

## **Chapter 1.**

### **Introduction**

The two papers in this thesis, “Education and Socioeconomic Wellbeing in Racially Diverse Rural Counties”, and “Economic Growth in Racially Diverse Rural Counties: The Contribution of Historically Black Colleges and Universities”, tackle the problem of underdevelopment in racially diverse rural counties (RDRCs) of the US. Two issues, the role of education in community economic well-being and the influence that proximity to Historically Black Colleges and universities (HBCUs) has on postsecondary education attainment, are examined.

Low levels of education, Income and other social factors are interconnected and may contribute to a cycle of poverty. Low incomes limit the tax base, and therefore the local government’s ability to provide local services. Low levels of public expenditures may lead to lower quality of schools, which in turn limits the areas attractiveness to business. Low incomes also limit investments in college education through constraining the ability of individuals, and local governments to invest in postsecondary education. Limited availability of college-educated adults may also contribute to lowering the community’s attractiveness to business. Low demand for college-educated labor in turn, depresses returns to college education. Low returns to education limit the incentives of young adults to invest in education, and may force educated young adults to leave the area, further depressing incomes, and the tax base. Other aspects of the social life, like health and crime rates are also impacted by lower public expenditures.

#### **1.1 Investment in Infrastructure and Schooling.**

There is some debate on the effect that public spending on education has on the length and quality of schooling of communities individuals. Hanushek (1986) suggests that primary and

secondary school resources have little effect on educational outcomes and eventual earnings. Others, however, find investments in public education to be positively correlated with levels of income and employment, particularly in the rural south where large disparities in school funding existed historically along racial lines (Card and Krueger, Ouan and Beck).

On the postsecondary level, studies find proximity to colleges and universities to be positively correlated with individual's length of schooling (Card). Historically Black Colleges and Universities (HBCUs), given both their geographic location (figure3) and their mandate to provide accessible education to underserved Blacks, may provide accessible and effective policy mechanisms to local and federal governments for the development of RDRCs. A number of studies find that HBCUs play a unique role in fostering postsecondary education of young Blacks (Brazziel, Constantine).

## **1.2 Education and Income Growth**

The role of education in economic growth is well documented in literature. Growth models fall into two categories; neoclassic growth models (Solow 1956), and endogenous growth models (Lucas, Romer, Nelson and Phelps, McMahan).

Solow (1956) recognized that economies that had similar rates of savings were bound to converge to a long run steady state growth rate in incomes. Income would eventually grow at the rate of population growth, unless there was technical change, present. In the Solow model technology is assumed to be exogenous and a pure public good.

Endogenous growth models consider economic growth through technical change an endogenous process. Lucas (1988), and McMahan (2000) find income growth to be dependent of per capita physical and human capital deepening. Romer (1990), Nelson and Phelps (1966) find income growth within a period of time to be a function of the initial endowment of human

capital. The endowment of human capital in the base period is postulated to fuel technological change (Romer), and facilitate adoption of technology (Nelson and Phelps).

Unlike neoclassical models, endogenous growth models do not imply convergence to a steady state rate of growth. It is possible for diverging growth rates to persist. The classical literature implies that the role of governments in assisting development should be a passive one, as income growth rates and income levels are expected to naturally converge. New growth theory however, implies that Federal and Local governments need to play a proactive role in assisting development of communities with low levels of income and education. Endogenously growing education determines long run income growth paths, therefore development policy must, to a great extent; devote resources to enhancing education levels in underdeveloped areas.

### **1.3 Theses Objectives**

The two papers in this theses document socio-economic conditions in RDRCs. The papers also examine the impact that proximity to HBCUs, investment in local education infrastructure, and the promotion of higher education have on community development in RDRCs.

The following questions are addressed in the two papers. The first paper examines the correlation of investments in K-12 education with education attainment in RDRCs? Both papers address the question on whether proximity to HBCUs causes higher levels of college education amongst Black adults in RDRCs? And does college education among Blacks and the general population have an impact on income growth in RDRCs?

### **1.4 The Contributions of Each Chapter.**

Each paper makes a unique contribution of these overall objectives. “Education and Socioeconomic Wellbeing in Racially Diverse Rural Counties” justifies the choice of focus in

rural counties with high proportions of Black residents as the population for the study. Further, it provides a county-level descriptive review, showing that RDRCs have lower incomes, lower levels of education, higher incidence of poverty and lower tax revenues and expenditures on public services compared to rural counties in general. This paper also provides county-level correlation coefficients showing that expenditures on K-12 education are positively correlated with the rate of high school completion, and the correlation is stronger for the RDRCs than for rural US counties as a whole. Also, correlation coefficients showing the connection between expenditures on public goods such as police protection, and health facilities and measures of social well-being like crime rates, and infant death rates respectively, are reported. The paper also expedites county level associations between proximity of counties to HBCUs and other colleges and universities and the incidence of college degrees amongst adults 25 years of age or older. These associations are estimated for both, Blacks and the general population in RDRCs. The results show that proximity to HBCUs has a positive influence on Blacks education attainment above and beyond proximity to any college and university. However the paper does not establish a link between college education attainment and subsequent income growth.

“Economic Growth in Racially Diverse Rural Counties: The Contribution of Historically Black Colleges and Universities” then provides more structured analysis of the impact of HBCUs on income growth in county subdivisions of RDRCs. The paper documents the interconnections between levels of income and college education, in a poverty trap framework. Further, in this paper we estimate a linear regression model to assess the county-subdivision level impact of proximity to HBCUs on levels of education of Black adults, and the general population in RDRCs. Also, a linear regression model that establishes the link between college education attainment and the subsequent income growth of Blacks and the general population in

county subdivisions of RDRCs is estimated. The paper also presents comparisons in returns to base educational assets and the change in the fraction of college educated adults for Blacks in RDRCs with those of all rural Blacks, and the general rural population in the US.

### **1.5 Policy Implications**

As mentioned above, new growth theory suggests that encouraging education attainment should be a fundamental tenant of economic development policy. The second paper in this thesis uses empirical analysis to inform the policy question on whether postsecondary education assists per capita income growth in RDRCs. The findings suggest that college education is positively correlated with income growth, both for Blacks and the general population. Therefore local and federal governments should devote appropriate resources to encourage college education attainment. Having established that, it is necessary to discuss alternative policy tools that would be effective in enhancing college education attainment in RDRCs. The results show that HBCUs are attractive candidates for two reasons. First, out of the 105 accredited institutions considered, 18 were established by 1890 grants, and 51 are directly funded by states. Therefore HBCUs are readily accessible potential policy tools. Second, HBCUs appear to be particularly efficient at enhancing college education attainment amongst the fraction of the US population that shows particularly low income and college education attainment levels, rural Blacks (who are highly concentrated in RDRCs). Both papers in this thesis find that at the county level, and the county subdivision level, proximity to HBCUs influences the share of community's Black adult population with college degrees positively above and beyond proximity to any college and university.

## **Chapter 2. Education and Socioeconomic Wellbeing in Racially Diverse Rural Counties**

### **2.1 Introduction**

Two factors show a strong association with the level of family economic well-being in rural America: race and geographic location. U.S. racial disparities in economic well-being have been well documented. Historically, Blacks have lower returns to education and lower levels of educational attainment than Whites. Legacies of segregation and continuing discrimination in labor markets are contributing factors to persistent differences in economic well-being (Darity and Mason). Receiving less attention is the strong geographic dimension of racial disparities in economic well-being (Kodras).

The rural south has historically been the poorest region of the country. U.S. Bureau of Census, Current Population Survey (CPS) Data on economic well-being in the year 2001 indicates that in the rural south 18.0% of persons lived in families below the poverty line compared to 11.9% for the nation as a whole.<sup>1</sup> Blacks show a particularly strong concentration within the rural South, with over 89% of all rural Blacks living in the region. Blacks also show an exceptionally high rate of poverty in the rural south (31.6%) compared to their national average (23.0%).

Blacks with lower levels of economic well-being are also highly clustered geographically within rural areas of the south (Economic Research Service). For example, Beale finds that in over half of the persistently poor rural counties, with poverty rates above 20% in each U.S. Census from 1960 to 1990, Blacks are either the majority of the poor or their incidence of poverty alone accounts for the total poverty rate of above 20%. In summary, rural counties with high proportions of Black residents are located almost exclusively in the South and many are consistently among the poorest counties in the US. The chronically high incidences of families

with low levels of economic well-being in these counties create serious barriers to economic development. Low income levels limit the tax base and the level of local public services that can be provided. Low levels of public services, combined with historically low levels of educational attainment, limit the attractiveness for business. Almost half of all firms surveyed in predominantly Black rural counties cited the poor quality of local schools as a major problem for their plant's ability to compete (Economic Research Service). As a result, firms demanding skilled labor do not locate in these areas and educated young adults are often forced to migrate in order to find skilled employment (Mills and Hazarika). Low education levels among those remaining in-turn limit potential earnings, the local tax base, and constrain local funding for public schools.

State and federal support for public education can potentially assist local governments in improving area education levels, attractiveness for business, local labor market opportunities, income and well-being, and the local tax base. However, racially diverse rural counties (RDRCs) often have few inherent political advantages in lobbying for such support. As state and federal resources are increasingly limited and funding decisions are decentralized, localities must be able to document the effectiveness of local infrastructure investments in order to compete for funds. Even if state and federal assistance is not forthcoming, RDRCs need to clearly identify areas where local assets can be employed most effectively in order to improve economic well-being. But to date few studies have formally identified the contribution of investments in education and other areas to economic well-being in RDRCs.

This paper uses 1990 and 2000 U.S. Census of Population and Housing data to examine recent trends in economic and socio-economic well-being in rural counties with large shares of Black residents. While these racially diverse counties are located exclusively in the rural south,

conditions and trends are compared to rural U.S. counties as a whole for reference. County-level measures of public expenditures and their association with social indicators, particularly education levels, are then examined. This is followed by an analysis of the role that Historically Black Colleges and Universities (HBCUs) play in providing accessible higher education in RDRCs.

## **2.2 Location and Population**

Counties defined as non-metropolitan based on the 1990 U.S. Census of Population and Housing are designated as rural in this study.<sup>2</sup> The base U.S. Bureau of Census STF3C data for 1990 contains 2,300 rural counties. Consistent with the Economic Research Service (ERS), we designate RDRCs as those counties where Blacks comprise one third or more of the population.<sup>3</sup> U.S. Census Data indicates that under this definitions there were 208 RDRCs in 1990. The geographic location of these counties is shown in Figure 1. Consistent with previous analysis, RDRCs are located exclusively in the south and are strongly clustered. Further, the concentration of Blacks in these counties is striking; while accounting for only 8.8% of the total rural population in 1990, 44.0% of the rural Black population lived in RDRCs (Table 1).

It is also worth noting that the concentration of Blacks in RDRCs showed no signs of dispersion between 1990 and 2000. RDRCs showed a slower rate of population growth between 1990 and 2000 (6.9%) than rural counties as a whole (9.7%). But Blacks showed a higher rate of population growth in RDRCs (8.1%) than in rural counties as a whole (6.5%). As a result of these trends, both the percent of the rural Black population living in RDRCs and Blacks as a share of the total population of RDRCs increased slightly between 1990 and 2000.

## **2.3 Measures of Socio-economic Well-being**



The distribution of rural county per-capita incomes for the year 2000 is shown in panel A of Figure 2. Rural counties with average per-capita incomes below one standard deviation of the population weighted mean for all rural counties are located mainly in the south, in Appalachia, near the border with Mexico, and on Indian reservations in the Northern Plains. Panel B of the figure shows that a disproportionate number of RDRCs have per-capita incomes below the rural county mean. In fact, 27 RDRCs are among the 100 poorest rural counties in the nation. Even within RDRCs there appears to be geographic differences in well-being, as Virginia and North Carolina RDRCs have generally higher per-capita incomes than do RDRCs in the deep south. Overall, RDRCs show significantly lower average per capita incomes than U.S. rural counties as a whole (Table 2). Similarly, the incidence of poverty is significantly higher in RDRCs than for rural counties as a whole. Two factors appear to contribute to this gap in per-capita income. First, rural Blacks have lower per capita incomes in general. Second, Blacks and the general population have especially low per-capita incomes in RDRCs.

On a more positive note, there are signs that both the gap between rural Black per-capita incomes and those of the rural population as a whole and the gap between RDRC incomes and those in all rural counties decreased between 1990 and 2000. Black real per-capita incomes in all rural counties increased 34.8% between 1990 and 2000, versus 17.9% for rural counties as a whole. Real per-capita income levels in RDRCs grew 21.5% in the same period. Blacks in RDRCs apparently benefited from income growth among both rural Blacks and RDRC residents in general, as they saw real per-capita incomes rise an impressive 37.4% from 1990 to 2000. Poverty rates also saw faster percentage point declines in RDRCs than for rural counties as a whole.

The socio-economic well-being of a community is not, however, exclusively measured by per-capita income levels and poverty rates. Other indicators of social well-being are presented in Table 3. These indicators present a somewhat less optimistic portrait of changes in RDRCs in recent years. For example, between 1990 and 2000 the rate of workforce participation among 18 to 65 year old adults increased slightly in all rural counties from 59.9 to 60.6%. However, in RDRCs the workforce participation rate started at a lower base in 1990 of 57.6% and then declined to 55.3% in 2000. The rate of serious crimes was initially lower in RCRCs than in rural counties as a whole in 1985, but showed a far greater increase between 1985 and 1995 (up 49.2 versus 10.9%). Voter participation in 1986 elections was lower in RDRCs than for rural areas as a whole and fell more rapidly. While the infant death rate in RDRCs declined more rapidly between 1986 and 1996 than for rural areas as a whole, by 1996 it remained 44.1% higher in RDRCs than for rural areas as a whole. Overall, the figures show that RDRCs have persistently lower levels of social well-being than rural counties as a whole, suggesting that significant investments to support economic opportunities and social well-being are needed.

## **2.4 Educational Attainment**

The education levels of county adult residents also provide an important indicator of social well-being. Differences in adult educational attainment between RDRCs and rural counties as a whole, and between Blacks and the general population within both areas, show the same pattern found for per-capita incomes. Among the general population in rural counties, in 2000 23.2% of adults 25 years of age or older did not have a high school diploma and 41.2% had some post-secondary education (Table 4). For rural Blacks 25 years of age or older, 39.4% had no high school diploma and 26.5% had some post-secondary education. Blacks in RDRCs showed even lower levels of educational attainment. In 2000, 42.3% had no high school diploma

and only 25.3% had some post-secondary education. It is interesting to note that while Blacks in RDRCs have higher rates of noncompletion of high school and generally lower rates of post-secondary education than rural Blacks as a whole, but have higher incidences of adults with a B.S. or graduate degree. It is also worth noting that post-secondary education levels increased between 1990 and 2000 in rural areas generally and most notably among Blacks in RDRCs, but education levels in RDRCs, particularly for Blacks, remain well below rural area averages in 2000.

## **2.5 Infrastructure**

Low education levels in RDRCs and poor performance on other measures of social well-being may stem in part from scarce local public infrastructure in the education, health, and police protection. Data on local government finances show that both revenues and expenditures are lower on a per-capita basis in RDRCs than in rural counties as a whole (Table 5). Lower total per-capita expenditures arise mainly from lower expenditures on education and public welfare. RDRCs actually spend more per-capita on health and roughly the same per-capita on police as rural counties in general<sup>4</sup>. Correlation coefficients between local public expenditures for specific sectors and associated social indicators are also revealing (Table 6). For all rural counties, the percent of adults age 25 or older with no high school shows a slight negative correlation (-0.13) with local spending on kindergarten through twelfth grade (K–12) education. In other words, in counties where local spending on K–12 education is low the percentage of adults with no high school degree is high. In the RDRCs the negative correlation between local spending and the percent of adults with no high school is notably stronger (-0.39), suggesting that available resources for local education and educational levels have a particularly strong link in these counties. By contrast, the correlation between the rate of serious crime and local police

expenditures is strongly positive both for all rural counties and within RDRCs. Thus, in counties with higher crime rates more resources are being devoted to address crime. But in counties with high rates of high school dropouts, fewer resources are being employed, particularly in RDRCs, for local K–12 education. Infant death rates, on the other hand, show no correlation with local public expenditures on health care.

Lower expenditures on public education are particularly worrisome for those concerned about the intergenerational transmission of low levels of socio-economic well-being in RDRCs. Bowles and Gintis find that educational attainment is the most important mechanism for the intergenerational transmission of economic inequality in the U.S., with the transmission of earnings differences associated with race being the second most influential mechanism. It is less clear what role local educational expenditures play in promoting education attainment and, eventually, higher earnings. Hanushek suggests that school resources have little effect on educational outcomes and eventual earnings. However, Card and Krueger find that vast differences in resources devoted to the primary and secondary school education of White and Black youth in North and South Carolina had a strong impact on educational attainment and eventual earnings.

## **2.6 College Access and the Role of HBCUs**

A number of factors other than recent low levels of local expenditures on education play a role in the low rates of educational attainment observed among Blacks in RDRCs. Lower returns on investments in education may reduce the demand for post-secondary education among Blacks. Lower parental incomes may also restrict young Blacks' access to funds for education. In the rural south the legacy of segregation is a particularly strong factor in the current low levels

of post-secondary education. The impact of these policies continues to be felt across generations due to the strong cross-generational correlation of educational attainment (Bowles and Gintis).

HBCUs have historically played an important role in fostering post-secondary education among rural Blacks. Historically, Black Colleges and Universities were established to provide equal educational opportunities for students denied admission to their States' original 1862 land-grant university system. The Higher Education Act of 1965, as amended, defines an HBCU as: "any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." This analysis focuses on the 105 HBCUs that are nationally or regionally accredited, 18 of which were established as 1890 Land Grants, and 51 are publicly funded.

HBCUs continue to play a major role in the post-secondary education of Blacks. In 1995, HBCUs matriculated 26% of all African American students enrolled in four-year colleges, awarded masters degrees and first-professional degrees to about 1 in 6 African American men and women, and awarded 27% of all baccalaureate degrees earned by African Americans nationwide (U.S. Department of Education). The geographic location of HBCUs would suggest they play a particularly important role in the post-secondary education of Blacks in the rural south (Figure 3).

Given that HBCUs were created and supported in an effort to increase post-secondary education among mostly rural Blacks with historically restricted access to post-secondary education, observed low rates of post-secondary education make call into question the efficacy of

HBCUs. Next, a linear regression equation is specified and estimated to address the question: has access to HBCUs increased college education levels in RDRCs? A number of empirical modeling issues arise when attempting to measure the county-level response of RDRCs to HBCU access. We briefly discuss the major issues of measuring access, identifying the marginal influence of HBCUs, and addressing potential endogeneity in HBCU location, before turning to the results.

### *2.6.A Measuring Access*

Improved access to post-secondary education can occur over a number of dimensions. The presence of HBCUs may improve the social, financial, and physical dimensions of access to post-secondary education among rural Blacks. The social distance associated with going to college may be reduced by providing an educational environment where post-secondary education can be obtained among individuals with similar backgrounds. More frequent contact with HBCU students and faculty in the community may also increase the perception that a college degree is a feasible and desirable goal. HBCUs may make post-secondary education more financially accessible by providing relatively low-cost college education. At the same time HBCUs, by being predominantly located in the south, decrease the physical distance an individual residing in the rural south must travel in order to enroll in a college or university. This reduction in physical distance is likely to also reduce the social and financial costs of post-secondary education for rural Blacks. In this paper we use the geographic information system ARC-VIEW, along with data on college and university zip codes and county center coordinates to generate simple measures of straight-line distance from the center of each county to the nearest HBCU granting a bachelors degree. While not an all-encompassing measure of access to

post-secondary education, the straight-line distance measure is expected to be strongly correlated with transport, social and physical costs associated with HBCU attendance.

### *2.6.B Marginal Influence of HBCUs*

HBCUs are not the only, and often not the closest, college or university available to rural Blacks. In order to understand the unique impact that HBCUs have had on post-secondary educational attainment, the differential impact of access to a HBCU must be isolated from the impact of access to the nearest college or university and the impact of access to the nearest public university with a mandate to provide broad access to post-secondary education.

Therefore, measures of straight-line distance to the nearest degree granting college or university and to the nearest public university are also included in the analysis. The basic empirical model to be estimated is then

$$y_i = X_i B + e_i,$$

where  $y_i$  is a measure of the percentage of Blacks 25 years of age or older with a college degree or more in RDRC county  $i$ ,  $X_i$  is a vector of the independent variables, distance to the nearest college or university (ALL), distance to nearest public college or university (Public), and distance to the nearest HBCU and  $e_i$  is an error term that is assumed to be normally, independently, and identically distributed.

### *2.6.C Endogenous Location*

One of the greatest concerns associated with the estimation of the above regression equation is that the location of HBCUs may not be independent of either county levels of educational attainment or income levels that underlie them. A biased positive estimate of the influence of HBCU access on educational attainment would arise if HBCUs were established in counties with high levels of post-secondary education. Neither the historical mandate of HBCUs to provide post-secondary education to southern, mostly rural, Blacks who historically had

limited access, nor the fact that the per-capita incomes of rural counties hosting an HBCU were in fact lower in the year 2000 than the RDRC average for both Blacks (\$8,728) and the general population (\$14,239) provides evidence to support this concern. However, two alternative regression models are run to assess the robustness of the results.

Under the first alternative specification, the impact of HBCU access on the percentage of the general population attaining a college degree in RDRCs is estimated. In this case, a coefficient estimate on the HBCU access variable of similar magnitude to that in the initial specification would suggest the observed county level relationship between HBCU access and post-secondary education does not stem from improved access among rural Blacks. Under the second alternative, the percentage point change in county rates of adults with college degrees is regressed on same set of independent variables. Since HBCU location remains fixed in both periods, the HBCU access measure can not be dependant on changes in the incidence of adults with a college degree.

#### *2.6.D Results*

Regression results are presented in Table 7. In model 1, the county percentage of Black adults 25 years of age or older with a college degree is regressed on distance to the nearest college or university, distance to the nearest public college or university, and the distance to the nearest HBCU. Distance to the nearest college or university shows a negative relationship ( $p=0.05$ ) with the percent of county adult Blacks with a college degree, while distance to a public college or university does not show a significant relationship with the percent of adult Blacks with a college degree. Distance to the nearest HBCU also shows a significant negative relationship ( $p=0.01$ ) with adult Blacks' attainment of a college degree. Thus as access to HBCUs decays with distance, the percent of Blacks with college degrees declines even after



controlling for the presence of other colleges or universities in the area. In fact, the parameter estimate suggests that a 100 mile increase in distance from the nearest HBCU leads to a 5.8 percentage point decrease in the incidence of college degrees among adult Blacks. The fact that access to HBCUs is significant suggests that HBCUs provide a unique stimulus to post-secondary education beyond just closer physical access to a college or university. We speculate that this stimulus stems from related reductions in social distance created by the presence of an HBCU in the area.

Model 2 regresses the percent of all adults in RDRCs with college degrees on the same set of independent variables. As discussed, if the HBCU parameter estimate is of the same magnitude in this model, then the county level association between HBCU access and college degrees among Blacks may stem from a third factor that is correlated with both county distance from an HBCU and attainment of college degrees among the general population (e.g., HBCUs may be located in areas with higher levels of economic well-being). However, the parameter estimate on HBCU distance, while still significant ( $p=0.05$ ) in model 2, is much closer to zero. Thus, the association between county rates of college degrees and HBCU access appears to largely stem from Blacks. The association between the closest college or university and the percent of all adults with college degrees in RDRCs is now not statistically significant. On the other hand, the parameter estimate for the distance to the nearest public college or university variable is now negative and weakly significant ( $p=0.10$ ). Thus, the general population sees some decay in county rates of college degrees with increasing distance from the nearest public college or university, but the strongest association between HBCU access and increased attainment of college degrees appears to occur among Blacks.

Models 3 and 4 use the same set of independent variables, but in model 3 the dependent variable is now the change from 1990 to 2000 in the percent of RDRC adult Blacks with a college degree. In model 4, the dependent variable is the percentage point change from 1990 to 2000 in the general adult RDRC population with a college degree. The results from model 3 suggest that the distance to the nearest college or university has had no impact on 1990 to 2000 increases in the percent of adult Blacks holding a college degree. But closer access to public colleges and universities is significantly associated ( $p=0.05$ ) with increases in the percent of Black adults holding a college degree. Access to an HBCU also continues to result in significant additional gains in college degrees ( $p=0.05$ ). In this case, living 100 miles closer to an HBCU is associated with a 1.6 percentage point increase in adult Blacks with a college degree between 1990 and 2000. For the general population in model 4, distance to the nearest public college or university continues to show a negative association ( $p=0.10$ ) with the incidence of college degrees. But the HBCU distance coefficient estimate is positive and not significant. In fact, the *F*-test indicates that the regression equation as a whole is not significant. This, again, suggests that in RDRCs the impact of access to HBCUs on improved rates of post-secondary education occurs primarily among Blacks.

## **2.7 Conclusions**

The results of the paper show that RDRCs have lower levels of economic well-being and poorer performance on many indicators of social well-being than rural counties as a whole. Many conditions that underlie these low levels of socio-economic well-being are not, however, unique to RDRCs. Low education levels, weak workforce attachment, and low wages are found in many other counties in the rural south. The prevalence of Black adults with low education levels arise from the cross-generational legacy of segregation, low demand for skilled labor in

the region, and continued low levels of resources devoted to K–12 education. Low education levels, in turn, promote the continuation of these underlying conditions.

Some positive trends in RDRCs are, however, found in recent U.S. Census data. From 1990 to 2000 education levels among Blacks in RDRC increased rapidly, particularly at the post-secondary level. The regression analysis in this paper suggests that these increases in post-secondary education were due, in part, to the access to college education created by a concentration of HBCUs in the region. The analysis also reaffirms that HBCUs continue to have a unique role in drawing young Blacks to college, as the percent of Blacks in RDRCs with college degrees is 5.8 percentage points greater when 100 miles closer to a HBCU relative to the impact of being 100 miles closer to any college or university. The findings also suggests that local investments in both K–12 and post-secondary education infrastructure are linked to local education levels. Further research, including an analysis of the impact of access to colleges and universities at the sub-county level and the joint estimation of per-capita income and education levels, is needed to fully understand the nature of this link.

Policy options in most southern states to assist RDRCs to further strengthen local school systems are limited by the current fiscal climate. But the documentation of successes, like the impact that HBCUs have had on post-secondary education of Blacks in RDRCs, are important for preserving existing allocations and demonstrate that a future re-commitment to public infrastructure can have positive impacts on economic well-being.

<sup>1</sup> This paper uses 1993 U.S. Census designations of non-metropolitan and metropolitan counties. Metropolitan counties generally have populations greater than 100,000 (75,000 in New England) or a town or city of at least 50,000. Non-metropolitan counties are those counties not classified as metropolitan. For ease of exposition we refer to non-metropolitan counties as rural.

<sup>2</sup> The same counties are designated as rural for the year 2000 even though some of these counties may be reclassified as metropolitan following analysis of the 2000 U.S. Census data.

<sup>3</sup> Native Americans are the other racial group with significant concentration in rural counties. Predominantly Native American counties are not examined in the analysis as few counties with a third or more American Indians are located in the rural south (ERS). Ethnically diverse counties with large concentration of Hispanics are also not examined in the analysis.

<sup>4</sup> The latter may be due, in part, to fewer private hospital facilities.

## **Chapter 3. Economic Growth in Racially Diverse Rural Counties: The Contribution of Historically Black Colleges and Universities.**

### **3.1 Introduction**

Low levels of educational attainment and income often persist through time, creating a cycle of poverty. This interrelationship between educational attainment and income, both on the micro and macro level, has been well documented in literature<sup>1</sup>. On the micro level education is positively correlated with lifetime earnings (Mincer). But recent macro literature assigns education a central role to the process of income growth and economic development. The human capital endowment of a community determines the conduciveness of the economic environment to technological advancement and/or adaptation (Romer; Nelson, and Phelps).

Increases in human capital in an economy may also facilitate other positive externalities and make other inputs more productive (Lucas; McMahon). By the same token, low educational attainment in a community compromises the local economies ability to develop and adapt new technology, thus limiting the community's ability to maintain a healthy business atmosphere, attract investment, and spur entrepreneurial activity. As a result the demand for skilled labor and therefore returns to postsecondary education are within the community often low. Low returns to postsecondary education limit the incentives of community's young adults to pursue a college education. In addition, low returns to education may force highly-educated young adults to migrate out of the community (Mills, and Hazarika ), thus lowering the education base of the remaining workforce. This cycle leads to persistent stagnation in real incomes.

In turn, a community's income influences educational attainment through its impact on private and public spending on education. In the standard neoclassical economic framework the

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<sup>1</sup> Krueger and Lindahl (2000) provide a comprehensive review of the literature on income, growth, and education.

decision to make private investments in postsecondary education is made by comparing discounted expected future earnings to the discounted direct costs of college education and the foregone earnings from not being gainfully employed while attending school. Credit market constraints may, however, limit the ability of low-income families to obtain funds to invest in education until the discounted marginal benefits of education are equal to the discounted marginal costs. Also, low-income families may have a stronger need to use currently available income to meet present needs, and therefore, higher discount rates. Incentives to invest in college education may be particularly low for low-income Blacks because their returns to postsecondary education are often lower due to legacies of economic discrimination (Darity, and Mason).

In the US, public spending on education is also limited for poor counties due to their low tax bases. There is some debate on the role that public expenditure on education has on the county-level educational attainment and on subsequent levels of income and employment. Hanushek (1986) suggests that primary and secondary school resources have little effect on educational outcomes and eventual earnings. Many other studies, however, find investments in public education to be positively correlated with levels of income and employment, particularly in the rural south where large disparities in school funding along racial lines existed historically (Card, and Krueger; Ouan, and Beck).

Evidence of persistent cycles of low levels of educational attainment and low incomes, as well as high incidence of poverty is found in the US, most notably in the rural south. Race also appears to play an important role in the education income nexus, as levels of education and incomes are particularly low among rural Blacks. Blacks also show a particularly strong concentration within the rural south, with over 89 percent of all rural Blacks living in the region. Despite recent improvements in rates of educational attainment among rural Blacks in the south,

their incidence of college degrees remains well below the national average. Blacks have especially low levels of college education attainment in rural counties where they form a significant share of the population. According to US Census data, in 2000 only 7.7 percent of Black adults 25 years of age or older, in Racially Diverse Rural Counties where Blacks comprise one third or more of the population (RDRCs), had a college degree, while 16.62 percent of Black adults in the US, and 25.92 percent of all US adults had at least a four-year college degree.

Blacks also show an exceptionally high rate of poverty in the rural south (31.6 percent) when compared to their national average (23.0 percent). However even within the rural south, Blacks with lower levels of economic well-being are highly clustered geographically (Economic Research Service). For example, Beale (1996) finds that in over half of the persistently poor rural counties, with poverty rates above 20 percent in each U.S. Census from 1960 to 1990 Blacks are either the majority of the poor or their incidence of poverty alone accounts for rates of above 20 percent.

Persistently low levels of education, low incomes and high incidences of poverty, place RDRCs with high concentrations of Blacks at especially high risk of being locked in a cycle of poverty. Federal, state, and local governments continuously struggle to find mechanisms to stimulate development in such counties and break the poverty cycle. Historically Black Colleges and Universities (HBCUs), given both their geographic location (figure 3) and their mandate to provide accessible education to underserved Blacks, may provide such a policy mechanism for RDRCs. HBCUs have historically played an important role in providing higher education to Blacks. Several studies find that HBCUs still play a unique role in fostering postsecondary education of young Blacks (Mykerezi, Mills, and Gomes; Brazziel; Constantine).

The current study uses 1990 and 2000 US Census of Population and Housing county subdivision level data to explore the relationship between access to HBCUs and attainment of a college degree among Black adults in RDRCs. The link between postsecondary education attainment and real income growth in RDRCs is also examined.

To pursue these objectives the rest of the paper is organized as follows. The next section reviews the data used in the analysis and defines the RDRCs that are the focus of study. Section 3 examines the influence that proximity to HBCUs has on the incidence of college degrees in RDRCs. Section 4 examines the impact that postsecondary education attainment has on income growth in RDRCs. Section 5 distills conclusions and policy implications.

### **3.2 Data and Definitions**

This study relies primarily on census designated county subdivision level data from the 2000 and 1990 US Census of Population and Housing, STF3C tape. Counties and their subdivisions defined as non-metropolitan based on the 1990 US Census of Population and Housing are designated as rural in the study.<sup>2</sup> The base U.S. Bureau of Census STF3C data for 1990 contains 2,300 rural counties containing 24281 county subdivisions. Consistent with E.R.S. (1999), we designate RDRCs as those rural counties where Blacks comprise one third or more of the population.<sup>3</sup> U.S. Census Data indicates that under this definitions there were 208 RDRCs containing 1114 county subdivisions in 1990. For a comprehensive analysis of the location, demography, and economic and social well-being of these RDRCs see Mykerezzi, Mills, and Gomes (2003).

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<sup>2</sup> The same counties are designated as rural for the year 2000 even though some of these counties may be reclassified as metropolitan following analysis of the 2000 US Census data.

<sup>3</sup> Native Americans are the other racial group with significant concentration in rural counties. Predominantly Native American counties are not examined in the analysis as few counties with a third or more American Indians are located in the rural south (ERS, 1999). Ethnically diverse counties with large concentration of Hispanics are also not examined in the analysis.



The study also makes use of US Census TIGER database county subdivision center coordinates, and Department of Education's Postsecondary Education Participation System (PEPS) college and university zip codes to generate straight line distance measures from each County subdivision to the nearest college or university, nearest public college or university, and nearest HBCU. Table 8 presents summary statistics for the variables used in this study.

### **3.3 Location of Colleges and Universities and Educational Attainment.**

Several studies find evidence that access to educational institutions is positively correlated with individual's educational attainment. For example Card (1995) finds that closer distance to a college or university is positively related to educational attainment. Further, Card finds that proximity to colleges and universities has a larger impact on educational outcomes of individuals whose parents have low levels of education, suggesting that the location of colleges and universities in historically less well-off areas may have a greater impact on local educational attainment than their location in relatively well-off areas.

HBCUs, by their mandate and location in the rural south are likely to serve such a role (Figure 3). HBCUs were established to provide equal educational opportunities for students denied admission to their States' original 1862 land-grant university system, and they have historically played an important role in fostering postsecondary education among rural Blacks. The Higher Education Act of 1965, as amended, defines an HBCU as: "any historically Black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." This analysis focuses on the 105 HBCUs that are

nationally or regionally accredited, 18 of these institutions were established as 1890 Land Grants, and 51 are publicly funded.

HBCUs continue to play a major role in the postsecondary education of Blacks. In 1995, HBCUs hosted 26 percent of all African American students enrolled in four-year colleges, awarded masters degrees and first-professional degrees to about 1 in 6 African American men and women, and awarded 27 percent of all baccalaureate degrees earned by African Americans nationwide (U.S. Department of Education). Evidence exists that HBCUs continue to play a particularly important role on the achievement of Black Americans. For example the value added to the earnings of Blacks from a college degree is estimated to be 38 percent higher for those who graduate from an HBCU, than for those who obtain a college degree from other institutions (Constantine). A disproportionate number of Black PhD holders also list an HBCU as their school of undergraduate studies (Brazziel). Mykerezi, Mills, and Gomes (2003), using county level data, estimate that for RDRCs, the incidence of college degrees amongst Black adults drops by 5.8 percentage points and the rate of accumulation of college degrees for Blacks is 1.2 percentage points lower, even after controlling for the presence of other colleges and universities in the area, as the distance from a county to the nearest HBCU increases by 100 miles.

Despite this evidence, some question if HBCUs still have an important role in postsecondary education given that formal segregation in public postsecondary educational institutions has been removed (Tucker). However, informal barriers to African American enrollment in college continue to exist. These barriers arise from financial constraints, social distance, and lack of information on college enrollment requirements and financial aid opportunities. Proximity to HBCUs may reduce these barriers by providing nearby affordable

education to African Americans in underserved areas and by providing institutions where students of similar background can enroll.

Linear regression models are specified and estimated to address the question whether greater access to HBCUs has had causal effects on the share of the adult population with college degrees in 2000 and on the growth in the share of adults with degrees in RDRCs between 1990 and 2000. Similar models are also run for the general population, to see if the impact of HBCUs is specific to the Black population in RDRCs.

Several empirical and modeling issues arise when attempting to measure the impact of access to HBCUs on county subdivision level rates of college degree attainment in RDRCs. The most important issues that are addressed below are: measuring access to HBCUs, identifying the marginal influence of HBCUs on educational attainment of Blacks, addressing potential endogeneity of the location of HBCUs, and addressing concerns about unequal populations in county subdivisions.

### *3.3.A Measuring access:*

The presence of HBCUs may improve the social, financial, and physical dimensions of access to postsecondary education among rural Blacks. The social distance associated with going to college may be reduced by providing an educational environment where college education can be obtained among individuals with similar backgrounds (Akerlof, and Kranton). More frequent contact with HBCU alumni, students, and faculty in the community may also increase the perception that a college degree is a feasible and desirable goal. HBCUs may also make postsecondary education more financially accessible by providing relatively low-cost college education. At the same time HBCUs, by being predominantly located in the south, decrease the physical distance an individual residing in the rural south must travel in order to enroll in a

college or university. This reduction in physical distance is likely to also reduce the social and financial costs of postsecondary education for rural Blacks. In this paper we use the geographic information system ARC-VIEW along with data on college and university zip-codes and county subdivision center coordinates to generate measures of straight-line distance from the center of each county subdivision to the nearest accredited HBCU granting a bachelors degree. While not an all-encompassing measure of access to postsecondary education, the straight-line distance measure is expected to be strongly correlated with transport, social and physical costs associated with HBCU attendance.

### *3.3.B Marginal influence of HBCUs*

HBCUs are not the only, and often not the closest, college or university accessible for rural Blacks. In order to understand the unique impact that HBCUs have had on college degree attainment, the differential impact of access to a HBCU must be isolated from the impact of access to the nearest college or university and the impact of access to the nearest public university with a mandate to provide broad access to postsecondary education. Therefore, measures of straight-line distance to the nearest degree granting college or university and to the nearest public university are also included in the analysis. The impact of HBCUs under this specification is thus two-fold. First it has the general impact that is associated with any college or university (or any public college or university if it is publicly funded). Secondly it has a unique impact associated with being an HBCU.

### *3.3.C Endogenous location*

A major concern associated with the estimation of the impact of HBCU access on college degree attainment is that the location of HBCUs may not be independent of either county subdivision levels of educational attainment or income levels, and any other factors that underlie

education and income levels. A biased positive estimate of the influence of HBCU access on educational attainment would arise if HBCUs were established in counties with high levels of college education or relatively high incomes. Neither the historical mandate of HBCUs to provide postsecondary education to southern, mostly rural, Blacks who historically had limited access, nor the fact that the per-capita incomes of rural counties hosting an HBCU were in fact lower in the year 2000 than the RDRC average for both Blacks (\$8,728) and the general population (\$14,239) provides evidence to support this concern. In fact, since HBCUs appear to be located in areas with relatively low levels of economic wellbeing, parameter estimates of the influence of HBCU access on educational attainment may actually show a downward bias. Several tests are run to assess the robustness of the estimated association between HBCU access and Blacks' educational attainment.

First, a measure of county subdivision real per capita income is included in the regression equation. County subdivision per capita income and subdivision rates of adult college degree attainment are clearly jointly determined variables, thus the inclusion of per capita income in 2000 in the regression equation may present an endogeneity problem. To correct for potential endogeneity we use 1990 county subdivision per capita income to proxy for 2000 income<sup>4</sup>. A significant parameter estimate for distance from the subdivision to the nearest HBCU even after controlling for real income differences means that the parameter estimate either measures the true causal effect of access to HBCUs on adult Blacks' college degree attainment, or the correlation stems from a third factor, other than income, that is correlated with both location of HBCUs and county subdivision rates of college attainment.

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<sup>4</sup> Income in 1990 has a partial effect on the share of college graduates in 2000, but the latter cannot cause income levels in 1990.

To address this additional concern two alternative regression models are estimated. Under the first alternative specification, the impact of HBCU access on the share of the general adult population with a college degree in the county subdivisions of the RDRCs is estimated. In this case, a coefficient estimate on the HBCU access variable among the general population of similar magnitude to that in the initial specification for Blacks would suggest the observed county subdivision level relationship between HBCU access and college education does not stem from improved access among rural Blacks. Under the second alternative, the change in the share of county subdivision Black adults with college degrees between 1990 and 2000 is regressed on same set of independent variables. Since HBCU location remains fixed in both periods, the HBCU access measure cannot be dependant on changes in the incidence of adults with a college degree. A significant negative parameter estimate would therefore, imply a causal effect of access to HBCUs on changes in adult Blacks' college education attainment.

### *3.3.D Heteroskedasticity*

Since the study is interested in the causal effect that college access has on educational attainment of adults, individual-level data would be appropriate for the task. However given confidentiality restrictions on US census data, only aggregate data is available. Using an aggregated county subdivision data set, imbeds heteroskedasticity into the statistical model if the model with individual level data satisfies the homoskedasticity assumption (Wooldridge). Specifically the error in the statistical model is proportional to the inverse of the population size. Therefore using weighted least squares, whereby the respective population size is the weighting variable is appropriate. Again, this procedure assumes that the underlying individual-level equation satisfies the standard Gauss-Markov assumptions. There is no way of testing if that is

the case, so the heteroskedasticity robust errors are reported to account for any heteroskedasticity in the individual level model (Wooldridge).

The basic empirical model to be estimated is then:

$$w_i y_i = w_i X_i B + e_i$$

where:  $w_i$  are weights equal to the population size for each data point,  $y_i$  is a measure of the share of Blacks 25 years of age or older with a college degree in RDRC county subdivision  $i$ ,  $X_i$  is a vector of the independent variables: distance to the nearest college or university (ALL), distance to nearest public college or university (Public), distance to the nearest HBCU, real per capita income in 1990 (INC), and  $e_i$  is the error term.

### 3.3.E Results

Regression results for RDRC Blacks (model 5) and the RDRC general population (model 6) are presented in table 9. In model 5 distance to the nearest college or university shows a negative relationship ( $p=0.1$ ) with the share of county subdivision adult Blacks with a college degree. Distance to the nearest HBCU also shows a significant negative relationship ( $p=0.01$ ) with Black adults' attainment of a college degree. Thus as access to HBCUs decays with distance, the share of Blacks with college degrees declines even after controlling for the presence of other colleges or universities in the area and variability in county subdivision real per capita incomes. In fact, the parameter estimate suggests that a 10 mile decrease in distance from the nearest HBCU leads to a 0.8 percentage point increase in the incidence of college degrees among adult Blacks. The fact that access to HBCUs is significant even after controlling for the presence of other colleges and universities in the vicinity suggests that HBCUs provide a unique stimulus for postsecondary education among rural Blacks beyond just closer physical access to any

college or university. We speculate that stimulus stems from related reductions in social distance created by the presence of an HBCU in the area.

As expected, subdivision real per capita income also shows a significant relationship with the incidence of college degrees amongst Black adults ( $p=0.05$ ). As previously discussed, the fact that the parameter estimate of distance to the nearest HBCU is significant even after holding real per capita income constant suggests that the association between distance to HBCUs and Blacks' college education attainment does not stem from HBCUs having been located in areas with relatively high economic well-being within the RDRCs.

Model 6 regresses the share of all adults in RDRCs with college degrees on the same set of independent variables used in model 5. As discussed, if the HBCU parameter estimate is of a similar magnitude in this model, then the county subdivision level association between HBCU access and college degrees among Blacks may stem from a third factor that is correlated with both county distance from an HBCU and attainment of college degrees among the general population. However, the parameter estimate on HBCU distance, while still significant ( $p=0.05$ ) in model 6, is much smaller in magnitude (0.35 versus a 0.80 percentage point increase in incidence of degrees per 10 mile decrease in distance to the nearest HBCU). Thus, the association between county subdivision rates of college degrees and HBCU access appears to occur mainly with the adult Black population. The general population sees an increase in the incidence of college degrees with decreasing distance from the nearest college or university ( $p=0.05$ ). County subdivision income levels also show a significant ( $p=0.01$ ) positive correlation with the incidence of college degrees amongst all adults.

Models 7 and 8 regress the change between 1990 and 2000 in the share of Blacks and all adults, respectively, that have college degrees in RDRCs, on the same set of independent



variables as models 5 and 6. However the fraction of the Black adult population with college degrees in 1990 is also included in model 7 in order to control for initial levels of college graduates amongst Blacks. A similar variable is added for the general population in model 8. The results reported in table 9 show that distance of a county subdivision from the nearest college or university, and distance to the nearest public college or university show no significant effect upon the change between 1990 and 2000 in the share of Black adults with a college degree. Also, per capita income of Blacks in 1990 has no significant impact on the subsequent change in the share of Blacks with a college degree. However distance to the nearest HBCU continues to show a significant ( $p=0.01$ ) effect on the change in the share of degree holders amongst Black adults. In fact the parameter estimate suggests that the change in the share of Black adults with college degrees is 0.29 percentage points larger for every 10 miles closer a county subdivision is to the nearest HBCU. As discussed previously, the significance of the HBCU access measure alleys concerns that the association between HBCU access and college education attainment does not reflect the true causal effect of access to HBCUs on Blacks' college educational attainment. The share of the adult Black population with a college degree in 1990 also shows a significant ( $p=0.01$ ) negative correlation with the growth in the share of college educated Black adults, suggesting that the greatest gains in the share of Blacks with a college degree occurred in county subdivisions with lower initial shares of college educated Black adults.

For the general population in model 8, the distance to the nearest public college shows a significant ( $p=0.05$ ) impact on the rate of change in the share of adults with college degrees, but the distance to the nearest HBCU has no impact. Further, an F test indicates that the regression as a whole is not significant. Again, access to HBCUs appears to only have an impact upon the change in the share of college educated Blacks.

### **3.4 Education and Income Growth.**

The analysis next identifies the effects that college education of Blacks and of all adults in RDRCs have on the subsequent economic well-being of county subdivisions. The role of education in economic growth is well documented in literature. Early work, like Solow (1956) acknowledged that technological change and the level of human capital that underlies it have an impact on real income growth, but they were assumed exogenous. More recent work assigns education a central role in the process of income growth, on two different plains. Per capita human capital accumulation over time fuels growth by facilitating positive externalities, through enhancing the productivity of all inputs in an economy (Lucas; McMahan). The initial endowment of human capital also impacts income growth through its ability to fuel technological change (Romer), and facilitate diffusion of technology from the relatively more developed areas to the less developed ones (Nelson, and Phelps).

In this section we estimate a linear regression model that examines the overall impact of postsecondary education on the per capita income growth of Blacks and the general population in RDRCs, as well as across all rural US county subdivisions for comparison.

The model captures the impact of college education in two ways. First, consistent with Romer (1990), and Nelson and Phelps (1966), the fraction of the adult population, 25 years of age or older, with a college degree is included as a variable in the model. Second, consistent with Lucas (1988), the effect of the accumulation of human capital on income growth is accounted for by including the change in the fraction of the adult population with a college degree in the model. Several data and specification issues are addressed before turning to the results. These issues are (1) disentangling causality between education and income growth in linear regression

models, (2) overcoming the lack of subdivision-level data on physical capital, (3) and addressing potential heteroskedasticity in the statistical model.

#### *3.4.A Causality of Education and Income Growth*

The inclusion of initial levels of education presents no cause for concern about endogeneity, as it is not feasible for the level of education in 1990 to be dependent on subsequent income growth between 1990 and 2000. The growth in the share of college-educated adults may however, be an endogenous variable, as growth in the fraction of the adult population and income growth are likely jointly determined. While growth in human capital is expected to fuel income growth, the opposite may also be true. Faster growing areas may experience an increase in the demand for skilled labor, and therefore increasing returns to college education, inducing private investments in college education, and/or attracting college educated young adults to the area. Bils, and Klenow (2000) find that more than one half of the correlation between schooling and income growth across countries can be explained through the reverse channel, whereby faster growth induces more schooling. Several recent studies use natural experiments to obtain valid instrumental variables in order to correct for endogeneity bias<sup>5</sup>. A valid instrumental variable needs to satisfy two assumptions. First, it needs to be correlated with the endogenous independent variable. Second, it needs to be orthogonal to the error term in the income growth equation (Wooldridge). In section 3 we have made the case that the location of HBCUs is uncorrelated with subdivision per capita incomes in ways other than through its impact on educational attainment. Also model 7 (table 9) shows that distance to the nearest HBCU is significantly correlated with the change in the fraction of college graduates amongst Black adults in RDRCs. Thus distance to the nearest HBCU is used as an instrumental variable for the change in education to correct for endogeneity bias in the model specified for Blacks in RDRCs. Results

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<sup>5</sup> For a review on natural and policy experiments being used as instrumental variables see Card (2001).

are then reported for both, the instrumented and non-instrumented WLS models. For the regression equations on the general population in RDRCs, and those estimated for all subdivisions in the rural US, no such instrument is available, as to satisfy both the above stated assumptions. Thus a direct measure of the change in the share of college graduates is used in the last three models, acknowledging that the parameter estimates may potentially display positive endogeneity bias.

### *3.4.B Physical Capital*

Human capital is not the only factor influencing per capita income growth. The endowment of physical capital in the base period, and its rate of accumulation, for instance, also impact per capita income growth. It is thus desirable to include measures of physical capital in income growth regressions. County subdivision level data on physical capital are, however, not available. Several studies use economic base variables such as the fraction of employment in manufacturing and transfer payments, as proxies for physical capital (Krueger, and Lindahl). For example, Simon, and Nardinelli (2002) use the fraction of employment in manufacturing to control for variability in aggregate production functions across counties. We use the fraction of the employed population that is in manufacturing and construction, as well as the fraction of the employed population in services and public administration in 1990 to proxy for variability in physical capital across county subdivisions<sup>6</sup>. This assumes that the capital labor ratio is relatively constant across county subdivisions within these broad groupings.

### *3.4.C Heteroskedasticity*

The same concerns about heteroskedasticity pertain in this model as in the previous statistical models for shares of adults with college degrees. Therefore the income growth

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<sup>6</sup> Leaving the base group as the fraction of employment in agriculture fisheries and forestry in 1990.

equations are also estimated using WLS, where subdivision population size is the weighting variable. Robust standard errors are also reported.

The model is thus specified as:

$$W_i I_i = W_i C_i \mathbf{g} + e_i$$

$W_i$  is a vector of weights equal to the appropriate population size,  $I_i$  is the growth rate in per capita income for the census period [ $I = (\ln \text{Income}_{00} - \ln \text{Income}_{90})$ ], in county subdivision  $i$ .  $C$  is a matrix of the independent variables including; the share of the county subdivision adults 25 years of age or older that had at least a four year college degree in 1990 (EDUC), the change in the share of the adult population that has a college degree between 2000 and 1990 (DEDUC), the fraction of the employed population that is in manufacturing and construction in 1990 (MANU), the share of the employed population that is in the service industry or employed in the public sector in 1990 (SERV), a measure of the share of total subdivision population comprised of Blacks (PBLCK) is included in the model estimates for all rural county subdivisions<sup>7</sup>, and  $e_i$  is the error term. As noted (DEDUC) is instrumented for in model 10.

#### *3.4.D Results*

Income growth regression results are shown in table 10. Model 9 regresses the RDRC subdivisions per capita income growth rate for Blacks, on the fraction of the Black adult population with a college degree or more in 1990, the growth rate in the fraction of the Black adult population with a college degree, the fraction of the workforce employed in manufacturing and construction, the fraction of the workforce employed in the service sector and public administration in 1990, and the log of real per capita income for Blacks in 1990. Model 10 uses

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<sup>7</sup> The share of Blacks in the population has not been included in the regressions estimated for the RDRCs because this variable is truncated at one third or more Blacks by definition.

the same set of dependent and independent variables, but the change in the share of college educated Black adults is instrumented as discussed above.

Results for models 9 and 10 indicate that the growth of the fraction of college educated Black adults in RDRC subdivisions is positively correlated ( $p=0.01$ ) with the rate of real per capita income growth of Blacks. Parameter estimates in model 9 indicate that a 1 percentage point increase in the growth between 1990 and 2000 in the fraction of college educated Black adults yields an additional 1.4 percentage point increase, (2.4 percentage point increase in the IV model 10), in the growth rate of real income for the Black population in RDRC subdivisions for the same time period. The parameter estimate in the IV model while expected to be lower than in the non-instrumented model, is in fact higher. One weakness of the specification is that the use of aggregate data does not allow us to control for the quality and type of education institution that college educated adults have attended. The unexpected increase in the change in education parameter when instrumented may stem from the previous finding of Constantine (1995) that Blacks who attend HBCUs realize higher returns to college education than Blacks from other colleges and universities. The parameter estimates for the instrumented and un-instrumented models are, however, not statistically different from each other at the ( $P=0.05$ ) confidence level. It is thus, safe to conclude that the results provide no evidence of positive endogeneity bias in the model estimated for the Black population in the subdivisions of the RDRCs. The results also indicate that the initial share of college educated Black adults in county subdivisions of the RDRCs has no significant impact upon the subsequent income growth of Blacks. But, real per capita income in the initial period is negatively correlated with the income growth rate for Blacks in RDRCs, suggesting that Blacks in RDRC subdivisions with lower initial per capita incomes have realized greater rates of per capita income growth during the 90s.

Model 11 uses the same set of variables applied to the general population in county subdivisions of RDRCs. The results indicate that both the initial endowment of college educated adults, and the change in the fraction of educated adults are positively correlated with per capita income growth ( $p=0.01$ ). Parameter estimates suggest that a 1 percentage point higher share of college educated adults in 1990 is associated with a 1.5 percentage point increase in the real per capita income growth rate over the subsequent decade, and a 1 percentage point higher rate of change of college education attainment between 1990 and 2000 is associated with a 2.6 percentage point increase in the rate of growth of real per capita income for the general population in the RDRCs over the same time period. Initial real per capita income also continues to show a significant ( $p=0.01$ ) negative relationship with income growth, suggesting that subdivisions with low initial per capita income have seen larger income growth rates among the general population.

Models 12 and 13 apply the same specification as in models 9 and 11, respectively, to subdivisions of all rural US counties. The results show that the level of college education attainment in 1990, and the subsequent change in the share of college-educated adults between 1990 and 2000 are significantly correlated ( $p=0.01$ ) with income growth for both Blacks and the general population across the rural US. Parameter estimates suggest that a 1 percentage point higher fraction of Black college educated adults in 1990 yields 0.5 percentage points gain in income growth rate for Blacks. Similarly the gain for the general population in the rural US is 1.2 percentage points. Further, a 1 percentage point increase between 1990 and 2000 in the share of Black college educated adults yields 1.1 percentage point gain in the income growth rate for rural Blacks. While a similar change among the general population in the rural US leads to 1.9 percentage point gain on the growth rate of per capita income.

### **3.5 Comparing Returns to Education**

Comparing respective parameter estimates indicates that both the initial endowment and the change in the share of college educated adults produce smaller gains in the real per capita income growth rate between 1990 and 2000 for Blacks in subdivisions of the RDRCs than for the general population in the RDRCs (table 10). Blacks across the rural US also show lower parameter estimates for the impact of initial education base, and the change in the fraction of college educated adults on income growth than does the general rural population (table 10). Further, Blacks in RDRCs show lower income response to the initial endowment of college educated adults than do Blacks across the rural US. However they have comparable returns to changes in the share of college educated adults by one estimate (model 9), and the returns to the change in the share of adults with a college degree for Blacks in RDRCs is larger than that for all rural Blacks when change in education is instrumented (model 10).

### **3.6 Conclusions**

Blacks in RDRCs show relatively low levels of postsecondary education, and low levels of income compared to the general population. This study finds evidence that Blacks in RDRCs are not seeing the same benefits of initial education assets on subsequent income growth when compared to other rural Blacks, or to the general population. Returns on new investment in education are, however, at least as high, or higher for Blacks in RDRCs, when compared to all rural Blacks and the general population. These findings suggest that Blacks in RDRCs have difficulties in mobilizing base educational assets to generate economic growth. This may be due to lower levels of technology and other spillovers on educational assets in these communities.

Enhancing college education amongst Blacks should be a primary goal of any policy initiatives aiming to aid development of the RDRCs. As previously discussed, the decision of



individuals to pursue a college education depends on costs of education, its expected returns, and social factors that affect the perceived costs and benefits of college education to individuals. This study presents evidence that proximity to HBCUs significantly reduces costs of college education for Blacks in RDRCs. HBCUs are therefore accessible and efficient policy instruments to aid the further development of the RDRCs. Further their impact on promoting college education for Blacks is above and beyond that found from other colleges and universities.

Several additional research questions arise from this study. Most importantly, does the rate of return to college education from an HBCU differ from the rate provided by other institutions for Blacks? If that is the case, HBCUs are even stronger drivers to community development than is currently estimated in this study. An individual level dataset is needed in order to further explore this question. Another issue that needs further exploration arises from the finding that the fraction of the county subdivision comprised of Blacks is significantly and negatively correlated with income growth. This suggests that even after controlling for the initial fraction of adults with a college degree, change in the share of adults with college degrees, and physical capital both, the general population and Blacks see lower rates of income growth in subdivisions with higher fractions of Blacks. Thus, there appears to be some unaccounted for constraint on income growth associated with the concentration of Blacks in rural areas beyond the factors traditionally accounted for in the poverty trap framework.

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**Table 1.** Population and Race

<i>Variable</i>	Rural Counties			Racially Diverse Rural Counties		
	1990	2000	Change (%)	1990	2000	Change (%)
Total Population	51,189,163	56,165,270	9.7	4,243,841	4,538,480	6.9
Black Population	4,499,601	4,795,709	6.6	1,980,005	2,140,034	8.1
% Black	8.8	8.5	-3.4	46.7	47.2	1.1

Source: U.S. Census of Population and Housing, 1990 and 2000

**Table 2.** Economic Well-being (in real \$2000)

<i>Variable</i>	Rural Counties			Racially Diverse Rural Counties		
	1990	2000	Change (%)	1990	2000	Change (%)
Per-capita Income						
- All	14,381	16,950	17.9	11,941	14,511	21.5
- Blacks	7,804	10,516	34.8	7,196	9,884	37.4
Poverty Rates (%)	16.6	14.1	-15.0	26.0	21.7	-16.5

Source: U.S. Census of Population and Housing, 1990 and 2000.

**Table 3.** Indicators of Social Well-being

<i>Variable</i>	Rural Counties			Racially Diverse Rural Counties		
	1990	2000	Change (%)	1990	2000	Change (%)
Workforce participation (%)	59.9	60.2	0.5	57.6	55.3	-4.0
Infant death / (1000)	10.7	8.2	-23.4	15.72	11.84	-24.7
Serious Crime / (100000)	2804	3110	10.9	2682	4001	49.2
Voter Participation (%)	39.2	37.2	-5.1	35.6	33.0	-7.3

Sources: Bureau of Labor Statistics, National Center for Health Statistics, Federal Bureau of Investigation.

Notes: Figures on infant deaths per thousand are for the years 1986 and 1996. Figures on serious crime per hundred thousand are for the years 1985 and 1995. Voter participation rates are for the 1986 and the 1996 elections.

**Table 4.** Educational Attainment

	Rural Counties			Racially diverse rural counties		
	1990	2000	Change	1990	2000	Change
			(%)			(%)
<i>% of all adults age 25 or over with</i>						
No High School Diploma	31.0	23.2	-25.2	41.7	32.2	-22.8
High School Diploma	34.7	35.5	2.3	30.2	33.1	9.6
Some College No BS	21.2	25.7	21.2	17.2	22.0	27.9
BS	8.4	10.1	20.2	7.3	8.4	15.1
Graduate Degree	4.4	5.4	22.7	3.6	4.3	19.4
<i>% of Black adults age 25 or over with</i>						
No High School Diploma	50.1	39.4	-21.4	55.8	42.3	-24.2
High School Diploma	26.9	33.6	24.9	26.2	32.4	23.7
Some College No BS	14.1	19.3	36.9	11.9	17.6	47.9
BS	3.9	4.7	20.5	4.0	4.8	20.0
Graduate Degree	2.0	2.5	25	2.1	2.9	38.1

Source: U.S. Census of Population and Housing, 1990 and 2000.

**Table 5.** Local Government Finances

	Rural	Racially Diverse Rural
Total Revenue	1870	1628
Expenditures: Total	1828	1611
- Education	909	833
- Health	189	239
- Public Welfare	60	21
- Police Protection	69	68

Source: U.S. Census of Government (State and Local Government Finances).



**Table 6.** Correlation Coefficients for Local Sector Expenditures and Associated Social Indicator

	All Rural Counties Spending in Sector	Racially Diverse Rural County Spending in Sector
Share no high school degree <sup>a</sup>	-0.13	-0.39
Rate of Serious Crime <sup>b</sup>	0.43	0.60
Rate of Infant death <sup>c</sup>	0.00	0.04

<sup>a</sup> Coefficient is for the correlation between the county share of adults 25 years of age with no high school and local expenditures on public schooling.

<sup>b</sup> Coefficient is for the correlation between the county rate of serious crimes and local police expenditures.

<sup>c</sup> Coefficient is for the correlation between the county rate of infant deaths and local health expenditures.

**Table 7. Regression Results**

<i>Variable</i>	% of County Population with College Degree Black Population (Model 1)		Whole Population (Model 2)		Change in % of County Population with College Degree Black Population (Model 3)		Whole Population (Model 4)	
	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.
Intercept	10.004	0.487	14.855	0.689	2.057	0.308	2.092	0.332
All	-0.072	0.036	-0.026	0.051	0.032	0.023	0.038	0.025
Public	-0.004	0.034	-0.081	0.048	-0.044	0.021	-0.044	0.023
HBCU	-0.058	0.010	-0.030	0.014	-0.016	0.006	-0.001	0.007
Adj R-Sq	0.226		0.096		0.041		0.003	
F Value	21.150		8.300		3.955		1.237	

Note: S.E. indicates the standard error.

**Table 8.** List of Variables Used in the Empirical Model.

Variable	Explanation	Subdivisions of RDRCs		Rural US Subdivisions	
		Mean	Std. Dev.	Mean	Std. Dev.
income00	Per capita income in 2000	14391.970	3179.166	16967.840	3798.142
Income90	Per capita income in 1990	10290.510	3925.066	10919.150	8486.604
lnincome00	Log of per capita income in 2000	9.546	0.218	9.710	0.219
lnincome90	Log of per capita income in 1990	9.210	0.537	9.262	0.602
dlincome	Change in the log of income 1999-2000	0.328	0.527	0.443	0.582
educ00	Fraction of adults with college degrees, 2000	0.124	0.066	0.155	0.087
Educ	Fraction of adults with college degrees, 1990	0.106	0.059	0.128	0.077
Deduc	Change in the fraction of adults with college degrees	0.016	0.028	0.024	0.032
manu90	Fraction of the employed population in manufacturing in 1990	0.334	0.108	0.268	0.117
serv90	Fraction of the employed population in services in 1990	0.590	0.109	0.641	0.122
Pblak	Blacks as a share subdivision population			0.083	0.156
blckinc00	Per capita income in 2000 (Black population)	9741.603	2199.934	10419.500	3990.460
rbinc90	Per capita income in 1990 (Black population)	6699.953	1741.941	7298.287	4451.865
lnbinc00	Log of per capita income in 2000 (Black population)	9.155	0.220	9.201	0.316
lnbinc90	Log of per capita income in 1990 (Black population)	8.774	0.249	8.849	0.328
DLnbinc	Change in the log of income 1999-2000 (Black population)	0.377	0.239	0.351	0.327
beduc00	Fraction of adults with college degrees 2000 (Black population)	0.070	0.048	0.071	0.065
beduc1	Fraction of adults with college degrees 1990 (Black population)	0.059	0.045	0.059	0.065
Dbeduc	Change in the fraction of adults with college degrees (Black population)	0.010	0.031	0.011	0.062
manu90	Fraction of the employed population in manufacturing in 1990 (Black population)	0.331	0.108	0.306	0.117
serv90	Fraction of the employed population in services in 1990 (Black population)	0.591	0.108	0.621	0.118

Note: The means and standard errors have been weighted by the representative population.

**Table 9: Impact of College Locations on Postsecondary Education Attainment in RDRCs**

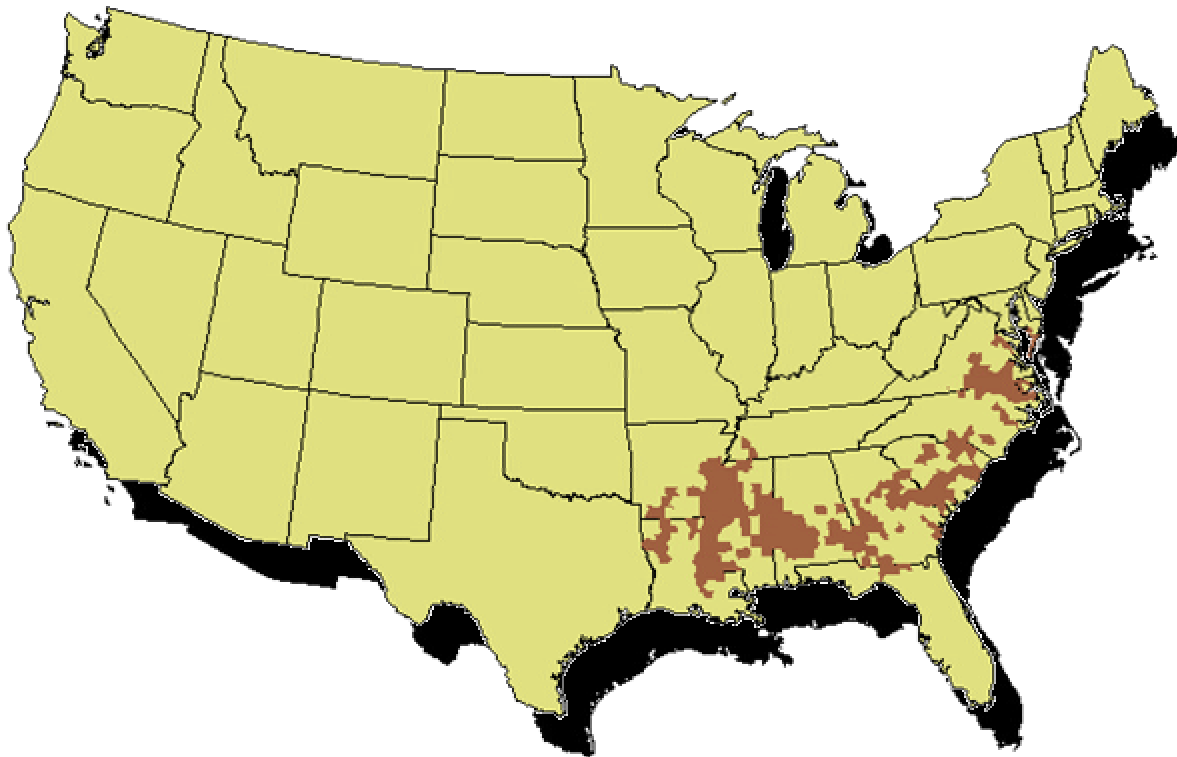
<i>Variable</i>	Share of Adult Population with College Degrees in Subdivisions of RDRCs				Change in Share of Adult Population with College Degrees in Subdivisions of RDRCs			
	Black Population (Model 5)		Whole Population (Model 6)		Black Population (Model 7)		Whole Population (Model 8)	
	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.
Intercept	0.092	0.009	0.099	0.12	0.034	0.001	0.0019	0.003
HBCU (10 mi)	-0.0080	0.0018	-0.0035	0.0017	-0.0029	0.0007	-0.0001	0.006
ALL (10 mi)	-0.0146	0.0082	-0.0124	0.0059	-0.0023	0.0029	-0.0026	0.025
PUBLIC (10 mi)	-0.0038	0.0080	-0.0046	0.0057	-0.0017	0.0028	-0.045	0.023
INC (10000USD)	0.0400	0.0176	0.0752	0.0128	0.3610	0.7405	0.4480	0.334
EDUC90					-0.240	0.057	0.027	0.026
Adj R-Sq	0.200		0.206		0.116		0.010	
F Value	7.22		21.66		10.45		1.78	

**Table 10: Impact of College Education on Income Growth.**

Variable	Growth Rate in Per Capita Income in Subdivisions of RDRCs Between 1990 and 2000						Growth Rate in Per Capita Income in Subdivisions of Rural Counties Between 1990 and 2000			
	Black Population (Model 9)		Black Population (Model 10)		Whole Population (Model 11)		Black Population (Model 12)		Whole Population (Model 13)	
	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.	Coefficient	S. E.
Intercept	5.391	0.292	5.436	0.295	8.284	0.409	5.840	0.192	8.740	0.471
LnINC90	-0.625	0.040	-0.632	0.040	-0.933	0.055	-0.665	0.022	-0.946	0.050
EDUC	0.208	0.267	0.418	0.394	1.521	0.243	0.475	0.096	1.183	0.090
DEDUC	1.441	0.268	2.303	0.189	2.637	0.294	1.086	0.091	1.860	0.076
MANU	0.533	0.132	0.532	0.133	0.756	0.121	0.539	0.104	0.620	0.022
SERV	0.392	0.145	0.344	0.295	0.297	0.134	0.390	0.106	0.205	0.031
PBlck							-0.156	0.021	-0.417	0.010
Adj R-Sq	0.402		0.391		0.885		0.391		0.917	
F Value	72.86		64.57		87.46		225.97		7050.14	

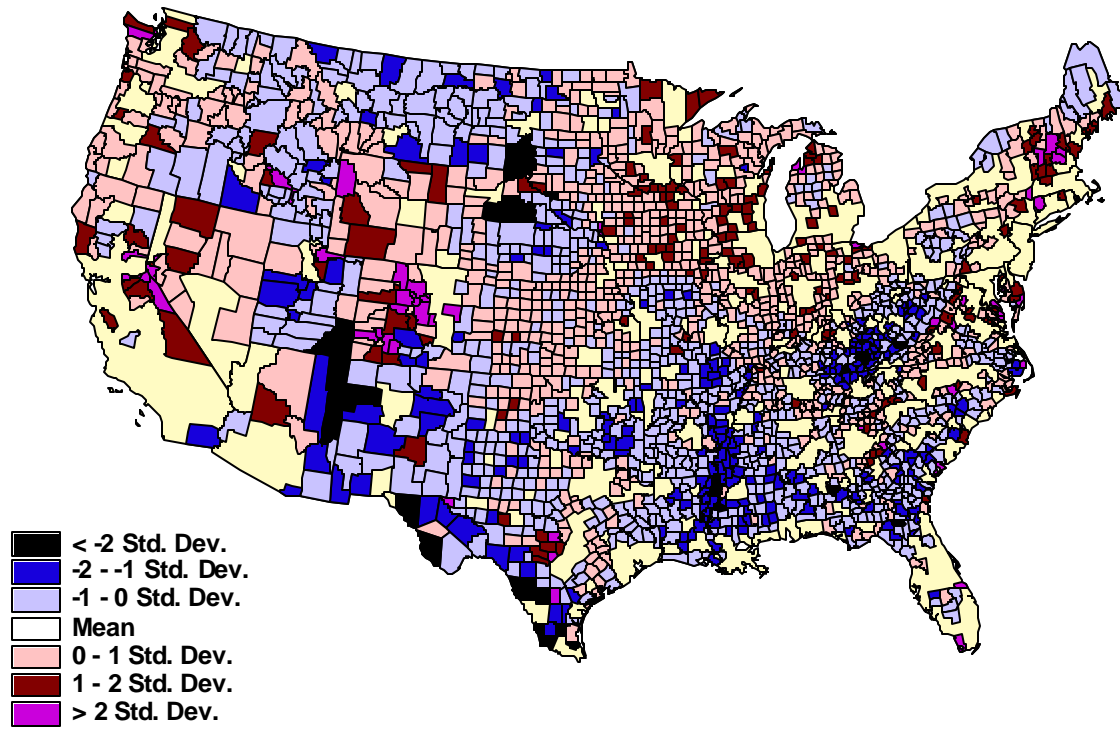
Note: S.E. indicates the standard error.

**Figure 1.** Location of Racially Diverse Rural Counties

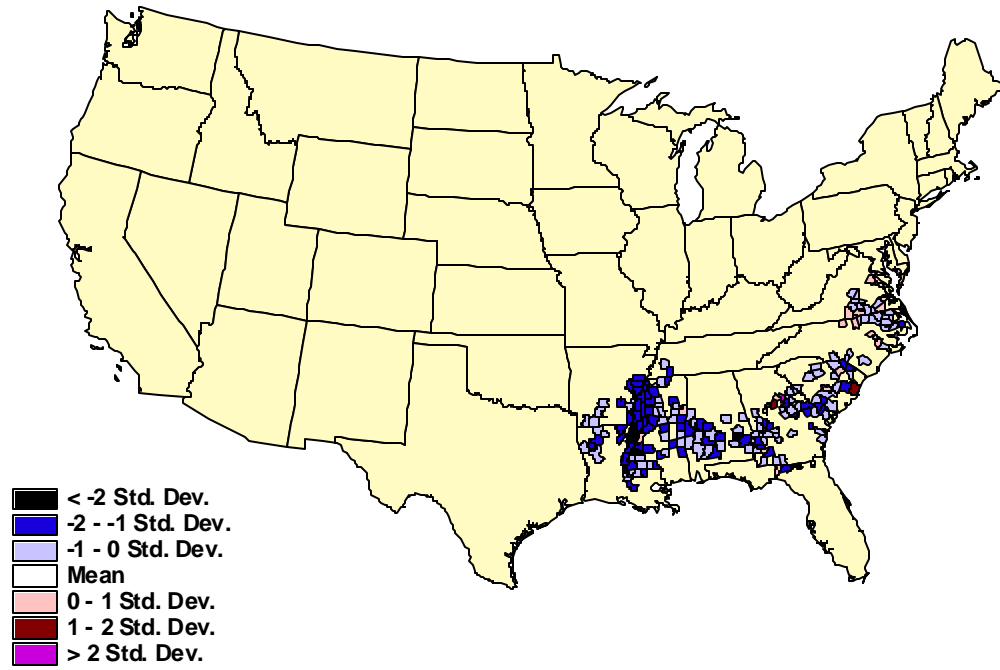


**Figure 2.** Income Distribution in the Rural US

Panel A

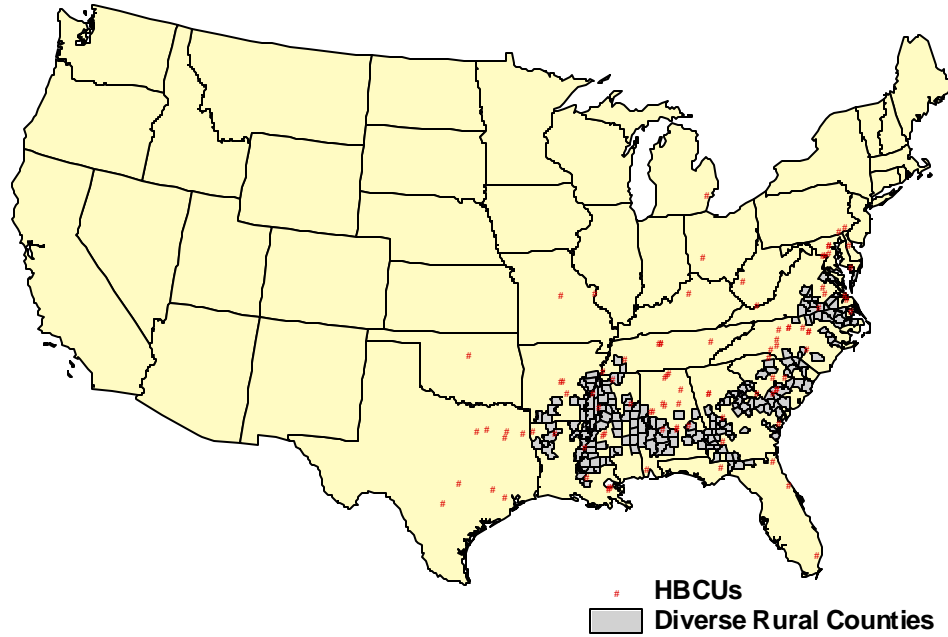


Panel B





**Figure 3. Location of RDRCs and HBCUs**



## VITA

Elton Mykerezi was born in Albania on June 22, 1979. His basic education was completed in Korca, Albania. In 1997 he was graduated from Preca High School. Immediately after high school Elton enrolled in an Agro-business program and earned an Associate Degree in Agricultural Business Management from Dimitris Perrotis College of Agricultural Studies in Thessaloniki, Greece.

He received a B.S. degree in Agribusiness Management from the University of Arkansas Fayetteville in 2001. Elton joined the department of Agricultural and Applied Economics at Virginia Polytechnic Institute and State University in the spring of 2002, and finished his M.S. in the Spring of 2004. He stayed with the department working towards a PhD. He is now a Ph.D. candidate in Economics.

During his undergraduate studies Elton did two internships: He worked in the human resource management division of Tyson Foods in 2001, and was a research assistant in the department of Agricultural Business and Economics at Iowa State University in 1999.

During his graduate studies he is involved in different research projects. Elton is co-author with Dr. Bradford Mills in two published research papers.