). Glaeser et al. (2002) found that migration reduces social capital levels in a community as it weakens local networks and associations.

Poor communities, composed mostly of minorities, tend to engage more with local resources (e.g., volunteers, social and cultural clubs, and cooperatives) than more affluent communities (Chaskin et al., 2001). However, Putnam (1995) found that racial differences have contributed to a decline in social capital in the United States. Alesina and La Ferrara's (2000) study supports this contention. The study found that participation in associational activities is significantly lower in ethnically-fragmented localities. In such a scenario, when minority residents feel alienated, participation in local affairs declines and collective action is fragmented (Israel and Beaulieu, 2004). Also, Glaeser et al. (2002) found that social capital is higher among homeowners. Homeowners have an incentive to improve the community they live in. Social capital first rises and then falls with changes in age groups. Also, educational level determines people's attitudes and behaviors while they choose whether or not to be a member of civic organizations (Putnam, 1995; Glaeser, 2001) . Higher educational level may lead to higher levels of social capital in a community.

Landscape variables (LV), such as agricultural or forest lands, water, and good quality soil are important raw materials for manufacturing capital. They are a means for creation of more jobs. Higher amounts of raw materials in a community ensure sustenance of industries and jobs without a fear of closing industries or loss of jobs (Ahn et al., 2001; Alig, 1986; Platinga and Miller, 2001; Wears and Gries, 2002). Usually, higher quality land is used for agricultural farming so it increases the chances for the presence of agricultural processing industries. Similarly, the presence of high-density forestlands increases the chances for forestry-based industries.

Physical proximity increases opportunities for interactions among local residents that build community bonds (Israel and Beaulieu, 2004). Increasing distance to the major highways and shipping points (waterways) may result in a lower likelihood of the presence of industry capital, as it will increase the cost of hauling and the commuting distance for workers. Similarly, urban areas increase the likelihood of the presence of financial and service-oriented capital as several government and county or state agency offices are located in urban areas.

Table 2 provides information on the dependent and independent variables and control variables. All eight forms of community capital are expected to have a positive relationship with human well-being. Because these forms of capital assist communities to build their community capability, effectively manage local resources, and increase community resilience, they should thereby increase human well-being (Flora and Flora, 2004).

RESULTS

Descriptive statistics

Out of the total 1,048 counts of capital, the largest share was natural (249 establishments) capital, followed by political (203), social (140), built (113), human (106), financial (72), and cultural (78) capital, respectively. These counts of capital were not evenly distributed across the study region (Figure 2). For a better interpretation of the counts, these forms of capital were standardized per 1,000 CBG populations. The four columns on the right side of Table 3 represent the central tendency measures (minimum, maximum, mean, and median) of the standardized counts of community capitals per 1,000 population in a CBG and central tendency measures of other control variables. These measures suggest that distribution of the major forms of community capital are positively skewed because the majority of the forms of capital are concentrated in the CBGs that are relatively densely populated and are parts of towns or

Table 3. Descriptive statistics of the dependent and independent variables in 2000*.

Variables	Total counts of capitals in 136 CBGs	Min.	Max.	Mean	Median
Well-being 2000		0.24	0.82	0.52	0.51
Cultural capital	78	0.00	9.55	0.68	0.00
Financial capital	72	0.00	15.15	0.60	0.00
Human capital	106	0.00	9.09	0.94	0.00
Built capital	113	0.00	7.52	0.93	0.00
Industrial capital	87	0.00	8.95	0.75	0.00
Natural capital	249	0.00	16.47	2.00	1.22
Political capital	203	0.00	19.70	1.63	0.00
Social capital	140	0.00	13.64	1.24	0.68
Total	1048				
Population density	-	0.01	8.61	0.68	0.05
African Americans%	-	0.91	100.00	64.34	71.26
Dependent population ratio	-	0.16	1.03	0.67	0.66
Home ownership%	-	20.55	97.88	73.72	80.56
Urban area (dummy)	-	0.00	1.00	0.24	0.00
Total forests%	-	21.28	100.00	72.74	77.15
Road density (meter per acre)	-	0.00	22.74	3.94	2.29

*N = 136 CBGs. CBGs with at least one form of capital are included in the analysis. In the analysis, the capital represents the number of establishments per 1,000 population.

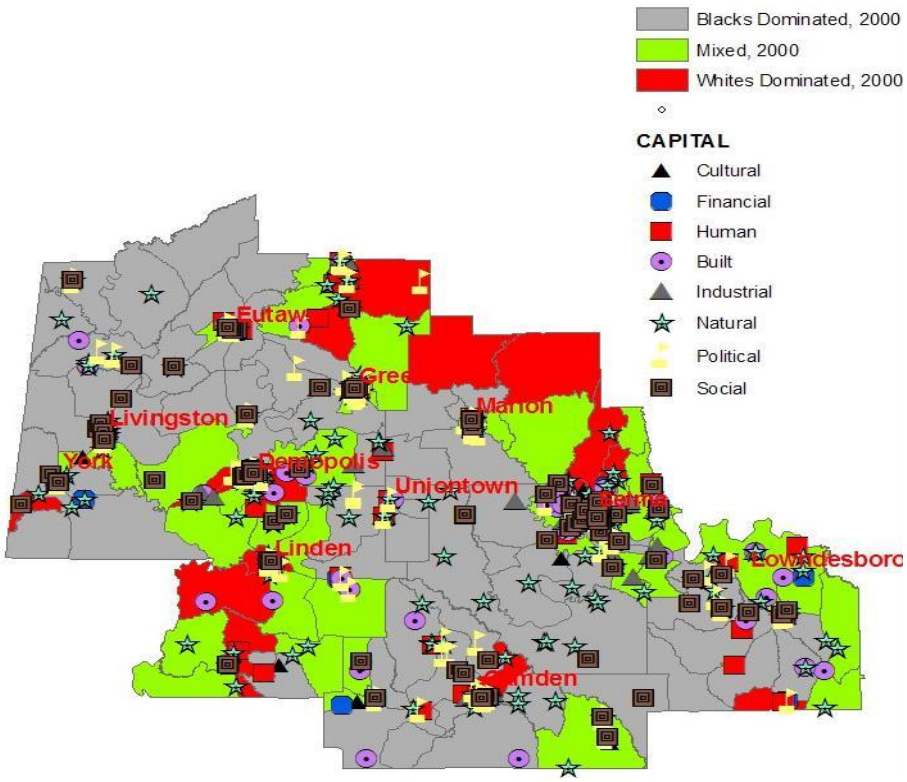

Figure 2. Spatial distribution of eight forms of community capital in the study region in 2000.

Table 4. Univariate Moran's I values for human well-being, community capitals and control variables in 2000.

Variables	Moran's *i* value
Human well-being	0.33
Population density	0.63
African Americans	0.35
Dependent population	-0.02
Homeownership	0.36
Roads network	0.41
Total forests	0.37
Cultural capital	0.07
Financial capital	0.02
Human capital	0.21
Built capital	-0.03
Industrial capital	0.09
Natural capital	-0.06
Political capital	-0.04
Social capital	0.08

nearby towns, parts of major road intersections, business hubs, or industrial zones, such as Selma, Demopolis, Camden, Marion, Livingston and Greensville.

Spatial data exploration

The spatial pattern of the distribution of the HWBI, community capital and the control variables were explored using univariate Moran's *I* values to examine the magnitude of autocorrelation among the variables (Table 4). The values of the HWBI, population density, the percentage of African Americans, roads, homeownership, and forests were highly correlated to each other. The CBGs that are clustered together (or have shared a border) have high likelihood of having similar values of these variables. However, among the community capital variables, only human capital had a high univariate Moran's *I* value. Other capital had very low Moran's *I* value suggesting a random distribution of these other forms of capital across the study area.

Spatial regression analysis

The ordinary least squares (OLS) model was highly significant overall (F = 18.18, P 0.001). The OLS model indicated that 65% of the total variation in human well-being was explained by the explanatory variables (Table 5). Among the community capital variables, social capital was significant (= 0.24, t = 2.36), suggesting its positive relationship with well-being. Among the control variables, African-American population (= -0.78, t = 12.43) was significant at the 1% level, the age-dependency ratio (= -0.12, t = 2.24) was significant at the 5% level, and urban area (= 0.34, t =1.71) was significant at the 10% level.

Due to the presence of significant spatial clustering effects in the OLS model, as observed by the presence of a significant Moran's error value (Moran's *I* = 0.14, P 0.001) and Lagrange multiplier for lag (7.70, P 0.001), a spatial lag model based on the maximum likelihood (ML) was estimated to obtain unbiased estimates of the relationship between human well-being and community capital (Anselin, 2003; Lim, 2003; Rey and Montouri, 1999).

The spatial lag model improved significantly and provided better explanations of the relationship than the OLS model. This was evident by the increase in R^2 value (from 0.65 to 0.71) and a decline in the Akaike Information Criterion (from 255.70 to 249.43). The model was significant (likelihood ratio test value = 8.27, P 0.001) and was free of multicollinearity (the multicollinearity condition number was < 30) and heteroskedasticity (a Breusch-Pagan test was not significant at the P 0.10 level). However, the model did not add any new significant variables. The variables that were significant in the OLS model, e.g., social capital, African Americans, age-dependency ratio, and urban areas, were also significant in the spatial lag model with the same signs.

The results indicate that the CBGs with more social capital are likely to have a higher level of human well-being. Similarly, the presence of micropolitan areas (towns) positively affects human well-being.[**] The negative relationship between African Americans and human well-being is suggested by the lower HWBI in the

[**] A micropolitan area contains an urban core of at least 10,000, but less than 50,000, population

Table 5. Results of the ordinary least square (OLS) and spatial lag model for the relationship between human well-being and forms of community capitals in 2000.

Variables	OLS model		Spatial Lag model	
	-coef.	t-statistics	-coef.	*z*-value
Constant	0.08	1.17	0.07	1.12
A. Community capital				
Cultural	-0.10	1.19	-0.12	1.51
Financial	0.05	0.60	0.05	0.79
Human	-0.09	1.09	-0.108	1.37
Built	-0.04	0.71	-0.02	0.46
Industrial	0.01	0.09	0.01	0.01
Natural	-0.03	0.52	-0.04	0.69
Political	-0.03	0.37	-0.01	0.04
Social**	0.24	2.36	0.27	2.84
B. Demographic variables				
Population density	-0.09	1.11	-0.07	-0.93
African Americans***	-0.78	12.43	-0.68	10.84
Age dependency ratio**	-0.12	2.25	-0.11	2.34
Homeownership	0.03	0.37	0.05	0.78
Urban area*	0.34	1.71	0.31	1.71
C. Landscape variables				
Forestlands	-0.01	0.01	-0.05	-1.11
Roads density	-0.07	1.09	-0.05	-0.86
Spatial lag *(Rho)*			0.24	
R^2	0.65		0.71	
F value	18.18***			
AIC	255.70		249.42	
Multicollinearity condition number	6.24			
Breausch-Pagan test	14.61 (ns)		13.37 (ns)	
Moran's I value	0.14***			
Lagrange multiplier (Lag)	7.70***			
Robust LM (lag)	2.58*			
Lagrange multiplier (error)	5.51**			
Robust LM (error)	0.39 (ns)			
Likelihood ratio test			8.27***	

*** 1%, ** 5%, * 10% significance levels; z-values are absolute values.; ns = not significant at 10% level; AIC = Akaike information criterion; LM = Lagrange multiplier.

CBGs where a higher number of African Americans live. The spatial lag (*rho*) estimate was positively significant (= 0.24, *z* = 4.625) suggesting a one-unit change in the HWBI in the adjacent CBG causes the human well-being of the CBG to go up by 0.24 unit. This suggests a positive neighborhood effect on the HWBI.

DISCUSSION

The results suggest that human well-being and various forms of community capital have a weak relationship. Among the eight community capital variables, only social capital has a positive significant relationship with human well-being. The results reveals that the increasing amount of social capital – such as social networks, social and cultural clubs, farmers' associations, and non-government organizations have had positive effects on the HWBI of the studied region. The results of this study, consistent with the findings by Flora and Flora (2004), Parent and Lewis (2003), and Svendsen et al. (2007), suggested that social capital is one of the strongest

assets of a community, which not only helps to bond communities but also plays a role in the socioeconomic development of rural areas. Social capital helps to increase the bargaining power of communities (Krishna, 2002; Putnam, 2000).

The control factors such as urban areas indicated a positive relationship with human well-being. However, the African-American population and the ratio of the dependent population were negatively correlated with the human well-being index suggesting the likelihood of lower HWBI in the African-American and dependent-dominant CBGs. The study also found significant neighborhood or clustering effects on human well-being, suggesting a high likelihood of the presence of well-off communities around the communities that have high records of human well-being, which is also evident by the results of Gyawali et al. (2009).

A closer examination of the distribution of community capital results indicates an uneven spatial distribution of different forms of community capital across the study region. Cultural, financial, human, industrial, and social capital differed significantly in their numbers and distribution between urban and rural areas. Service-providing entities such as roads, financial, political, industrial, and social capital were located in greater proportion in the urbanized centers. Such pattern suggests that community capital tends to be clustered around high-population areas (urban centers) and along the highways. It may be because urban growth brings more businesses and creates more revenue for the investment in urban infrastructure and human capital development (Callaghan and Colton, 2007; Flora and Flora, 2004; Terluin, 2003). Such growth increases the likelihood of creating more benefits to the people who are living nearby urban centers or the locations of those businesses. As suggested by Woodhouse (2006), the lower poverty rate of urban places in the study region may be the result of the concentration of major forms of capital in the urban areas.

The African-American population variable had a negative relationship with human well-being suggesting that this group of people (who are the majority in the region) lags behind in socioeconomic conditions. The results show that the situation in predominantly African American communities in Alabama's Black-Belt is no different from that in the rest of the country (Fraser et al., 2005; Gyawali et al., 2008, 2009) . The uneven distribution of community capital and the lower proportion of the financial, built, natural, and political capital provide

a gloomy condition of the status of African-American-dominant CBGs, and the results are consistent with previous findings (Alesina et al., 1999; Gilbert et al., 2001; Rupasingha et al., 2006). Such isolation from the major resources is counterproductive for their overall economic development.

As the study did not find a strong relationship between human well-being and all eight forms of community capital (except social capital), there might be many confounding factors that affect human well-being. Size and edge of the CBGs and exogenous effects such as state, local, and county policies may have an important role in human well-being or in the formation of community capital or in causing the concentration of community capital in a specific location.

The study suffered from limitations related to availability of data at the CBG level. The high correlations among the forms of community capital may have overestimated the prediction of human well-being. The proxies of community capital may not have represented the core definition or values of community capital. The human well-being index did not include life expectancy, one of the major constituents of quality of life, due to the unavailability of information at the CBG level. At the same time, all four factors (high school and bachelor-level education, income, and employment) were provided equal weights. These attributes may have contributed differently to the human well-being and using weighted values may have improved the analysis. Due to these data constraints, the regression models may be underspecified. Even though the spatial regression model explained over two-thirds of the total variations (R^2 = 71%), the explanatory power could have been stronger if these factors were included.

The question of whether the trends of human well-being measures such as education, income, and employment have improved over time as a function of community capital is a major concern and can be addressed by correctly selecting variables at multiple levels. A multi-scale approach using time-series data at micro-level (household), meso-level (communities) or macro-level (counties) could be employed to better understand the relationship between human well- being and community capital. A combination of diverse data collection methods (such as surveys and focus group interviews) could be the way to obtain or supplement data that truly represent human well-being and community capital.

Conclusion

This study provides empirical evidence of the major issues facing African-American communities in Alabama's Black Belt. This region is highly racially segregated with an uneven (some would suggest inequitable) distribution of the resources needed to foster economic development (Bliss and Bailey, 2005). This highly segregated area has pockets of well-developed communities with high income growth and higher level of social capital. However, for large areas in this region, there is limited capital, especially in the areas where African-American communities are in majority. The observed

limited linkage of human well- being to major forms of community capital may have been the evidence of discrimination and exclusions of African Americans from local social networks, government institutions and economic opportunities. African Americans were less likely to be found in areas high in natural, infrastructural and social capital such as forests, roads, and industrial facilities, market and financial centers. Such hindrances may have contributed to the formation of community capacity and perpetuation of poverty in the region. These are the important issues for further research. Policymakers interested in addressing poverty issues and bringing real economic development to persistently poor African-American communities may need to rethink their development policies and strategies. Such policies aimed at improving conditions in this region need to recognize as this study did, the importance of different forms of social capital and target efforts to address their specific needs, such as developing financial, built, social, and human capital and engaging citizens in these capitals.

ACKNOWLEDGMENTS

The authors would like to thank the anonymous reviewers of the manuscript for their suggestions and comments. The authors would also like to thank USDA Forest Service, the Alabama Agricultural Land Grant Alliance (AALGA), and National Sci. Foundation (NSF -HRD-0420541) for providing the financial support for this study.

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