The Socio-Economic Impact of Concentration of Timberland Ownership in Alabama

by

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Abstract

The purpose of this thesis is to examine the relationship between concentration of timberland ownership at the county level which has more than 50% of its population living in rural areas and quality of life in Alabama. Divestiture of land by the forest products industry may have resulted in continued concentration in some counties or fragmentation of ownership in others. Based on the classic study of Walter Goldschmidt, it is hypothesized that the higher the concentration of timberland ownership, the poorer the quality of life. Counties with higher concentrated pattern of timberland ownership are compared to lower concentrated pattern of ownership. Statistical analysis shows that socio-economic well-being decreases as the concentration of timberland ownership increases. The T-Test reveals that the group of counties with high concentration of timberland ownership has higher poverty rates, food insecurity rates, unemployment rates, a higher percent population receiving SNAP and K-12 students receiving school lunches, and lower income per capita, median household income and population density. However, no significant differences are found for infant mortality rate and education attainment. The Spearman's correlation, support the results showing that the higher the level of concentrated pattern of timberland ownership, the poorer the quality of life. Timber dependency, absentee ownership and internal colonialism explain the poor socio-economic well-being of these counties of high concentrated pattern of timberland ownership. An interrelationship is established among concentration of timberland ownership, timber dependency and absentee ownership with low socio-economic well-being.

Keywords: Timberland; Ownership; Socio-Economic Well-Being; High and Low Concentrated Pattern of Timberland Ownership, Rural Areas, Alabama.

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Lists of Abbreviations

HC	High Concentrated Pattern of Timberland Ownership Counties
LC	Less Concentrated Pattern of Timberland Ownership Counties
NIPF	Non-Industrial Private Forest
SNAP	Supplemental Nutrition Assistance Program
TIMO	Timber Investment Management Organization
REIT	Real Estate Investment Trusts

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Chapter I

Introduction

The United States (US) contains within its borders approximately 751 million acres of timberland with diverse forms of ownership ranging from public to private and including industrial and family forestland. The United States Department of Agriculture`s Forest Service distinguishes between forestland (land with some trees or land that was at one time forested) and timberland (land that can produce at least 20 cubic feet of wood per year (Hartsell and Johnson 2000:45, 49). For purposes of this paper, we will refer to timberland as this is the category where active management techniques have the potential of increasing productivity.

Historically, in many parts of the US, timberland ownership has been characterized by large tracts but over time many of these tracts have been divided into smaller units with different objectives (Kaetzel *et al.* 2012). Levitt (2002) pointed out that in some areas, timberland owners are moving to rural areas as primary residences, causing an influx of people to some rural areas and increasing demand for land. Wear and Greis (2002) found that this is leading to fragmentation of land into smaller tracts and that private forest lands are progressively being controlled by family forest owners. Family forest owners have diverse motivations concerning how to manage their land (Majumdar, Teeter and Butler 2009). Thus, timber production in the US is in the hands of a varied and dynamic group of people (Bengston, Asah and Butler 2010).

Alabama has approximately 70% of its land in timberland, covering 23.0 million acres, the third largest total in the nation (Hartsell and Brown 2002; Alabama Forest Commission 2012). Approximately 94% of Alabama's timberland is privately owned and 6%

of timberland is publicly owned (Smith *et al.* 2004). Corporations in the forest products industry (defined as companies that own wood processing plants) possess approximately 9% of Alabama's timberland while 85% is owned by the non-industrial private sector (see table 1).

Many counties in Alabama, especially those in the demographically-defined Black Belt region, have been heavily dependent on the timber industry. Moreover, these counties have been associated with low socio-economic well-being as compared to non-timber dependent counties (Howze, Robinson, and Norton 2003).

The structure of Alabama private timberland ownership has undergone drastic change during the last two decades, caused by the forest products industry selling off most of its timberland holdings (Gunnoe and Gellert 2011). Non-Industrial Private Forest (NIPF) owners have increased their share of ownership from 43% to 85% of Alabama's timberland from 1990 to 2012 while the forest products industry has regressed from 26% to 9% (Table 1). TIMOs (Timber Investment Management Organizations) and REITs (Real Estate Investment Trusts) are included under the category of NIPF owners and Corporate respectively, making these categories both large and diverse and explaining why the new category of family forestland owner is increasingly in use (Majumdar, Teeter and Butler 2008). Most of the new buyers of industrial land are TIMOs and the REITs but family forestland owners and conservation organizations (public and private) also have purchased lands (Randle 2014).

Pan *et al.* (2007) analyzed trends among family forest owners in Alabama between 1994 to 2004. He found that there was a significant increase both in the number of small forest holdings (1-99 acres) and large forest holdings (> 500 acres), with decreases among intermediate holdings (100 -500 acres). He argued that the pattern of smaller holdings is related to non-timber objectives being highly valued by family forest owners who manage their land for aesthetic, hunting and environmental amenities. On the other hand, owners of

larger tracts are more inclined to manage for timber production which can best be accomplished through larger holdings and economies of scale. Pan *et al.* reported a strong correlation between larger timber holdings and timber harvest. The structural change in holding size gives an indication of the trends towards parcelization and consolidation. Pan, Zhang and Majumdar (2009) found that land holding size is an important indicator of welfare and socio-economic development and that also is the case for timberland holding size (see also Sisock 1998; Mehmood and Zhang 2001; Gobster and Rickenbach 2004).

The current study will also look at the interrelationship and association between timber dependency, concentration of timberland ownership and socio-economic well-being.

There is abundant literature documenting the connection between regions that have been dependent on forestry with low socio-economic well-being. Many studies have also shown that timber dependent counties have lagged behind non-timber dependent counties in socio-economic well-being (Humphrey 1995; Bliss and Bailey 2005; Dyer, Bailey and Tran 2009; Howze, Robinson, and Norton 2003). Conversely, there is very little literature that has analyzed the extent of ownership concentration and rural socio-economic well-being (Sisock 1998; Bliss, Sisock and Birch 1998; Kennealy *et al.* 2006). This literature is further discussed in Chapter II.

Land tenure and ownership has been found to have a profound impact on socio-economic well-being (Geisler 1995). There are a few studies carried out on concentration of ownership and rural well-being (Bliss, Walkingstick and Bailey 1998; Kennealy *et al.* 2006; Bliss, Sisock, and Birch 1998; Sisock 1998). In her study, Sisock (1998) found an association between timberland ownership concentration and negative socio-economic well-being in rural Alabama counties. Bliss, Sisock, and Birch (1998) found that there has been a trend of increasing consolidation of timberland ownership in the state of Alabama. They stated that the link between land ownership, wealth and power is clear but the relationship

between land tenure patterns and quality of life in communities is more complex. They found that forest consolidation has been occurring round the vicinity of pulp and paper mills which led to larger holdings and fewer owners of timberland around the mills. Most of these mills were in west-central Alabama in the demographically-defined Black Belt of Alabama (Figure 1).

Using a qualitative comparative case study method, Bliss, Walkingstick and Bailey (1998) compared two timber dependent counties in Alabama, one with highly concentrated timberland ownership and the other with much less concentration. They showed that the county in Alabama with less concentration had a higher level of entrepreneurship and that this created a more diversified economic landscape compared to the county having a higher concentration of timberland ownership, where the quality of life was badly affected.

Kennealy *et al.* (2006) analyzed 800 counties from nine states in the South which included Alabama and found that concentration of timberland ownership has an inverse relationship with quality of life.

In sum, available research shows that timber dependency, land tenure concentration and persistent rural poverty are interrelated. The research on timberland concentration has been based primarily on US Department of Agriculture data, specifically from the Forest Inventory Assessment (FIA) which is based on a nationwide sample. These data tell us who owns the parcel identified as part of the sample grid, but does not give us data on ownership of land involving multiple parcels. This thesis utilizes county tax records from all 67 Alabama counties to document ownership at the county level whether the ownership entity owns one parcel or 100. This allows for distinguishing between counties with high levels of concentration and counties with relatively low levels of concentration in ownership of timberland.

Walter Goldschmidt (1978) examined the size and organization of farms in California, developing what has come to be known as the Goldschmidt hypothesis. He examined two agricultural communities, Arvin and Dinuba. In Arvin, farming was an industrial activity with absentee owners hiring managers to oversee operations. In contrast, in Dinuba, family farms dominated the landscape. Goldschmidt found that socio-economic well-being in communities based on small family farms was better than in those communities where large industrial farms predominated.

Based on the brief review of literature presented above, I adopt and adapt the Goldschmidt hypothesis to timberland ownership in non-metro counties of Alabama. My central hypothesis is that socio-economic well-being in non-metro counties with relatively low concentration of timberland ownership will be higher than in those non-metro counties where timberland ownership is relatively concentrated.

Furthermore, according to Goldschmidt (1978), small farms are related to locally owned land as compared to larger farms which has been synonymous to absentee ownership. Bailey and Majumdar (2014) show that absentee ownership of timberland in 51 Alabama counties was negatively correlated with quality of life. This study does not directly address issues of absentee ownership and quality of life beyond noting this should be the focus of future research.

Objectives

The purpose of this thesis is to examine the relationship between concentration of timberland ownership and quality of life at the county level in Alabama. The study is timely because divestiture of land by the forest products industry may have resulted in continued concentration in some counties or fragmentation of ownership in others. There is evidence in Alabama that timberland ownership remains highly concentrated in some parts of the state (see Table 3). The purpose of this thesis is to examine the consequences of concentration on social well-being. My working hypothesis is that socio-economic well-being will be better in counties where timberland ownership is less concentrated compared to counties where there is a more concentrated pattern of ownership. Documentation on timberland ownership for the year 2012 has been collected for all 67 Alabama counties. Concentration will be measured as a percentage of all privately-owned timberland in a county in holdings of 1,000 acres and more. Such holdings may involve multiple parcels held in the name of the same owner.

Metropolitan counties which have more than 50 percent of the population residing in urban areas will be excluded from this analysis (Census 2015). Urbanized metro counties have more highly diversified economies where the impact of concentrated ownership would be more difficult to assess compared to non-metro counties or metro counties which are predominantly rural in character. Out of the 67 counties in Alabama, 19 are metro counties with at least half of the population residing in urban areas. This study is limited to the remaining 48 study counties.

The specific objectives to be pursued are the following:

Objective 1: Review literature on the importance of land ownership in relation to community and individual well-being.

Task 1.1 – Identify research papers relevant to the study and build up a comprehensive literature review.

Task 1.2 - Develop the hypothesis and the rationale of the study, clearly stating the problem to be addressed.

Objective 2: Excluding metro counties where over 50 percent of the population residing in urban areas, identify 17 counties with the highest percent of timberland in holdings of over 1,000 acres and 17 counties with the lowest percent of timberland in holdings of over 1,000 acres.

Task 2.1 – Rank the study counties with regard to percentage of timberland in holdings of 1,000 acres or more.

Task 2.2 – Select 17 counties having the least and highest percentage of timberland held by ownership blocks greater than 1000 acres.

The rationale for separating counties into three sets (counties with the highest and lowest concentration and an intermediate set of counties) is to compare the two extremes regarding concentration and examine how differences in concentration are associated with socio-economic well-being. The dividing line was drawn so that there would be at least 15% difference between counties with the highest and lowest levels of timberland concentration. The 15% figure was arbitrary but created three nearly equal groups of counties, with 14 counties separating the 17 counties with the highest and 17 counties with the lowest levels of concentration.

Objective 3: Select secondary data related to quality of life variables to be used in comparisons between the two sets of counties with the highest and lowest concentration of land ownership identified in meeting Objective 2. Variables to be examined are per capita income, median household income, food insecurity, percent population under poverty, percent of population receiving public assistance (i.e., Supplemental Nutrition Assistance Program, SNAP), education attainment (percent population 25 years and above with a high school or above education), unemployment rate, change in population density, infant

mortality rate, and percentage of students in public schools eligible for free or reduced price lunches.

Task 3.1 – Data on socio-economic well-being was obtained from the US Census Bureau and other sources of secondary data (Bureau of Labor Statistics, Kids Count Data Center and Feeding America web site)

Objective 4: Analyze the data to test the hypothesis that quality of life is negatively correlated with concentration of timberland ownership in Alabama.

Determine the association and strength of interrelationship between counties with high concentration of timberland ownership, timber dependent counties and socio-economic well- being.

Objective 5: Draw conclusions and identify needs for further research.

Chapter II

Theoretical Framework

Land tenure has been of great significance to rural America as it has been closely associated with community well-being (Bliss, Sissock, and Birch 2008; Geisler 1995). The relationship between land ownership, wealth and power is well defined. Lewis (1980:1) notes that "*Ownership establishes the right to decide how a piece of land will be used and fixes responsibility for that use. The benefits arising from land ownership are closely related to the size and value of land holdings and to the type of ownership interest. Land not only produces income but serves as a store of wealth and power*".

Geisler (1995) draws a connection between land ownership and poverty. He analyzed poverty departing from the normal approach of looking at income and employment. He described land ownership as a precursor which defines poverty which in turn is associated with social status and most importantly family security and a resource to fend off poverty. Geisler says that analysts often have overlooked land ownership with regards to social inequality and that we should include land ownership in assessing the wealth of a society. Informed by Geisler's insight, this study will examine the socio-economic impact of concentration of timberland ownership on quality of life.

Most of the literature on the importance of land ownership focuses on individual well-being, or differences in well-being between those who own and those who do not own land. The relationship between concentration of ownership and quality of life of local communities is more complicated, encompassing social, economic and environmental aspects and disparities of social well-being among the population.

Walter Goldschmidt

The central hypothesis of this study, that quality of life is influenced by the concentration of timberland ownership, was inspired by the classic study of Walter

Goldschmidt (1978). Goldschmidt compared two communities, one of which had moderate scale family farms and the other was organized around industrial farms with absentee owners. Walter Goldsmith (1978:281) found that "*the small independent farms create socially and economically democratic communities*." As conclusion, he established that the "*small farms community had a higher standard of living, a higher level of physical communities' services and facilities (better infrastructure), a greater number of civic organizations, and more and better schools*" than large farm communities. Goldschmidt found that larger farms contribute towards a poor quality of life in rural towns due to low wage labor where capital and profits are being exported from the community. I hypothesize that the less ownership of timberland is concentrated, the better is the socio-economic well-being in the 48 Alabama counties being studied. Conversely, I hypothesize that higher concentration of timberland ownership will be associated with lower quality of life as measured by a set of standard measures of well-being.

Previous Research

The existing literature provides some support for using the Goldschmidt hypothesis as the inspiration for examining possible socio-economic consequences of timberland concentration in Alabama. Previous works related to this thesis can be divided into four sets of literatures. I start with a brief review of literature on the status of the forest products industry in Alabama before turning to a set of issues related to (1) timber dependency and its association with socio-economic well-being, (2) consequences of concentration of timberland ownership on quality of life, (3) role of absentee ownership in affecting quality of life, and (4) internal colonialism as a mean for exploiting these timber dependent counties.

Alabama's Timber Industry: 2014

Timber has consistently ranked second in cash receipts among agricultural commodities and accounts for 10% of all commodities produced in Alabama (Alabama

Forestry Commission 2014). Alabama`s forest products industry is the second largest manufacturing industry in the state. In that year, the industry produced $ 12.78 billion worth of products, with the pulp and paper mills contributing up to $8 billion with the remainder accounted for by dimensional lumber, plywood, and other wood products (Table 2).

In 2001, timber harvests from southern forests accounted for 58% of the nation`s total production and 77% of the nation`s total pulpwood harvest (Smith, Vissage and Pugh 2004). Approximately 40% of all timber harvests were directed to pulp and paper mills producing materials for boxes, office paper, newsprint and personal sanitary products.

The pulp and paper industry dominated the forestry industry where there has been investment up to $2 billion in individual mills (Bailey, Teeter and Barlow 2011). During the year 2004, there were 14 large pulp and paper mills in Alabama, where the labor force made up of 38% of total employment in the industry, receiving 52% of the payroll. Between 2004 and 2011, employment in Alabama forest products industry declined from around 42,000 to 30,000 (Gunnoe and Gellert 2011).

The total stumpage revenue for the sale of all forest products was approximately $760 million for the year 2014 as compared to $969 million for the year 2004, representing a decrease of 21% over the decade. Nevertheless, an increase of 12.5% in 2014 was recorded as compared to 2013 due to higher stumpage prices for saw timber and pulpwood and an increase in timber harvests (Alabama Forestry Commission 2005 and 2014).

Timber Dependency in Alabama

Norton, Howze, and Robinson (2003) used employment as the primary criterion for defining timber dependency in Alabama. They argued that Alabama is both heavily forested and is deeply involved in manufacturing forestry products. Much of the labor in the rural manufacturing sector is in forestry enterprises. They used historical, demographic, economic,

and agricultural census data to examine timber dependency in Alabama and found that such dependency was negatively correlated with quality of life.

Many scholars have used specific criteria to describe timber dependency but there is no one definition of timber dependency in the literature. Humphrey (1990) related timber dependency to employment concentration in timber related activities. It has also been based on where there is a high concentration of labor force in this industry. Stedman, Parkins and Beckley (2004) have used CSD`s (Statistics Canada`s census subdivision) of labor force employed in the forest industry and applied Overdest and Green`s (1995) research using core and periphery labor markets to analyze relationship between forest dependency and well-being. Haynes (2003) defined forest dependency as percentage cover of the forestland and argued that any region having forest cover over 66.3% should be defined as forest dependent. Daniels (2004) defined forest dependency as the percentage of total forestland per county instead of timberland area. Robinson and Bailey (2007) identified six variables for defining timber dependency in 53 counties of Alabama. In general, they used forest employment rate forest manufacturing employment as percent total manufacturing, percent timberland, land use patterns, value of timberland, and value of forests products. Counties covering at least 3 of the criteria`s were considered dependent and counties which covered all six criterias were described as heavily dependent. For purposes of this particular study, the definition of timber dependency by Robinson and Bailey will be used (see Figure 1).

Interest in the topic of timber dependency was sparked by disruption caused by changes in federal policies affecting many rural communities in the Pacific Northwest (Dumont 1996). In that region, conflict over management of resources often pitted environmentalists against the timber industry. In the early 1990s, federal forest policy virtually halted all harvests on federal lands because continued harvests of old growth forests were threatening the spotted owl, recognized as an endangered species under the Endangered

Species Act promulgated in 1973. This led to a massive decline in timber production and employment in the Pacific North West because the forest was now under protection and no further timber could be harvested on public lands. Working in the Pacific Northwest, Cook (1995) focused attention on relatively high rates of poverty including childhood poverty, low growth rate of jobs and income difference in forest dependent communities as compared to other areas in Washington.

During the latter half of the twentieth century, the South experienced rapid development of timber resources. Paper could be produced from soft wood that made up a major part of the forest. The southern loblolly pine, which also grows faster than hard wood as well the soft wood mainly grown in the Pacific Northwest, attracted corporate interest. Corporations moving to the South generally, and Alabama specifically, were given generous tax abatements (Joshi *et al.* 2000).

Although the pulp and paper industry has been instrumental in creating jobs and a wood market to rural Alabama, the counties where the mills are located have lagged in terms of socio-economic well-being when compared to other counties (Bliss *et al.* 1998; Bliss and Bailey 2005; Dyer, Bailey and Tran 2009). With occasional and usually short-term exceptions, timber dependent counties (and resource dependent counties more generally), often have been associated with systematic poverty, lack of economic development, poor infrastructure, and associated with out-migration of labor (Freudenburg 1992). These communities have been subjected to "Boom and Bust" cycles over which they have had little control. Humphrey (1995) also found a long-term downward trend of employment for natural resource dependent communities' workers as compared to the employment trend in US agriculture in general for more than a century. The main reasons behind this change has been the downward spiral of commodity prices such as timber (Freudenburg 1992; Rinehart 2010) and the shift in resource extraction and processing from labor-intensive to a capital-

intensive regime. There has also been an increasingly global competition where natural resource processors are looking for cheaper raw materials. Extraction of timber in natural resource dependent communities has been linked to underinvestment in human capital among natural resource dependent workers. Joshi *et al.* (2000) found that this was true in Alabama, where tax abatements and low property taxes, while intended as catalysts for attracting industry to Alabama, badly affected funding in the local public schools.

Overdevest and Green (1995) examined the relationship between forest dependency and economic well-being in states experiencing growth in the forest products industry in the 1980`s. The per capita income and levels of poverty were unevenly spread throughout natural resource dependent communities. People living near core forest product industries, such as pulp and paper mills, had higher per capita incomes than residents of other natural resource dependent communities, with more peripheral industries like sawmills having a segmented labor market. Overdevest and Green (1995) also reported that timberland concentration was negatively related to per capita income and positively related to poverty rate.

Absentee Forest Land Ownership

Alabama has 96% of its land under forest and farmland with forestry covering 70 % (Alabama Forestry Commission 2012) and agriculture covering 26% of the land (Alabama Statistic 2012). Nearly all the farmland and 94% of the forest land are privately owned (Smith *et al.* 2004). 60% of all forestland and 40% of all farmland in Alabama are owned by citizens leaving in a different county where the lands are owned (Bailey and Majumdar 2014). Moreover, at least one-third of the lands are owned by people outside Alabama.

Alabama is one of the least heavily taxed states in the nation, and property taxes in the state are the nation's lowest (PARCA 2013). Absentee owners have no incentive to contribute towards improving the quality of life in counties where their land is located through supporting public education or other social services, and the tax system allows them to

extract wealth without giving anything back to the people living in the county. Majumdar (2011:10) found that "*Limited tax revenues have the effect of limiting the services that local governments can provide, including education and other social services that can be used to improve local quality of life*." This is consistent with the findings of Goldschmidt (1978) that absentee ownership is negatively correlated with socio economic well-being.

Timberland ownership in some parts of Alabama has become progressively less connected to local communities (Gunnoe and Gilbert 2010) which Robin Blackburn (2008) referred as "*gray capitalism*".

The surplus production is removed from the productive counties and the profit is captured by distant shareholders. This is considered as a major factor associated with poverty in timber dependent counties. Goldschmidt (1978) found that large-scale farming is equivalent to absentee land ownership and capitalist agriculture, whereas small-scale farming tends to be locally owned. This brings to the concept of internal colonialism which explains the exploitation of these timber dependent areas.

Internal Colonialism

Vladimir Lenin and Antonio Gramsci used the concept of internal colonialism to describe political and economic inequalities between regions within a given society, characterizing the uneven effects of state development also is known as "*uneven development*" on a regional basis.

Internal colonialism is also used to describe the distinct separation of the dominant core from the periphery in an empire (Howe 2002). An internal colony supposedly produces wealth for the benefit of those areas most closely associated with the state, usually the capital area. The relationship between the core and its geographical periphery is also exploitative and mimics classic colonialism. Widening the scope of national markets does not automatically mean that this will result in greater welfare for peripheral regions (Hechter 1975). Polanyi

(1944) mentioned that both land and labor are fictitious commodities and that by subsuming them to the logic of the market we inevitably run the risk of their mutual deterioration. Much of the literature on poverty now suggests that the economic system is structured in such a way that poor people fall behind regardless of how competent they may be (Gonzalez 1965; Gunder 1970).

Chapter III

Study Area

Alabama is in the southeastern region of the Unites States, bordered by Tennessee to the North, Georgia to the East and Florida and the Gulf of Mexico to the south, and Mississippi to the west. Alabama has an estimated population of 4,779,730, with 68.5 % is white and 26.3 % of African-American (US Census Bureau 2010). The median household income of the state is $42,917 as compared to $53,657 for the US. Over 19 %of Alabama residents live under the poverty line compared to 15.5 % nationally (US Census Bureau, 2014).

Method

My thesis compares the socioeconomic status within 48 counties distinguished by having the most and the least concentration of private timberland ownership in Alabama. The 48 counties included non-metropolitan as well as metropolitan counties where over 50 % of the population resided in rural areas. I grouped these counties into three categories:

1. High concentration of ownership: 17 counties having the highest percentage of timberland held by ownership blocks greater than 1,000 acres were defined as having a high concentration of timberland ownership. The percent of total private timberland in holdings of 1,000 acres or more in these counties ranged from 39.1 to 74.7%.
2. Low concentration of ownership: 17 counties having the least percentage of timberland held by ownership blocks greater than 1000 acres were selected. The percent of total private timberland in holdings of 1,000 acres or more in these counties ranged from 4.0 to 27.3%.
3. Medium concentration of ownership: The remaining 14 counties had ownership of private timberland in holdings of 1,000 acres or more ranged from 28 to 38.6%.

Data used for this study come from property tax data from all 67 Alabama counties. The data were collected by Dr. Andrew Gunnoe as part of the US Department of Agriculture project that also supported this thesis research. The data included the percentage of timberland held in ownership blocks of 1,000 acres or more (Table 3).

To analyze differences, the two categories (high and low concentration) needed to be distinct from each other. To achieve this, I wanted to make sure that there was a difference between the two blocks and I wanted the three blocks (high, low, and intermediate concentration) to be roughly equal in size. I could identify 17 counties with high and 17 counties with low concentrations of timberland and a group of 14 counties with intermediate levels of concentration. This also allowed me to differentiate the high and low concentration counties by at least 15%. I hypothesized that measures of socio-economic well-being will show statistically significant differences in socio-economic well-being between counties with relatively high and relatively low concentration of private timberland ownership. My central hypothesis is that quality of life as measured by a set of socio-economic variables is negatively correlated with concentration of private timberland ownership.

Secondary data related to quality of life variables were used to test the hypothesis of this study, that concentration of timberland ownership affects quality of life. The dependent variables identified are described below.

Data Collection

Data on private timberland ownership were collected from the Revenue Commissioner in each of Alabama's 67 counties. Data on socio-economic well-being were retrieved from the US Census Bureau for the 48 study counties under the criteria mentioned for three distinct years (2000, 2007 and the latest data available, usually 2015).

Measures

Dependent Variable

In this study, well-being is defined by a set of ten socio-economic, health, and educational quality of life variables measured at the county level: per capita income; median household income; unemployment rate; number of families below the poverty line; food insecurity rate; percent participation in the Supplemental Nutritional Assistance Program (SNAP); student meal (percent of K-12 students in public school eligible for free or reduced price lunch); infant mortality rate; education attainment (percent population 25 years and above who have at least a high school education); and population change (measured by changes in population density).

Rationale of selecting dependent variables

Income level of a population reveals their economic as well as their purchasing power for the provision of their basic requirements. Unemployment rate, people benefiting from SNAP, and student eligible for student meal are indicators of economic stress affecting well-being. Educational attainment affects employment opportunities and human capital. The infant mortality rate is often used as an indicator of the level of health and an elevated level indicates poor health facilities associated with high levels of poverty. Population density reflects diversity of economic opportunities and social services, with low population densities reflecting the absence of economic opportunity. In this present study, I have considered these socio-economic variables as they depict the quality of life of a population and have been used by others studying social forestry in Alabama (Majumdar 2011; Howze, Robinson, and Norton 2003 and Bliss *et al.* 1993). Food insecurity rate has been introduced in this study since it is also a measure of accessibility to enough food for an active, healthy life at all times. It has an impact on the well-being of children, adults, families, and communities (Economic Research Service n.d).

Independent Variables

As independent variables, we have the thirty-four counties divided into seventeen high and 17 low concentrations of timberland ownership categories. The high and low concentration counties used in this study are shown in Figure 2.

For the Spearman`s rho correlation coefficient, as independent variable, we have the timberland concentration ownership for all the forty-eight non-metro counties and selected dependent variables (percent poverty, unemployment rate, median household income, food insecurity rate, percent population benefiting from SNAP and population density).

Statistical Models and Analysis

Using SPSS software, Repeated Measures ANOVA was carried out to determine any significant differences between the two groups of counties (lower and higher concentration of private timberland ownership), testing the equality of means. The analysis conducted has both the within-subject's factors and between subject's factors, and is called the repeated measures ANOVA with between-subjects factors.

The rationale for using the repeated measures ANOVA is as follows:

- This study has repeated observations for three years with the dependent variable measured on an interval/ratio scale.
- There could be great variances of the measurements between the two groups of counties across the three different years. Repeated measures of each group of counties provide a way of accounting for this variance, thus reducing error variance.
- Each group of counties have been matched to a specific condition, with the 17 counties with the highest level of concentration of ownership and 17 counties with the least level of concentration of ownership. When sample members (the group of counties) are matched, measurements across the years are treated like repeated measures in repeated measures ANOVA.

The null hypothesis for the repeated measures of ANOVA is described as follows:

Test of within-subjects contrasts

Ho: There are no differences of sample means of dependent variable across the three years.

Ha: The sample means are significantly different.

Test within-subjects effects

The interaction between the two groups of counties and across the three years under (Year *Group) have also been analyzed. This is in line to determine the main effect causing the difference in means of the population or any significant interaction effect.

Ho: There is no interaction between groups of counties and the number of years

Ha: There is interaction between groups of counties and the number of years

Test of between subject effects

Ho: No differences between means of dependent variable between the two groups of counties.

Ha: There are differences between means of dependent variable between the two groups of counties.

Assumptions

- Each independent variable needs to be approximately normally distributed and under the concept of Sphericity representing the measures, equivalent of homogeneity of variances. It refers to the condition where the variances of the differences between all possible pairs of within-subject conditions (i.e., levels of the independent variable) are equal.
- The Shapiro – Wilk test was used to test normality and the Mauchly`s test of Sphericity was conducted to test the equivalent of homogeneity of variances. A Spherical matrix has equal variances and covariance is equal to zero.

- Upon violation of Sphericity, Epsilon Adjustment Values, (i.e. the Greenhouse & Gressier and Huynh & Feldt corrections) were used to make the appropriate corrections (Laerd Statistics 2013).

However, if the measurement variable is not normally distributed, there is an increasing chance of a false positive result (incorrect rejection of a true null hypothesis). However, ANOVA is not very sensitive to moderate deviations from normality; simulation studies, using a variety of non-normal distributions, have shown that the false positive rate is not affected very much by this violation of the assumption (Lix, Keselman and Keselman 1996). This is because when you take many random samples from a population, the means of those samples are approximately normally distributed even when the population is not normal.

The repeated measures ANOVA will not show where the differences among the groups of counties lies. Where the results were statistically significant, post hoc tests were conducted which highlighted exactly where the differences across the years occurred.

Following a significance difference from the repeated measures ANOVA, an Independent Sample t-test (parametric test) or the Kruskal–Wallis (non-parametric test) was performed to find out exactly where the differences were.

The Independent Samples t-test compared the means of two independent groups which were unrelated and in this case the two groups of counties. This was to determine any statistical evidence that the associated sample means are significantly different (Laerd Statistics 2013).

The Independent Samples t-test is a parametric test which also requires that the dependent variable is approximately normally distributed within each group. The null hypothesis for the independent sample t-test was that the sample means from the two unrelated groups of counties are equal.

$$H_0: u_1 = u_2$$

U1= concentrated pattern of ownership

U2= less concentrated pattern of ownership

The alternative hypothesis, which is that the sample means are not equal:

$$H_A: u_1 \neq u_2$$

The significance level (also called alpha) that allows us to either reject or accept the alternative hypothesis is set at p= 0.05.

Assumptions for Independent sample t-test:

- The dependent variable should be measured on a continuous scale. The socio-economic well-being variables are at ratio level of measurement.
- The independent variable should consist of two categorical, independent groups. (This study compares two groups of counties.)
- There should be independence of observations, where there are different counties in one group but no counties in more than one group.
- There should be no significant outliers. The problem with outliers is that they can have a negative effect on the independent t-test, reducing the validity of the results. In case of significant outliers, consideration was given to perform the analysis without this observation to determine how it impacted the results.
- The dependent variables should be approximately normally distributed for each group of the independent variable. However, the t-test is described as a robust test with respect to the assumption of normality. This means that some deviation away from normality does not have a large influence on Type I error rates, thus still providing valid results. Normality was still tested using the Shapiro-Wilk test.

- Another important assumption is the homogeneity of variances which was tested by the Levene's test which is an alternative to Barlett test known to be less sensitive to departures from normality.

The Kruskal-Wallis (non-parametric measures) test was carried out where the assumption of normality was violated. The profile plot was also displayed to portray any differences between the two groups (Laerd Statistics 2013).

Interpretation

The rationale behind the interpretations of the results for main and interaction effects is as follows (Minitab 2016):

To determine whether each main effect and the interaction effect was statistically significant, the p-value for each term was compared to the significance level to assess the null hypothesis which was set at 0.05 (denoted as α or alpha).

- The null hypothesis for a main effect is that the response mean for all factor levels are equal.
- The null hypothesis for an interaction effect is that the response mean for the level of one factor does not depend on the value of the other factor level.

The statistical significance of the effect depends on the p-value, as follows:

- If the p-value is greater than the significance level selected, the effect is not statistically significant.
- If the p-value is less than or equal to the significance level selected, then the effect for the term is statistically significant.

The following shows how to interpret significant main effects and interaction effects.

- If the main effect of a factor is significant, the difference between some of the factor level means is statistically significant.

- If an interaction term is statistically significant, the relationship between a factor and the response differs by the level of the other factor. In this case, we cannot interpret the main effects without considering the interaction effect.

Spearman`s rho Correlation

A Spearman`s rho correlation analysis was conducted to find the interrelationship among the timberland ownership concentration and selected indicators (percent poverty, unemployment rate, median household income, food insecurity rate, percent population benefiting from SNAP and population density) of socio-economic well-being for the forty-eight non-metro Alabama counties for the most recent year ranging from the year 2013-2016. The concentration measure served as the independent variable to compare against the selected measures of socio-economic well-being.

The Spearman`s rho correlation is a measure of the linear correlation between two variables, giving a value between +1 and −1 inclusive, where 1 is total positive correlation, 0 is no correlation, and −1 is total negative correlation. Positive correlation specifies that both variables increases or decreases together while a negative correlation, shows that if one variable increases the other one decreases and vice versa. It is a measure of the degree of linear dependence between two variables.

The null hypothesis of Spearman correlation is Ho: There is no association between the two variables (in the population) and Ha: There is association between the two variables.

Chapter IV

Results

The classification of counties according to degree of concentration of private timberland ownership revealed a strong interrelationship between counties with high concentration of ownership, timber dependent counties and low socio-economic well-being (also see Figure 2).

The central hypothesis that socio-economic well-being decreases as the concentration of timberland ownership increases holds in this study. The group of counties with a highly-concentrated pattern of ownership of timberland has lower income per capita, lower median income per household, higher unemployment rates, higher poverty rates, higher food insecurity rates, higher percentages of the population using SNAP benefits, and higher percentages of school children eligible for free and reduced lunch programs as compared to counties where the timberland ownership is less concentrated.

However, there was no significant difference for infant mortality rates for two out of three years used in this analysis (significant for year 2000 but not for year 2007 and 2014). There also was no significant difference for the education attainment variable for the three years 2000, 2005-09 and 2011-15.

I present below detailed results of the statistical analysis carried out for each category of dependent and independent variables. A repeated measure ANOVA was performed followed by a post hoc t-test analysis for all the years under study.

A Spearman`s rho correlation is carried out to find the interrelationship among the timberland ownership concentration and selected indicators of socio-economic well-being for the 48 non-metro (rural) Alabama counties with their most recent year which ranged from the years 2013-2016.

Group HC refers to counties with more concentrated pattern of timberland ownership and Group LC refers to counties with less concentrated pattern of timberland ownership.

Income per Capita

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 7 & 8). The results showed that the difference of income per capita between the two groups of counties were statistically significant (Table 10). There was no interaction effect between the number of years and the two groups of counties (Table 9), leaving the main factor to be the groups of counties.

A post hoc t-test analysis was carried out using data from 2000, 2007, and 2014 to identify where the estimated sample means of income per capita are significantly different from each other, i.e., between the two groups of counties across the number of years. Conforming to the normality test via the Shapiro–Wilk test (Table 11), an independent sample t-test (Table 13) was conducted and showed a significant difference in the income per capita between the two groups of counties for all the three years.

Results show that Group LC counties had a higher income per capita than Group HC for all three years included in this study (Table 4 and 12).

Median Household Income

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 14 & 15). The results showed that the difference in median household income between the two groups of counties was statistically significant (Table 17). There was no interaction effect between the number of years and the two groups of counties (Table 16), leaving the main factor to be the groups of counties.

A post hoc t-test analysis using data from 2000, 2007, and 2014 was carried out to identify where the estimated sample means of median household income were significantly

different from each other, i.e., between the two groups of counties across the number of years. Conforming to the Shapiro–Wilk normality test (Table 18), an independent sample t-test (Table 20) was conducted and showed a significant difference in the median household income between the two groups of counties for all the three years.

Results suggest the Group LC having a higher median household income than Group HC across all the three years (Table 4 and 19).

Percent Benefiting from SNAP

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 21 & 22). The results showed that the difference in the percent population benefiting from SNAP between the two groups of counties were statistically significant (Table 24). There was no interaction effect between the number of years and the two groups of counties (Table 23), leaving the main factor to be the groups of counties.

A post hoc analysis using data for 2000, 2007, and 2013 was carried out to identify where the estimated sample means of percent population benefitting from SNAP are significantly different from each other, i.e., between the two groups of counties across the number of years. By not conforming the to the Shapiro–Wilk normality test (Table 25), a non-parametric Kruskal-Wallis test (Table 27) was conducted and showed a significant difference between the two groups of counties for all the three years.

Results suggest Group HC counties had a higher percent of people using SNAP than Group LC counties across all the three years (Table 4 and 26).

Unemployment Rate

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 28 & 29). The results showed that the difference of unemployment rate between the two groups of counties were statistically

significant (Table 31). There was no interaction effect between the number of years and the two groups of counties (Table 30), leaving the main factor to be the groups of counties.

A post hoc analysis of data from 2000, 2007, and 2016 was carried out to identify where the estimated sample means of unemployment rate were significantly different from each other, i.e., between the two groups of counties across the number of years. Four of the six variables conformed to the Shapiro – Wilk normality test (Table 32) and the other two variables did not have major outliers. An independent sample t-test (Table 34) was conducted and showed a significant difference in the unemployment rate between the two groups of counties for all the three years.

Results suggest the Group HC had a higher unemployment rate than Group LC across all the three years (Table 4 and 33).

Food Insecurity Rate

Data on food insecurity were only available for one year, 2014. With only one of the two groups conforming to the Shapiro-Wilk normality test (Table 36), an independent sample t - test (Table 37) was conducted and showed a significant difference in the food insecurity rate between the two groups of counties.

Results show that Group HC counties had a higher food insecurity rate than Group LC in 2014 (Table 4 and 35).

Percent Population in Poverty

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had been violated (Table 38 & 39). The Greenhouse–Gressier estimate of Sphericity correction was used. The results showed that the difference of unemployment rate between the two groups of counties were statistically significant (Table 41). There was no interaction effect between the number of years and the two groups of counties, leaving the main factor to be the groups of counties (Table 40).

A post hoc analysis using data from 2000, 2007, and 2014 was carried out to identify where the estimated sample means of percent population under poverty are significantly different from each other, i.e. between the two groups of counties across the number of years. Three of the six variables did not conform to the normality test (Table 42). A non-parametric Kruskal-Wallis test (Table 44) was conducted and showed a significant difference between the two groups of counties for each of the three years.

Results suggest Group HC counties have a higher percent of people living in conditions of poverty than Group LC across all the three years (Table 4 & 43).

Infant Mortality Rate

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 45&46). The results showed that the difference of infant mortality rate between the two groups of counties were not statistically significant (Table 48). There was no interaction effect between the number of years and the two groups of counties (Table 47).

A post hoc analysis using data from 2000, 2007, and 2013 was carried out to identify where the estimated sample means of infant mortality rate are significantly different from each other, i.e., between the two groups of counties across the number of years. Four of the six variables conformed to the Shapiro–Wilk normality test (Table 49). The other two variables did not have major outliers. An independent sample t-test was conducted and showed a non-significant difference in the infant mortality rate between the two groups of counties for year 2007 and 2013 only (Table 51).

For the year 2000, there was significant difference where Group LC counties had a lower infant mortality rate than Group HC counties (Table 4 and 50).

Population Demographic Changes (Population Density)

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had been violated (Table 52 & 53). The Greenhouse – Gressier estimate of Sphericity correction was used. The results showed that the difference of population density between the two groups of counties were statistically significant (Table 55). There was also an interaction effect between the number of years and the two groups of counties (Table 54), where the difference of population density could also be explained by other reasons than the two groups of counties. This means that other events across the years could have an influence in population density.

For the years 1980, 1990, 2000 and 2014, four of the eight variables did not conform to the Shapiro–Wilk normality test (Table 56). A non-parametric Kruskal- Wallis test (Table 58) was conducted and showed a significant difference between the two groups of counties across all four years. Results for the year 1980 are not presented in the summary (Table 4).

Results show that Group LC counties had a higher population density than Group HC across all the four years (Table 4 and 57).

Education Attainment (percent high school graduates and above, for population 25 years and over)

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 59 & 60). The results showed that the difference in education attainment between the two groups of counties were not statistically significant (Table 62). There was no interaction effect between the number of years and the two groups of counties (Table 61).

A post hoc analysis for 2000, 2005-09, and 2011-15 was carried out between the two groups of counties across the number of years. Conforming to the Shapiro–Wilk normality

test (Table 63), an independent sample t-test was conducted and showed no significant difference across all the three years (Table 65).

Results show that there is no significant difference between the two groups LC and HC in education attainment (percent high school graduates and above, for population 25 years and over) (Table 4 and 64).

Percent Students (K-12) receiving Free and Reduced Lunch (Student Meal)

A repeated measure ANOVA was performed and Mauchly`s Test of Sphericity indicated that the assumption of Sphericity had not been violated (Table 66 & 67). The results showed that the difference of percent students (K-12) receiving free and reduced lunch between the two groups of counties were statistically significant (Table 69). There was no interaction effect between the number of years and the two groups of counties (Table 68), leaving the main factor to be the groups of counties.

A post hoc analysis for 2000, 2007, and 2012 was carried out to identify where the estimated sample means of percent students (K12) receiving free and reduced lunch are significantly different from each other, i.e., between the two groups of counties across the number of years. Confirming the Shapiro–Wilk normality test (Table 70), an independent sample t-test (Table 72) was conducted and showed a significant difference for all three years.

Results show that Group HC counties had a higher percent of students (K-12) receiving free and reduced lunch than Group LC counties across all the three years (Table 4 and 71).

Spearman`s rho Correlation Analysis

A Spearman`s rho correlation coefficient (Table 5) was computed to determine the relationship between selected socio-economic variables for the most recent years, usually 2015, and concentration of timberland ownership of parcels ≥ 1000 acres, for the 48 study counties.

The main results that emerged are as follows: The results show a weak association between the timberland concentration ownership but a significant causal relationship with percent population living in poverty, median household income and population benefiting SNAP at the $p<0.005$ and unemployment rate, food insecurity rate, and population density at the $p<0.001$.

These relationships were not very strong and ranged from 0.276 to 0.543. Four variables show positive relationship: percent population in poverty, unemployment rate, food insecurity rate and population benefiting from SNAP. This means that counties with higher concentration of timberland ownership have a higher percent of the population in these categories. Two variables showed a negative relationship: median household income and population density, meaning counties with higher concentrations of timberland ownership had a lower income per capita and lower population density.

Table 5 also shows a probable issue of multicollinearity among measures of socio-economic well-being. All six variables were highly correlated among each other with a significance level of $p<0.01$. This was expected as poverty is highly correlated to unemployment, median household income, food insecurity rate and percent people benefiting from SNAP across the non-metro counties.

The results from the Spearman`s correlation shows that timberland concentration has a detrimental influence on socio-economic well-being; counties with a high level of concentration of timberland ownership had a lower quality of life.

Chapter V

Discussion

The central hypothesis of this research study, that socio-economic well-being is influenced by concentration of timberland ownership, was inspired by the study of Walter Goldschmidt (1978). Goldschmidt was working in a different time and place, and with a different industry, but the question of scale of ownership of productive land is a point of commonality. Goldschmidt found that family farms were conducive to a diverse local economy and that industrialized agricultural operations had the opposite effect. For purposes of the present study, I hypothesized that the lower the concentration of timberland ownership, the better the quality of life. Conversely, higher concentrations of timberland ownership were hypothesized as leading to lower quality of life.

The hypothesis that socioeconomic well-being decreases as the concentration of timberland ownership increases is supported by this study. The group of counties with high concentration of timberland ownership has lower income per capita and median household income. Those counties also have higher unemployment rates, poverty rates, food insecurity rates, participation in SNAP, and students receiving free and reduced price lunch as compared to counties with less concentrated timberland ownership (Table 4). However, there were no significant differences for infant mortality rate and education attainment (Table 4).

The counties with high concentration timberland ownership have a lower income per capita as compared to the least concentration pattern of ownership for all the three years under study. It has been the same for median household income, where counties with high concentration of timberland ownership have a lower median household income as compared to the counties with low levels of concentration for the three years under study. It is worth mentioning here that income per capita and median household income of both groups of counties were lower than Alabama as a whole (see figure 3 and 4). Rural counties generally

have lower incomes than urban and metropolitan counties. Counties with high concentration of ownership have the worst socio-economic conditions as measured by the ten indicators of well-being used in this study.

In this study,10 of the 17 counties with the least concentrated pattern of ownership were situated in the northern part of Alabama. The northern part of the state, generally, has a history of small farms and a more diverse economy than the southern coastal plains, the center of the pre-Civil War cotton economy (Bliss, Walkingstick, and Bailey 1998). 6 of the remaining counties were found in the eastern side of the state and only one was on the western part of Alabama. None of these counties were situated in the timber dependent counties centered in the southwest of Alabama. These are the counties with the most concentrated pattern of ownership. 14 out of the 17 counties with the highest degree of timberland ownership concentration are in that southwest quadrant of the state characterized by timber dependency (Robinson and Bailey 2007). The gentle topography and abundant water resources in that area supports large pulp and paper mills and plantation pine production. These factors, plus the history of plantation agriculture where concentrated ownership of land was a prominent feature of the region, have led in more recent years to the concentration of timberland ownership (see Figure 2).

This new finding supports the theory that timber dependent counties suffer from high rates of poverty, low income, and other measures reflecting challenged circumstances. The data presented here add a new variable to the theory of timber dependency, the concentration of timberland ownership (Bliss *et al.* 1998; Bliss and Bailey 2005; Dyer, Bailey, and Tran 2009).

Bliss *et al.* (1998) found that there was a higher level of entrepreneurship and hence economic opportunities in counties where timberland ownership was less concentrated. The results obtained in this study showed a higher income per capita and median household

income in the counties with least concentrated pattern of ownership, suggesting a higher level of economic activities in these counties. The findings also revealed that counties with higher concentration of timberland ownership were also counties that have been identified as timber dependent. They were also among the poorest counties in Alabama as revealed by the two economic indicators mentioned above. Tax abatements used to attract timber industries to Alabama have contributed to the poor quality of life (Joshi *et al.* 2000). In the US, Alabama has the lowest property taxes (PARCA 2013).

Absentee ownership has been negatively correlated to socio economic well-being or quality of life (Goldschmidt 1978; Ameyaw 2013). Counties with high concentration of timberland ownership and are timber dependent also have a high level of absentee ownership (Ameyaw 2013; Majumdar 2011; Bailey and Majumdar 2014). Absentee ownership means that the wealth is extracted from timber producing counties for the benefit of owners living elsewhere. The term internal colonialism has been used to describe regions which are being economically and socially exploited (Hechter 1975).

The forest industry has been restructuring through the past decades and mechanization of the industry has limited employment opportunities in timber dependent counties of Alabama (Bliss, Walkingstick and Bailey 1998). Mechanization of logging operations has reduced the need of manual labor. This study revealed a higher unemployment rate in counties with higher concentration of ownership as compared to counties with lower concentration of timberland ownership. Restructuration of the timber industry led to sub-contracting of logging to independent contractors and competition among them which resulted in a further decrease in the wage rate of the labor further impoverishing the population in these timber dependent counties. Bailey *et al.* (1996) also provided insight over a segmented labor market in the pulp and paper industry. They argued that the primary jobs like engineers, managers or skilled workers, which are the well-paid jobs, draw on national or

international labor markets. The remaining secondary jobs, mostly unskilled in nature, are for the local uneducated population and are not well remunerated. These categories of workers are vulnerable during the restructuration of the forest industry, resulting in a higher unemployment rate in these regions with a lower wage rate. Both counties with high and low concentrations of timberland ownership experienced a sharp spike in the unemployment rate during the Great Recession and both groups of counties have suffered through unemployment rates higher than the average for the state, reflecting tough economic conditions in rural compared to urban Alabama. However, high unemployment rate (see Figure 5) in the counties with higher concentration pattern of timberland ownership resulted into a higher poverty rate as compared to the less concentrated pattern of timberland ownership. Both groups of counties have poverty rates higher than that of Alabama, but counties with high concentration of timberland ownership are the poorest counties in the state of Alabama (see Figure 6).

A high level of poverty may have contributed to a high food insecurity rate. Eventually, the analysis revealed that counties with a higher concentration of timberland ownership also have a higher percent population experiencing food insecurity (21.6%) as compared with those counties with the least concentrated ownership (16.6%). The percent food insecurity for Alabama for the year 2014 was 18.8, which makes the counties with high concentration pattern of timberland ownership the most food insecure in the state. The analysis of the correlation also showed a very high level of association between food insecurity rate, percent poverty level, unemployment rate and population benefiting SNAP (see Table 5).

The results revealed that counties with a higher concentration pattern of timberland ownership have a higher percent of the population receiving SNAP benefits as compared to counties with the least concentrated pattern of ownership respectively for the three years

under study. Both groups of counties have a higher percent population receiving SNAP benefits compared to Alabama (see Figure 7).

The counties with higher concentration of timberland ownership have a higher percent of K-12 students who received free or reduced price lunch compared to the least concentrated pattern of ownership groups respectively. The counties with least concentrated pattern of ownership have a lower percent rate even than that of the state of Alabama, making the counties with high concentrated ownership of timberland the most dependent on school lunch programs (see Figure 8).

Counties with the highest concentration of timberland ownership have the lowest income per capita and the lowest median household income. They also have higher unemployment rates and the highest population using the SNAP program.

The population density of counties with high concentrations of timberland ownership has remained steady for the four-time period covered in this study. The counties with the least concentrated ownership, however, have experienced a gradual increase in population density across the same four years under study (1980 to 2014; see Figure 9). It is interesting to mention that the study carried out by Bliss *et al.* (1993) showed outmigration in the timber dependent counties between 1950 to 1980 indicating negative economic growth. This new finding suggests that outmigration may already have reached its downward peak by the 1980`s after which population density remained constant throughout the years1980 to 2014. In contrast, counties with less concentrated ownership showed population growth across the years 1980 to 2014, suggesting better economic conditions. In migration and out migration in an area reflects population response to socio-economic and demographic change in a region (Smith 2016). The counties with high concentrated pattern of timberland ownership experienced outmigration, while counties with lower concentrations of ownership saw populations increasing as measured by the gradual increase in the population density. The

results suggest that counties with least concentrated pattern of timberland ownership have a much broader range of economic opportunities. The population of the counties with high concentrated of timberland ownership with no in migration suggests a depressed economic condition, with a reduced number of skilled workers further depreciating the economy. This leaves limited opportunities to rural development. The population may be poorly educated with no outlet and living in geographically isolated conditions and were left behind in the process of outmigration, resulting in persistent poverty. Normally, there a tendency of youth out migration from counties with low economic development which is the case for the high concentration of ownership counties (timber dependent) leaving behind an aging population which has a severe implication on the population structure and the economic development potential of these rural areas (Smith *et al.* 2016). The persistent population loss through the 1950 – 1980`s (Bliss *et al.* 1993) has limited economic opportunities in the long run where its negative effects are being felt now. This has impacted socio-economic well-being as shown in this study.

The correlations showed that population density was strongly negatively correlated to unemployment rate and food insecurity rate, suggesting that counties with high concentration of timberland ownership having a lower density population have a high unemployment rate, and were highly food insecure. It was also highly positively correlated to median household income where low population density would mean having a lower median income per household. A moderate negative correlation was recorded with public assistance (SNAP and free and reduced lunch for K12 student) which mean that the low population density was correlated with a higher percentage of population using SNAP and free and reduced price lunch programs (Table 5). It is concluded that counties with high concentrated pattern of timberland ownership with lower population density have a poorer socio-economic well-

being when compared to counties with the least concentrated pattern of timberland ownership, confirming the Goldsmith hypothesis.

The analysis carried out for comparing education attainment for high school graduates and above (for the population of 25 years and over), showed no significant differences between the two groups of counties. Nevertheless, the figure for both group of counties are well below of that of Alabama state for the years 2005-09 and 2011-15 respectively (see Figure 10). The poor education status locked many of these people into persistent poverty as they have no outlet for a skilled or well remunerated job. Bliss *et al.* (1998) described an underinvestment in human capital in timber dependent counties. Absentee ownership combined with the ills associated with timber dependency is among the reasons behind a poor education system. The lack of concern for the community and the tax abatement could have resulted in a poor education system in these non-metro counties of Alabama (Joshi *et al.* 2000). It is worth mentioning that news reports have suggested that high school graduation rates have been misstated and inflated for the state of Alabama. The Alabama graduation rate was reported to have increased by 17.3 points as compared to 4.2 points nationally for the 2010 -11 school year. This manipulation of data might explain why the counties with high concentration of timberland ownership showed improvement resulting in no significant difference when compared to the other group of counties under this study (Carsen 2016). This topic needs further research, which is beyond the scope of this study.

The infant mortality rate between the two groups of counties displayed significant differences only for the year 2000 after which there were no significance differences. Bliss *et al.* (1993), found that timber dependency was positively correlated with infant mortality. The new findings showed an improvement in health care variables which could be attributed to Obamacare and better availability of Medicare-funded health services. Results might also be influenced by the small number of cases in any given year. Since rates are expressed in cases

per 100,000 live births and some counties have total populations of less than 10,000, it takes only one or two cases of infant mortality to widely skew the reported rate. Nevertheless, much progress has been made in limiting infant mortality rate as expressed in the social media. The program 'A box for a baby' steered by Baby Box Co. and Alabama Development Rural Office in the region of Alabama has helped a lot in improving the health and diminishing risks of death of new born babies (Yurkanin 2017). Nevertheless, Alabama`s infant mortality rate remains higher than the national average.

The Spearman`s rho correlation coefficient analysis showed that timberland concentration for percent parcels greater than 1000 acres is significantly correlated to the selected socio-economic well-being where a higher-level concentration of timberland ownership was translated to a lower quality of life. However, the association between the timberland concentration ownership and percent poverty, unemployment rate, median household income, food insecurity rate, percent population benefiting from SNAP and population density showed a weak relationship. The high level of collinearity among the dependent variables also showed a very strong level of association among them (Table 5).

Both analysis, the independent sample t-test or the Kruskal Wallis t-test comparing the two groups of counties based on concentration of ownership (Table 4), and the Spearman`s rho correlation (Table 5) of timberland concentration with selected indicators, showed that counties with higher concentrated type of timberland ownership have a lower socio-economic well-being which supports the Goldschmidt. Three explanations are brought forward to explain why the socio-economic well-being of counties with high concentration of timberland ownership have lower socio-economic well-being than the counties with lower concentration of timberland ownership.

Timber Dependency

The study revealed that out of the 17 counties with the highest concentration of ownership, nine were also timber dependent as defined by Robinson and Bailey (2007) and 6 were found near the timber dependent counties (see Figure 2). Therefore, I deduce that the degree of concentration in ownership could be considered as a variable associated with timber dependency. Timber dependency in Alabama has been associated with low socio-economic well-being (Bliss *et al.* 1998; Bailey 2011; Bliss and Bailey 2005; Howze, Robinson, and Norton 2003). The boom and bust cycle of the timber industry contributed to economic vulnerability of timber dependent counties. The shift of provision of raw materials to foreign countries and the decrease in prices due to international market fluctuations has locked these regions into a cycle of poverty as there are limited alternatives of job opportunities and economic prospects. This has led to outmigration especially of skilled workers further hindering rural development in these counties (Smith 2016). The populations left behind are aging. The study also revealed that there has been no in migration in the counties with high concentrated pattern of ownership between 1980 to 2014, suggesting a lack of economic activities in these regions.

Absentee Ownership

In his study, Goldschmidt (1978) found that large-scale farming is associated with absentee ownership and capitalist agriculture whereas small-scale farming is based on locally owned enterprises. Bailey and Majumdar (2011) found that 60.5 % of all timberland in Alabama is owned by absentee owners, defined as people who do not live in the county where their land is located. A strong negative correlation was also found between absentee ownership and a range of quality of life variables in Alabama.

Bailey (2017) found that the top thirty owners in Alabama, which are almost virtually out of the state, own over twenty percent of timberland. He also showed that in 2012, 59% of

all timberland was absentee owned. Eleven out of the seventeen counties with high concentration timberland ownership have more than sixty percent absentee ownership. Counties with less concentrated timberland ownership have only two counties above the level of sixty percent as absentee ownership (Table 6). The overlap between timber dependent counties and counties with high concentrations of timberland ownership and high rates of absentee ownership compound the problems of timber dependency. The study demonstrates that counties with high concentration of timberland ownership have a higher level of absentee ownership than the counties with less concentrated pattern of ownership. This suggests that the counties with higher level of absentee ownership compounded with a higher concentration of timberland ownership and timber dependency will result in poorer counties as revealed by the study. The wealth produced through timber production is being captured and extracted out of rural Alabama, which leads to the concept of internal colonialism.

Internal Colonialism

The relationship between counties with high concentrations of timberland ownership, timber dependency and high rates of absentee ownership has been established. Under these conditions, profits are extracted to the benefit of corporate and other private owners living outside the state of Alabama. This brings also the relationship of the core (the timber industry and other timber private owners) and the geographical periphery (rural Alabama) which is being exploited for its natural resources and cheap labor. People living in rural Alabama do not benefit from the extractive industries, which pay few taxes and employ relatively few people living in counties where the timber is produced. Large absentee ownership does not contribute to the development of timber producing regions as in the state they have no incentives to do so which makes these counties poorer and explains the nature of the reproduction of social inequalities through decades.

Chapter VI

Conclusion

The central hypothesis of this study, that concentration of timberland ownership influences quality of life, was based on the classic study of Walter Goldschmidt. It was hypothesized that for 48 Alabama counties where at least half of the population live in rural areas, the lower the concentration of timberland ownership, the better the quality of life when compared to counties with higher concentrations of timberland ownership.

The hypothesis that socioeconomic well-being decreases as the concentration of timberland ownership increases holds in this study. The group of counties with high concentration of timberland ownership has higher poverty rates, food insecurity rates, unemployment rates, lower income per capita, and median household income. They also have a higher percent of the population receiving SNAP and free or reduced price school lunches than counties with less concentrated timberland ownership. However, there were no significant differences for infant mortality rate and education attainment (high school graduate and above for population over 25 years and above). The infant mortality data may indicate that health care has improved in Alabama. The data obtained for educational attainment may have been tampered with, so that no clear findings are possible at this time. The Spearman`s rho correlation also showed significant causal relationships between the timberland concentration and selected socio-economic well-being. A high level concentrated pattern of timberland ownership is associated with a poor quality of life.

This study has also established the interrelationship among counties with concentration of timberland ownership, timber dependency and absentee ownership associated with low socio-economic well-being. Timber dependency, absentee ownership and internal colonialism have been brought forward to explain the poor socio-economic well-being of counties where timberland ownership is highly concentrated. Timber dependency

provides an explanation for why counties with a high concentration of timberland ownership are locked in the cycle of poverty with limited economic and job opportunities. Absentee ownership showed how resources (raw materials) and profits are being removed out of the counties, not contributing to rural and economic development, hence leaving these counties in deprived economic conditions. The concept of internal colonialism provides insight on the systematic nature of this exploitation and the reproduction of social inequalities through decades.

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Tables and Figures

Table 1: Alabama Private Timberland Ownership (1990 – 2012)

	Year		
Timberland ownership	**1990**	**2000**	**2012**
Non-industrial private forest land owners	43%	71%	85%
Forest product industry	26%	17%	9%
Corporate	8%	12%	-
Other	-	-	6%
Farmer	2%	-	-

Source: Vissage and Miller (1991), Hartsell and Brown (2002) and AFC 2012

Table 2 : Alabama Forestry and Forest Industry Economic Impact, 2014

Year	**Product (NAICS code)**	**Number of Employees**	**Payroll ($ thousands)**
2014	Forest and logging (113)	4,365	172,047
	Wood products (321)	14,192	536,727
	Paper products (322)	10,627	778,459
	Wood and paper products (321 & 322)	24,819	1,315,186
	Manufacturing (31-33)	234,726	11,759,599
	Forest products percent of total Manufacturing	12.43	12.65

Source: (US Census 2016; Alabama Forestry Commission 2014)

Table 3: Counties Categorized by Percentage of Timberland held in Ownership Blocks > 1000 Acres for Selected Alabama Counties

	County (48 Total)	Percentage of Timberland held in Ownership Blocks >1000 acres
1	Limestone	4.01
2	De Kalb	4.20
3	Geneva	7.32
4	Marshall	7.54
5	Dale	7.91
6	Lawrence	13.97
7	Cullman	20.02
8	Elmore	21.41
9	Pike	22.05
10	Henry	23.27
11	Randolph	24.73
12	Fayette	25.63
13	Macon	26.15
14	St. Clair	26.33
15	Jackson	26.63
16	Washington	26.91
17	Talladega	27.27
18	Barbour	28.70
19	Franklin	29.86
20	Hale	30.44
21	Clay	31.89
22	Lamar	31.90
23	Marion	33.95
24	Crenshaw	34.15
25	Greene	34.85
26	Bullock	36.07
27	Walker	36.37
28	Cleburne	36.67
29	Tallapoosa	36.87
30	Lowndes	38.62
31	Winston	38.63
32	Sumter	39.07
33	Wilcox	39.74
34	Coosa	43.19
35	Marengo	43.86
36	Covington	44.63
37	Perry	44.95
38	Pickens	46.09
39	Chilton	46.20
40	Choctaw	47.11
41	Bibb	47.91
42	Monroe	48.02
43	Butler	48.03
44	Clarke	52.62
45	Cherokee	55.56
46	Blount	59.90
47	Conecuh	72.77
48	Escambia	74.73

Table 4: Summary of T-Test Comparison of Means - Low and High Concentrated Pattern Type of Timberland Ownership Counties

		Year 2000					Year 2007					Most Recent Year				
		LC		HC		t-test (p value)	LC		HC		t-test (p value)	LC		HC		t-test (p value)
	P /NP	M	SD	M	SD		M	SD	M	SD		M	SD	M	SD	
Income per Capita	P	20934.4	1986.11	19221.4	1378.7	0.007*	27835.2	2629.67	25511.7	1926.79	0.006*	33026.6	2290.78	30788.3	2277.03	0.007*
Median Household Income	P	32018.9	4568.62	27814.1	4516.02	0.011*	37689.2	6556.13	32252.9	5852.35	0.016*	39871.8	6809.84	34250.4	5624.92	0.013*
SNAP	NP	10.21	4.91	16.51	9.66	0.019*	13.79	4.82	19.84	8.24	0.012*	20.84	5.45	26.61	8.46	0.019*
Unemployment Rate	P	5.26	1.14	6.76	1.96	0.011*	4.65	1.06	6.33	2.02	0.005*	6.08	1.15	7.85	2.6	0.017*
Percent Population in Poverty	NP	15.99	3.9	20.14	5.41	0.005*	17.99	4.81	22.62	6.45	0.012*	20.48	4.8	25.71	7.9	0.018*
Student Meal	P	51.62	13.49	67.33	18.79	0.01*	56.04	14.42	70.63	15.77	0.01*	64.92	12.33	77.47	12.83	0.01*
Percent Food Insecurity	P	-	-	-	-	-	-	-	-	-	-	16.65	3.86	21.59	5.78	0.006*
Infant Mortality Rate	P	8.42	2.88	12.25	6.55	0.038*	8.89	5.81	8.21	5.3	0.725	8.02	6.91	6.56	5.63	0.506
Educational Attainment	P	69.39	4.52	66.66	3.34	0.05	75.71	4.15	74.05	2.61	0.17	79.87	3.53	78.71	2.45	0.28
Pop Density	NP	62.90	32.02	27.41	12.49	0.0*	70.84	38.73	29.61	17.52	.001*	78.06	47.19	29.10	20.57	0.001*

* Significant at 0.05, N=17

P – Parametric measure
NP-Non-Parametric measure
LC – Least concentrated timberland ownership
HC - Highest concentrated timberland ownership

M – Mean
SD- Standard Deviation

Population Density – Years analyzed are 1980 (not in table, discussed in results), 1990, 2000 and 2014.

The actual sample mean has been displayed for the non-parametric measure (Kruskal-Wallis) instead of the mean rank which has no significance in this table

Most recent available year for Income per capita	- Yr 2014	% population under food insecurity	- Yr 2016	Unemployment Rate	- Yr 2016
Median Household Income	- Yr 2014	Infant Mortality Rate	- Yr 2013	% population under Poverty	-Yr 2014
SNAP	- Yr 2013	Educational Attainment	- Yr 2015	Student Meal	-Yr 2012

Table 5: Spearman`s rho Correlations of Timberland Concentration and Selected Indicators of Social Well-Being in 48 Non-Metro Alabama Counties

	1	2	3	4	5	6
1. Timberland Concentration % Parcels ≥ 1,000 Acres	--					
2. Poverty % in Poverty 2014	.276*	--				
3. Unemployment Rate 2016	.375**	.698**	--			
4. Media Income Household 2014	-.263*	-.851**	-.600**	--		
5. Food Insecurity Rate 2016	.371**	.826**	.793**	-.751**	--	
6. SNAP 2013 % of Benefit Recipients	.303*	.902**	.682**	-.783**	.874**	--
7. Population Density 2014	-.543**	-.581**	-.652**	.667**	-.737**	-.637**

*p<0.05; **p<0.01; N= 48

*Correlation is significant at the 0.01 level (1- tailed)

**Correlation is significant at the 0.05 level (1- tailed)

Table 6: High and Low Concentrated type of Ownership Counties Categorized under Percent Absentee Ownership, 34 Non-Metro Alabama Counties

% Absentee Ownership	Number of high concentrated pattern of timberland ownership counties (N=17)	Number of Low concentrated pattern of timberland ownership counties (N=17)
Less than 45%	1	7
45- 60%	5	8
61-75%	8	1
Greater than 75%	3	1
Percentage (≥ 61%)	64.8	11.8
Percentage (≤ 60%)	35.3	88.2

Based on Bailey (2017) Alabama Timberland, http://aers.auburn.edu/conner-bailey/alabama-timberland/

Appendix

Table 7: Mauchly`s Test of Sphericity for Income per Capita, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor1	.829	5.826	2	.054	.854	.925	.500

Table 8: Test of Within-Subjects Effects for the Years and Group of Counties for Income per Capita, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	2389447584.7	2.0	1194723792.4	982.6	0.0
	Greenhouse-Geisser	2389447584.7	1.7	1399404959.0	982.6	0.0
	Huynh-Feldt	2389447584.7	1.9	1291295059.0	982.6	0.0
	Lower-bound	2389447584.7	1.0	2389447584.7	982.6	0.0
Factor 1 * Group	Sphericity Assumed	1858511.2	2.0	929255.6	0.8	0.5
	Greenhouse-Geisser	1858511.20	1.71	1088456.51	.764	.451
	Huynh-Feldt	1858511.20	1.85	1004368.68	.764	.461
	Lower-bound	1858511.20	1.00	1858511.20	.764	.389
Error (factor1)	Sphericity Assumed	77813079.41	64.00	1215829.37		
	Greenhouse-Geisser	77813079.41	54.64	1424126.36		
	Huynh-Feldt	77813079.41	59.21	1314106.63		
	Lower-bound	77813079.41	32.00	2431658.73		

Table 9: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Income per Capita, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor1	Linear	2378942023.76	1.00	2378942023.76	1388.92	0.00
	Quadratic	10505560.96	1.00	10505560.96	14.61	0.00
Factor 1 *	Linear	1172719.12	1.00	1172719.12	0.68	0.41
Group	Quadratic	685792.08	1.00	685792.08	0.95	0.34
Error	Linear	54809650.12	32.00	1712801.57		
(factor1)	Quadratic	23003429.29	32.00	718857.17		

Table 10: Test of Between-Subjects Effects for the Two Groups of Counties for Income per Capita, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	70121719215.69	1.00	70121719216	6362.44	0.00
Group	111557995.92	1.00	111557995.9	10.12	0.00
Error	352678461.06	32.00	11021201.91		

Table 11: Test of Normality for Data of Income per Capita, 34 Non-Metro Alabama Counties.

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.954
	HC	.969
Year 2007	LC	.964
	HC	.953
Year 2014	LC	.950
	HC	.909

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 12: Descriptive Statistics Data for Income per Capita, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	20934.41	1986.11	481.70
	HC	19221.41	1378.70	334.38
Year 2007	LC	27835.24	2629.67	637.79
	HC	25511.71	1926.79	467.32
Year 2014	LC	33026.59	2290.78	555.60
	HC	30788.29	2277.03	552.26

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 13: Independent Samples T-Test for Equality of Means for Income per Capita, 34 Non-Metro Alabama Counties

		Levene's test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 2000	Equal variances assumed	2.28	0.14	2.92	32.00	0.01	1713.00	586.39	518.57	2907.43
	Equal variances not assumed			2.92	28.51	0.01	1713.00	586.39	512.81	2913.19
Year 2007	Equal variances assumed	0.41	0.53	2.94	32.00	0.01	2323.53	790.67	712.99	3934.07
	Equal variances not assumed			2.94	29.34	0.01	2323.53	790.67	707.23	3939.83
Year 2014	Equal variances assumed	0.50	0.49	2.86	32.00	0.01	2238.29	783.38	642.61	3833.98
	Equal variances not assumed			2.86	32.00	0.01	2238.29	783.38	642.61	3833.98

Table 14: Mauchly`s Test of Sphericity for Median Household Income, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	0.874	4.192	2	.123	.888	.966	.500

Table 15: Test of Within-Subjects Effects for the Years and Group of Counties for Median Household Income, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	917568527.47	2.00	458784263.74	190.95	.000
	Greenhouse-Geisser	917568527.47	1.78	516816126.28	190.95	.000
	Huynh-Feldt	917568527.47	1.93	475171278.12	190.95	.000
	Lower-bound	917568527.47	1.00	917568527.47	190.95	.000
Factor 1 * Group	Sphericity Assumed	10079613.31	2.00	5039806.66	2.10	.131
	Greenhouse-Geisser	10079613.31	1.78	5677294.45	2.10	.137
	Huynh-Feldt	10079613.31	1.93	5219820.21	2.10	.133
	Lower-bound	10079613.31	1.00	10079613.31	2.10	.157
Error (factor1)	Sphericity Assumed	153769175.88	64.00	2402643.37		
	Greenhouse-Geisser	153769175.88	56.81	2706555.00		
	Huynh-Feldt	153769175.88	61.79	2488461.82		
	Lower-bound	153769175.88	32.00	4805286.75		

Table 16: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Median Household Income, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	2378942023.76	1.00	2378942023.76	1388.92	0.00
	Quadratic	10505560.96	1.00	10505560.96	14.61	0.00
Factor 1 * Group	Linear	1172719.12	1.00	1172719.12	0.68	0.41
	Quadratic	685792.08	1.00	685792.08	0.95	0.34
Error (factor1)	Linear	54809650.12	32.00	1712801.57		
	Quadratic	23003429.29	32.00	718857.17		

Table 17: Test of Between-Subjects Effects for the Two Groups of Counties for Median Household Income, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	117793301887	1.00	117793301887.41	1260.478	.000
Group	659995016	1.00	659995015.69	7.062	.012
Error	2990441344	32.00	93451292.01		

Table 18: Test of Normality for Data of Median Household Income, 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.966
	HC	.989
Year 2007	LC	.927
	HC	.966
Year 2014	LC	.922
	HC	.981

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 19: Descriptive Statistics Data for Median Household Income, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	32018.88	4568.62	1108.05
	HC	27814.12	4516.02	1095.30
Year 2007	LC	37689.18	6556.13	1590.10
	HC	32252.94	5852.35	1419.40
Year 2014	LC	39871.76	6809.84	1651.63
	HC	34250.41	5624.92	1364.24

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 20: Independent Samples T-Test for Equality of Means for Median Household Income, 34 Non-Metro Alabama Counties

		Levene's test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 2000	Equal variances assumed	.028	.868	2.70	32.00	.01	4204.76	1558.03	1031.16	7378.37
	Equal variances not assumed			2.70	32.00	.01	4204.76	1558.03	1031.15	7378.38
Year 2007	Equal variances assumed	.140	.711	2.55	32.00	.02	5436.24	2131.46	1094.60	9777.87
	Equal variances not assumed			2.55	31.60	.02	5436.24	2131.46	1092.42	9780.05
Year 2014	Equal variances assumed	.218	.644	2.62	32.00	.01	5621.35	2142.20	1257.83	9984.88
	Equal variances not assumed			2.62	30.90	.01	5621.35	2142.20	1251.72	9990.99

Table 21: Mauchly`s Test of Sphericity for SNAP, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.855	4.843	2	.089	.874	.949	.500

Table 22: Test of Within-Subjects Effects for the Years and Group of Counties for SNAP, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	1893.82	2.00	946.91	357.63	.000
	Greenhouse-Geisser	1893.82	1.75	1083.86	357.63	.000
	Huynh-Feldt	1893.82	1.90	998.00	357.63	.000
	Lower-bound	1893.82	1.00	1893.82	357.63	.000
Factor 1 * Group	Sphericity Assumed	1.19	2.00	0.60	0.23	.799
	Greenhouse-Geisser	1.19	1.75	0.68	0.23	.769
	Huynh-Feldt	1.19	1.90	0.63	0.23	.788
	Lower-bound	1.19	1.00	1.19	0.23	.638
Error (factor1)	Sphericity Assumed	169.46	64.00	2.65		
	Greenhouse-Geisser	169.46	55.91	3.03		
	Huynh-Feldt	169.46	60.72	2.79		
	Lower-bound	169.46	32.00	5.30		

Table 23. Tests of Within-Subjects Contrasts for the Years and Group of Counties for SNAP, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	1826.26	1.00	1826.26	502.38	.000
	Quadratic	67.56	1.00	67.56	40.69	.000
Factor 1 * Group	Linear	1.19	1.00	1.19	0.33	.571
	Quadratic	0.00	1.00	0.00	0.00	.983
Error (factor 1)	Linear	116.33	32.00	3.64		
	Quadratic	53.13	32.00	1.66		

Table 24: Test of Between-Subjects Effects for the Two Groups of Counties for SNAP, 34 Alabama Counties, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	32932.90	1.00	32932.90	219.90	.000
Group	930.04	1.00	930.04	6.21	.018
Error	4792.45	32.00	149.76		

Table 25: Test of Normality for Data of SNAP, 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.815*
	HC	.872*
Year 2007	LC	.909*
	HC	.885*
Year 2013	LC	.877*
	HC	.884*

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 26: Descriptive Statistics Data for SNAP, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	10.21	4.91	1.19
	HC	16.51	9.66	2.34
Year 2007	LC	13.79	4.82	1.17
	HC	19.84	8.24	2.00
Year 2013	LC	20.84	5.46	1.32
	HC	26.61	8.47	2.05

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 27: Kruskal-Wallis Test -Non-Parametric, 34 Non-Metro Alabama Counties

	Group	Mean Rank
Year 2000	LC	13.50
	HC	21.50
Year 2007	LC	13.24
	HC	21.76
Year 2013	LC	13.50
	HC	21.50

	Year 2000	Year 2007	Year 2013
Chi-Square	5.488	6.241	5.487
Df	1	1	1
Asymp. Sig.	.019	.012	.019

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 28: Mauchly`s Test of Sphericity for Unemployment Rate, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.902	3.203	2	.202	.911	.993	.500

Table 29: Test of Within-Subjects Effects for the Years and Group of Counties for Unemployment Rate, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	38.00	2.00	19.00	24.68	.000
	Greenhouse-Geisser	38.00	1.82	20.87	24.68	.000
	Huynh-Feldt	38.00	1.99	19.14	24.68	.000
	Lower-bound	38.00	1.00	38.00	24.68	.000
Factor 1 * Group	Sphericity Assumed	0.33	2.00	0.17	0.22	.806
	Greenhouse-Geisser	0.33	1.82	0.18	0.22	.786
	Huynh-Feldt	0.33	1.99	0.17	0.22	.805
	Lower-bound	0.33	1.00	0.33	0.22	.645
Error (factor1)	Sphericity Assumed	49.28	64.00	0.77		
	Greenhouse-Geisser	49.28	58.28	0.85		
	Huynh-Feldt	49.28	63.54	0.78		
	Lower-bound	49.28	32.00	1.54		

Table 30: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Unemployment Rate, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	15.53	1.00	15.53	15.50	.000
	Quadratic	22.47	1.00	22.47	41.77	.000
Factor 1 * Group	Linear	0.32	1.00	0.32	0.32	.573
	Quadratic	0.01	1.00	0.01	0.02	.902
Error (factor 1)	Linear	32.07	32.00	1.00		
	Quadratic	17.21	32.00	0.54		

Table 31: Test of Between-Subjects Effects for the Two Groups of Counties for Unemployment Rate, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3864.05	1.00	3864.05	503.31	.000
Group	69.51	1.00	69.51	9.05	.005
Error	245.67	32.00	7.68		

Table 32: Test of Normality for Data of Unemployment Rate, 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.946
	HC	.945
Year 2007	LC	.882*
	HC	.945
Year 2016	LC	.906
	HC	.888*

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 33: Descriptive Statistics for Unemployment Rate, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	5.26	1.14	0.28
	HC	6.76	1.96	0.47
Year 2007	LC	4.65	1.06	0.26
	HC	6.33	2.02	0.49
Year 2016	LC	6.08	1.15	0.28
	HC	7.85	2.60	0.63

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 34: Independent Samples T-Test for Equality of Means for Unemployment Rate, 34 Non-Metro Alabama Counties

		Levene'sTest for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 2000	Equal variances assumed	5.75	0.02	-2.73	32.00	0.01	-1.50	0.55	5.75	0.02
	Equal variances not assumed			-2.73	25.79	0.01	-1.50	0.55		
Year 2007	Equal variances assumed	3.75	0.06	-3.02	32.00	0.00	-1.68	0.55	3.75	0.06
	Equal variances not assumed			-3.02	24.15	0.01	-1.68	0.55		
Year 2016	Equal variances assumed	6.45	0.02	-2.58	32.00	0.01	-1.78	0.69	6.45	0.02
	Equal variances not assumed			-2.58	22.04	0.02	-1.78	0.69		

Table 35: Descriptive Statistics Data for Food Insecurity Rate, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2014	LC	16.6529	3.86007	.93620
	HC	21.5882	5.77969	1.40178

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 36: Test of Normality for Food Insecurity, 34 Non-Metro Alabama Counties

	Group	Shapiro-Wilk
		Statistic
Year 2014	LC	.830*
	HC	.975

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 37: Independent Samples T-Test for Equality of Means for Food Insecurity Rate, 34 Non-Metro Alabama Counties

		Levene'sTest for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 2016	Equal variances assumed	2.985	.094	-2.93	32.00	0.01	-4.94	1.69	-8.37	-1.50
	Equal variances not assumed			-2.93	27.90	0.01	-4.94	1.69	-8.39	-1.48

Table 38: Mauchly`s Test of Sphericity for Percent Population under Poverty, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.735	9.561	2	.008	.790	.850	.500

Table 39. Test of Within- Subjects Effects for the Years and Group of Counties for Percent Population under Poverty, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	432.27	2.00	216.13	61.66	.000
	Greenhouse-Geisser	432.27	1.58	273.50	61.66	.000
	Huynh-Feldt	432.27	1.70	254.15	61.66	.000
	Lower-bound	432.27	1.00	432.27	61.66	.000
Factor1 * Group	Sphericity Assumed	4.95	2.00	2.47	0.71	.498
	Greenhouse-Geisser	4.95	1.58	3.13	0.71	.467
	Huynh-Feldt	4.95	1.70	2.91	0.71	.476
	Lower-bound	4.95	1.00	4.95	0.71	.407
Error (factor 1)	Sphericity Assumed	224.35	64.00	3.51		
	Greenhouse-Geisser	224.35	50.58	4.44		
	Huynh-Feldt	224.35	54.43	4.12		
	Lower-bound	224.35	32.00	7.01		

Table 40: Tests of Within- Subjects Contrasts for the Years and Group of Counties for Percent Population under Poverty, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	430.52	1.00	430.52	93.32	.000
	Quadratic	1.75	1.00	1.75	0.73	.399
Factor 1 * Group	Linear	4.92	1.00	4.92	1.07	.309
	Quadratic	0.02	1.00	0.02	0.01	.925
Error (factor 1)	Linear	147.62	32.00	4.61		
	Quadratic	76.73	32.00	2.40		

Table 41: Test of Between-Subjects Effects for the Two Groups of Counties for Percent Population under Poverty, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	42816.31	1.00	42816.31	474.11	.000
Group	556.27	1.00	556.27	6.16	.019
Error	2889.91	32.00	90.31		

Table 42: Test of Normality for Data of Percent Population under Poverty, 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.821*
	HC	.891*
Year 2007	LC	.906
	HC	.895
Year 2014	LC	.950
	HC	.845*

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 43: Descriptive Statistics Data for Percent Population under Poverty, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	15.99	3.90	0.94
	HC	20.14	5.41	1.31
Year 2007	LC	17.99	4.81	1.17
	HC	22.62	6.45	1.56
Year 2014	LC	20.48	4.80	1.16
	HC	25.71	7.90	1.92

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 44: Kruskal-Wallis Test -Non- Parametric -Percent Poverty, 34 Non-Metro Alabama Counties

	Group	Mean Rank
Year 2000	LC	12.74
	HC	22.26
Year 2007	LC	13.21
	HC	21.79
Year 2014	LC	13.47
	HC	21.53

	Year2000	Year2007	Year2014
Chi-Square	7.787*	6.324*	5.572*
Df	1	1	1
Asymp. Sig.	.005	.012	.018

*p<0.05, **P<0.001
Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 45: Mauchly`s Test of Sphericity for Infant Mortality Rate, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.994	.177	2	.915	.994	1.000	.500

Table 46: Test of Within- Subjects Effects for the Years and Group of Counties for Infant Mortality Rate, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	159.43	2.00	79.71	2.14	.126
	Greenhouse-Geisser	159.43	1.99	80.17	2.14	.126
	Huynh-Feldt	159.43	2.00	79.71	2.14	.126
	Lower-bound	159.43	1.00	159.43	2.14	.153
Factor 1 * Group	Sphericity Assumed	138.29	2.00	69.15	1.86	.164
	Greenhouse-Geisser	138.29	1.99	69.54	1.86	.164
	Huynh-Feldt	138.29	2.00	69.15	1.86	.164
	Lower-bound	138.29	1.00	138.29	1.86	.182
Error (factor 1)	Sphericity Assumed	2380.43	64.00	37.19		
	Greenhouse-Geisser	2380.43	63.64	37.41		
	Huynh-Feldt	2380.43	64.00	37.19		
	Lower-bound	2380.43	32.00	74.39		

Table 47: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Infant Mortality Rate, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	157.84	1.00	157.84	3.95	.055
	Quadratic	1.59	1.00	1.59	0.05	.831
Factor 1 * Group	Linear	118.59	1.00	118.59	2.97	.094
	Quadratic	19.70	1.00	19.70	0.57	.455
Error (factor 1)	Linear	1277.31	32.00	39.92		
	Quadratic	1103.11	32.00	34.47		

Table 48: Test of Between-Subjects Effects for the Two Groups of Counties for Infant Mortality Rate, 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	7767.43	1.00	7767.43	354.27	.000
Group	8.19	1.00	8.19	0.37	.545
Error	701.60	32.00	21.93		

Table 49: Test of Normality for Data of Infant Mortality Rate, 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.921
	HC	.877*
Year 2007	LC	.931
	HC	.885*
Year 2013	LC	.909
	HC	.923

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 50: Descriptive Statistics Data for Infant Mortality Rate, 34 Non-Metro Alabama Counties

	Group	Mean	Std.Deviation	Std. Error Mean
Year 2000	LC	8.42	2.88	0.70
	HC	12.25	6.55	1.59
Year 2007	LC	8.89	5.81	1.41
	HC	8.21	5.31	1.29
Year 2013	LC	8.02	6.91	1.68
	HC	6.56	5.63	1.37

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 51: Independent Samples T-Test for Equality of Means for Infant Mortality Rate, 34 Non-Metro Alabama Counties

		Levene'sTest for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 2000	Equal variances assumed	13.26	.001	-2.21	32.00	0.03	-3.83	1.74	-7.37	-0.29
	Equal variances not assumed			-2.21	21.96	0.04	-3.83	1.74	-7.43	-0.23
Year 2007	Equal variances assumed	0.02	.892	0.35	32.00	0.73	0.68	1.91	-3.21	4.56
	Equal variances not assumed			0.35	31.75	0.73	0.68	1.91	-3.21	4.57
Year 2013	Equal variances assumed	0.55	.463	0.67	32.00	0.51	1.45	2.16	-2.95	5.86
	Equal variances not assumed			0.67	30.75	0.51	1.45	2.16	-2.96	5.86

Table 52: Mauchly`s Test of Sphericity for Population Density, 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.049	92.863	5	.000	.424	.447	.333

Table 53: Test of Within-Subjects Effects for the Years and Group of Counties for Population Density, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	2572.03	3.00	857.34	11.69	.000
	Greenhouse-Geisser	2572.03	1.27	2023.02	11.69	.001
	Huynh-Feldt	2572.03	1.34	1917.07	11.69	.001
	Lower-bound	2572.03	1.00	2572.03	11.69	.002
Factor 1 * Group	Sphericity Assumed	1757.80	3.00	585.93	7.99	.000
	Greenhouse-Geisser	1757.80	1.27	1382.59	7.99	.004
	Huynh-Feldt	1757.80	1.34	1310.18	7.99	.004
	Lower-bound	1757.80	1.00	1757.80	7.99	.008
Error (factor 1)	Sphericity Assumed	7041.63	96.00	73.35		
	Greenhouse-Geisser	7041.63	40.68	173.08		
	Huynh-Feldt	7041.63	42.93	164.02		
	Lower-bound	7041.63	32.00	220.05		

Table 54: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Population Density, 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	2542.01	1.00	2542.01	13.26	.001
	Quadratic	2.84	1.00	2.84	0.12	.728
Factor 1 * Group	Linear	27.18	1.00	27.18	5.14	.030
	Quadratic	1749.23	1.00	1749.23	9.12	.005
Error (factor 1)	Linear	6.36	1.00	6.36	0.28	.603
	Quadratic	2.22	1.00	2.22	0.42	.522

Table 55: Test of Between-Subjects Effects for the Two Groups of Counties for Population Density, 34 Non-Metro Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	311213.55	1.00	311213.55	98.97	.000
Group	51154.31	1.00	51154.31	16.27	.000
Error	100623.16	32.00	3144.47		

Table 56: Test of Normality for Data of Population Density, 34 Non-Metro Alabama Counties

Shapiro-Wilk	Group	Statistic
Yr 1980	LC	.97
	HC	.85*
Yr 1990	LC	.92
	HC	.84*
Yr 2000	LC	.92
	HC	.80*
	LC	.91
Yr 2014	HC	.78*

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 57: Descriptive Statistics Data for Population Density, 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 1980	LC	57.12	31.09	7.54
	HC	27.64	11.13	2.70
Year 1990	LC	62.90	32.02	7.77
	HC	27.41	12.49	3.03
Year 2000	LC	70.84	38.73	9.39
	HC	29.61	17.52	4.25
Year 2014	LC	78.06	47.19	11.45
	HC	29.10	20.57	4.99

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 58: Kruskal-Wallis Test (Non-Parametric Test) Test for Equality of Means for Population Density, 34 Non-Metro Alabama Counties

	Group	Mean Rank
Year 1980	LC	23.06
	HC	11.94
Year 1990	LC	23.88
	HC	11.12
Year 2000	LC	23.82
	HC	11.18
Year 2014	LC	23.76
	HC	11.24

	Year 1980	Year 2000	Year 2014
Chi-Square	10.594*	13.710**	13.456**
df	1	1	1
Asymp. Sig.	.001	.000	.000

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 59: Mauchly`s Test of Sphericity for Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.860	4.665	2	.097	.877	.953	.500

Table 60: Test of Within-Subjects Effects for the Years and Group of Counties for Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	2189.59	2.00	1094.80	473.48	.000
	Greenhouse-Geisser	2189.59	1.75	1247.75	473.48	.000
	Huynh-Feldt	2189.59	1.91	1148.45	473.48	.000
	Lower-bound	2189.59	1.00	2189.59	473.48	.000
Factor 1 * Group	Sphericity Assumed	10.94	2.00	5.47	2.37	.102
	Greenhouse-Geisser	10.94	1.75	6.24	2.37	.110
	Huynh-Feldt	10.94	1.91	5.74	2.37	.105
	Lower-bound	10.94	1.00	10.94	2.37	.134
Error (factor 1)	Sphericity Assumed	147.98	64.00	2.31		
	Greenhouse-Geisser	147.98	56.15	2.64		
	Huynh-Feldt	147.98	61.01	2.43		
	Lower-bound	147.98	32.00	4.62		

Table 61: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	2156.065	1	2156.065	687.079	.000
	Quadratic	33.526	1	33.526	22.554	.000
Factor 1 * Group	Linear	10.484	1	10.484	3.341	.077
	Quadratic	.461	1	.461	.310	.581
Error (factor 1)	Linear	100.416	32	3.138		
	Quadratic	47.568	32	1.486		

Table 62: Test of Between-Subjects Effects for the Two Groups of Counties for Education Attainment (percent population 25 years and above with at least a high school education and above), 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	559544.04	1.00	559544.04	17262.08	.000
Group	87.18	1.00	87.18	2.69	.111
Error	1037.27	32.00	32.41		

Table 63: Test of Normality for Data of Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties.

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.954
	HC	.978
Year 2005-09	LC	.966
	HC	.958
Year 2011-15	LC	.983
	HC	.951

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 64. Descriptive Statistics Data for Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	69.39	4.52	1.10
	HC	66.66	3.34	0.81
Year 2005-2009	LC	75.71	4.15	1.01
	HC	74.05	2.61	0.63
Year 2011-2015	LC	79.87	3.53	0.86
	HC	78.71	2.45	0.59

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 65: Independent Samples T-Test for Equality of Means for Education Attainment (percent population 25 years and above with at least a high school education), 34 Non-Metro Alabama Counties,

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Year 2000	Equal variances assumed	.807	.376	2.003	32	.054	2.72941	1.36294	-.04680	5.50563
	Equal variances not assumed			2.003	29.436	.055	2.72941	1.36294	-.05632	5.51514
Year 2009	Equal variances assumed	1.950	.172	1.396	32	.172	1.65882	1.18816	-.76139	4.07904
	Equal variances not assumed			1.396	26.937	.174	1.65882	1.18816	-.77935	4.09700
Year 2015	Equal variances assumed	2.037	.163	1.111	32	.275	1.15882	1.04317	-.96605	3.28370
	Equal variances not assumed			1.111	28.503	.276	1.15882	1.04317	-.97632	3.29397

Table 66: Mauchly`s Test of Sphericity for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factor 1	.933	2.148	2	.342	.937	1.000	.500

Table 67: Test of Within-Subjects Effects for the Years and Group of Counties for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Sphericity Assumed	2425.75	2.00	1212.88	50.83	.000
	Greenhouse-Geisser	2425.75	1.87	1294.07	50.83	.000
	Huynh-Feldt	2425.75	2.00	1212.88	50.83	.000
	Lower-bound	2425.75	1.00	2425.75	50.83	.000
Factor 1 * Group	Sphericity Assumed	43.70	2.00	21.85	0.92	.405
	Greenhouse-Geisser	43.70	1.87	23.31	0.92	.400
	Huynh-Feldt	43.70	2.00	21.85	0.92	.405
	Lower-bound	43.70	1.00	43.70	0.92	.346
Error (factor 1)	Sphericity Assumed	1527.04	64.00	23.86		
	Greenhouse-Geisser	1527.04	59.98	25.46		
	Huynh-Feldt	1527.04	64.00	23.86		
	Lower-bound	1527.04	32.00	47.72		

Table 68: Tests of Within-Subjects Contrasts for the Years and Group of Counties for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Factor 1	Linear	2335.33	1.00	2335.33	79.08	.000
	Quadratic	90.43	1.00	90.43	4.97	.033
Factor 1 * Group	Linear	42.50	1.00	42.50	1.44	.239
	Quadratic	1.20	1.00	1.20	0.07	.799
Error (factor 1)	Linear	945.04	32.00	29.53		
	Quadratic	582.00	32.00	18.19		

Table 69: Test of Between-Subjects Effects for the Two Groups of Counties for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	426590.48	1.00	426590.48	703.30	.000
Group	5202.78	1.00	5202.78	8.58	.006
Error	19409.88	32.00	606.56		

Table 70: Test of Normality for Data of Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

Shapiro – Wilk	Group	Statistic
Year 2000	LC	.875*
	HC	.954
Year 2007	LC	.915
	HC	.959
Year 2012	LC	.909
	HC	.967

*p<0.05, **P<0.001

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 71: Descriptive Statistics Data for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

	Group	Mean	Std. Deviation	Std. Error Mean
Year 2000	LC	51.62	13.49	3.27
	HC	67.33	18.79	4.56
Year 2007	LC	56.04	14.42	3.50
	HC	70.63	15.77	3.83
Year 2012	LC	64.92	12.33	2.99
	HC	77.47	12.83	3.11

Note: LC refers to 17 counties with the least concentration of timberland ownership.
HC refers to 17 counties with the most concentration of timberland ownership.

Table 72: Independent Samples T-Test for Equality of Means for Free and Reduced Lunch (K12 students), 34 Non-Metro Alabama Counties

		Levene'sTest for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Year 200**0**	Equal variances assumed	3.36	0.08	-2.80	32.00	0.01	-15.71	5.61	-27.14	-4.28
	Equal variances not assumed			-2.80	29.03	0.01	-15.71	5.61	-27.19	-4.24
Year 2007	Equal variances assumed	0.23	0.64	-2.82	32.00	0.01	-14.59	5.18	-25.15	-4.03
	Equal variances not assumed			-2.82	31.75	0.01	-14.59	5.18	-25.15	-4.03
Year 2012	Equal variances assumed	0.14	0.71	-2.91	32.00	0.01	-12.55	4.32	-21.34	-3.76
	Equal variances not assumed			-2.91	31.95	0.01	-12.55	4.32	-21.34	-3.76

Figure 1. Timber Dependent Counties and Location of Pulp and Paper Mills in Alabama.

Note: There are three pulp and paper mills in Monroe County in the same town. These three pulp and paper mills are represented by one dot. Based on Robinson and Bailey (2006).

Figure 2. Map of Region of Study in the State of Alabama.

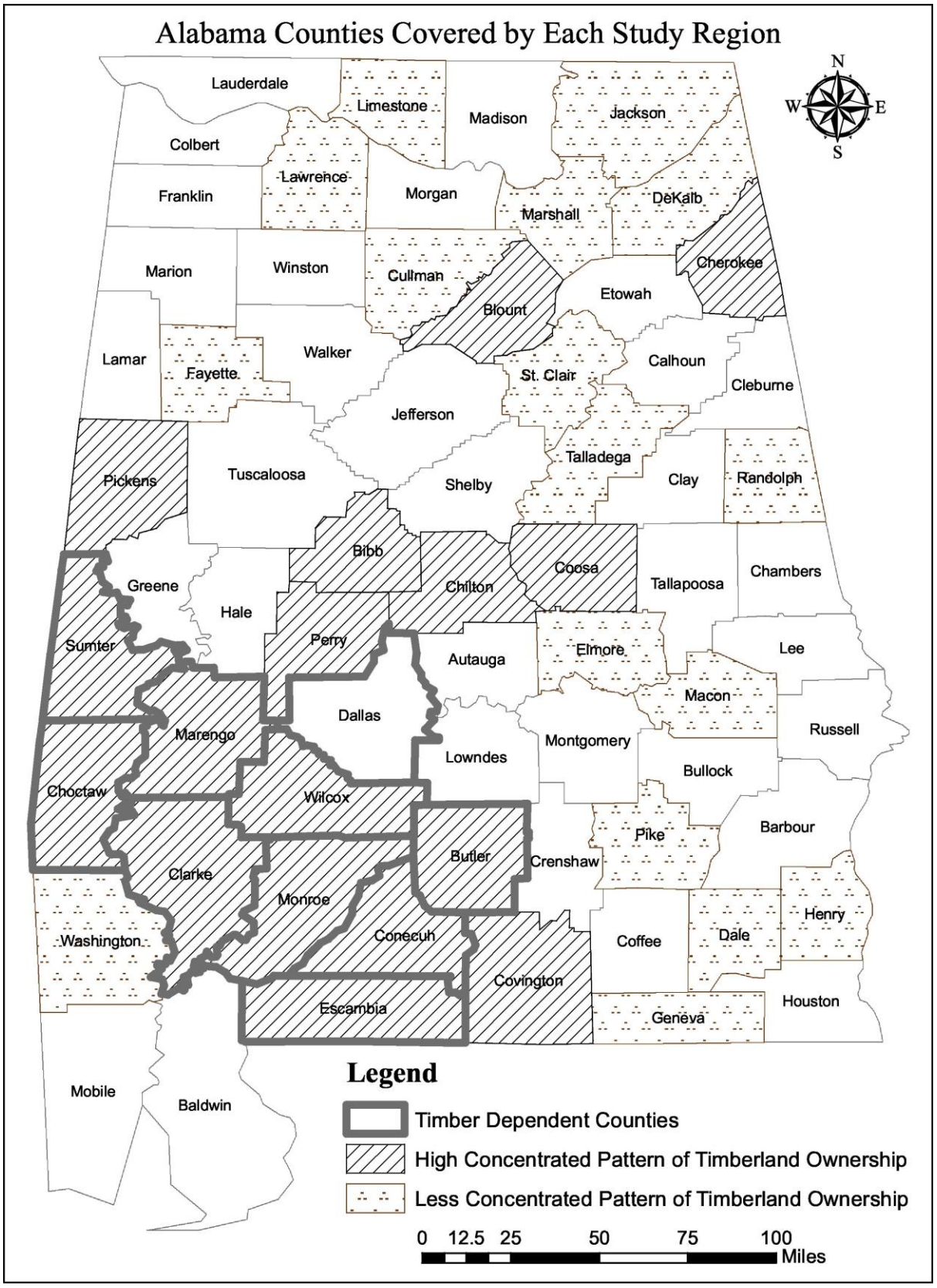

Figure 3. Income per Capita for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership.

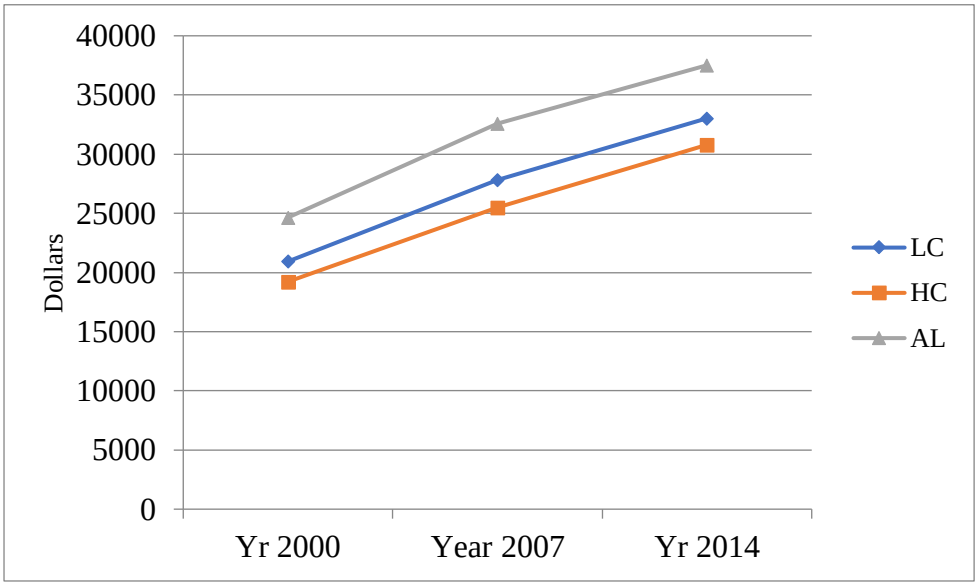

Figure 4. Median Household Income for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland ownership, 34 Alabama Counties

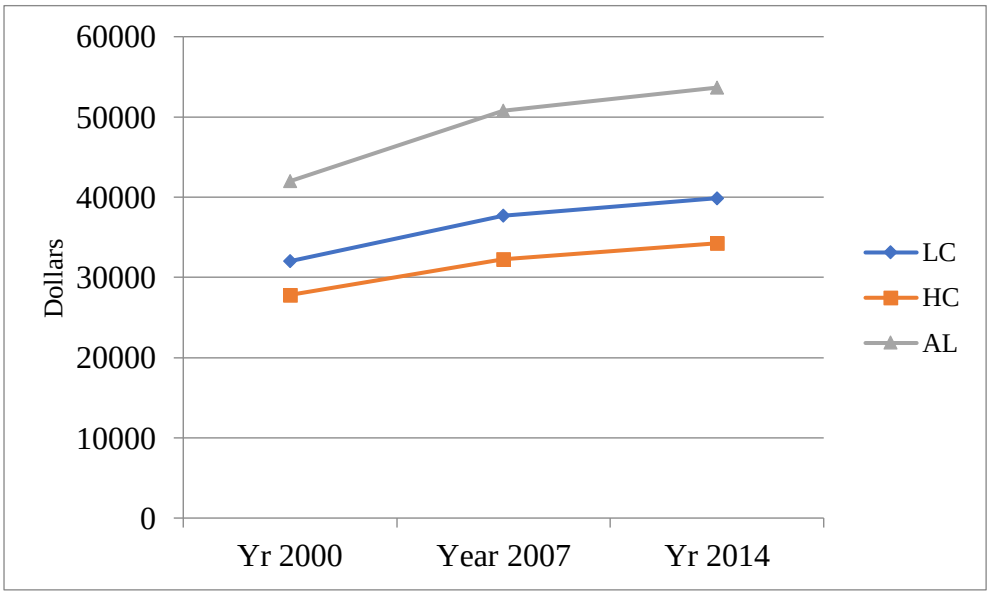

Figure 5. Unemployment Rate for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland ownership, 34 Alabama Counties

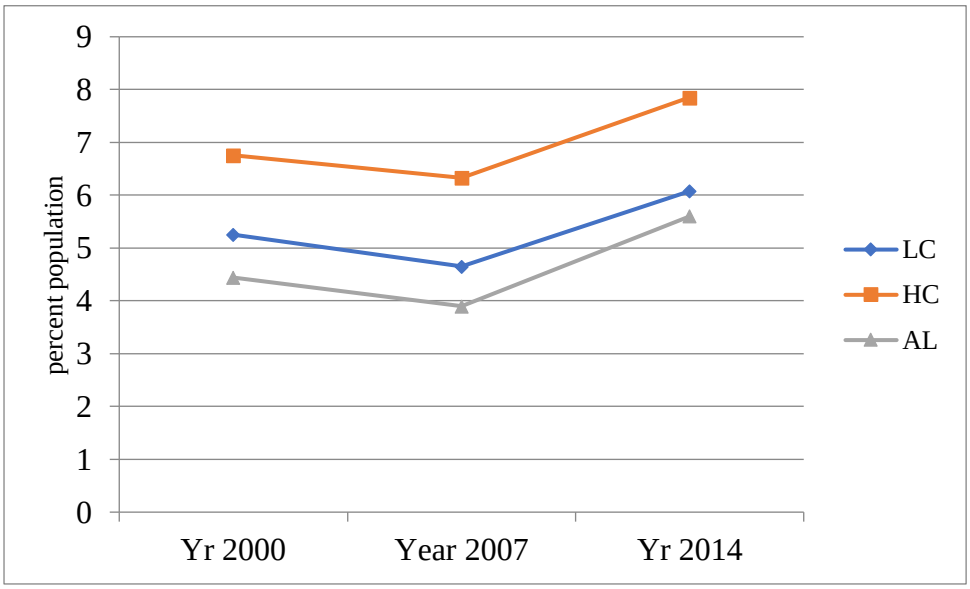

Figure 6. Percent Poverty for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership, 34 Alabama Counties

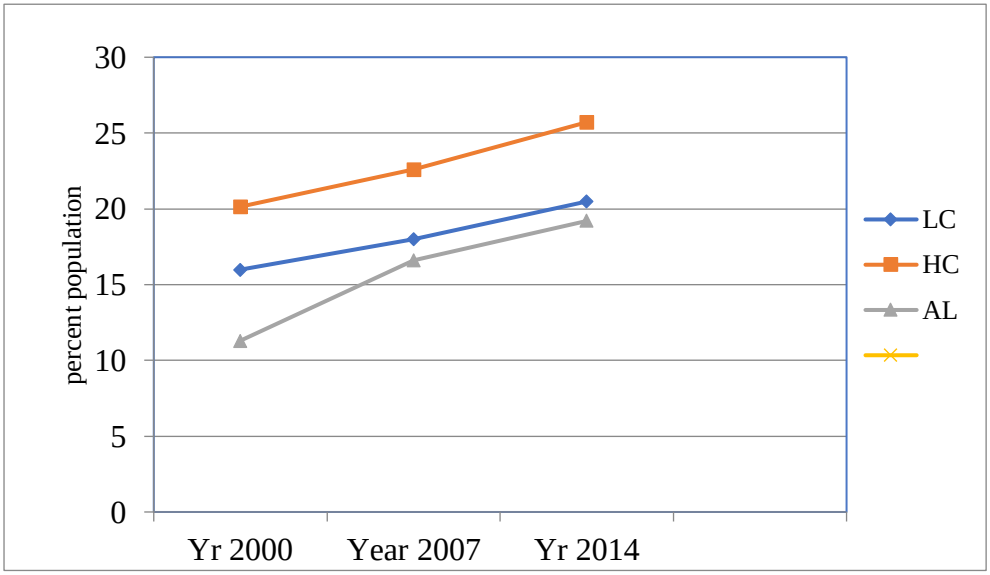

Figure 7. Percent Population Benefiting from SNAP for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership, 34 Alabama Counties.

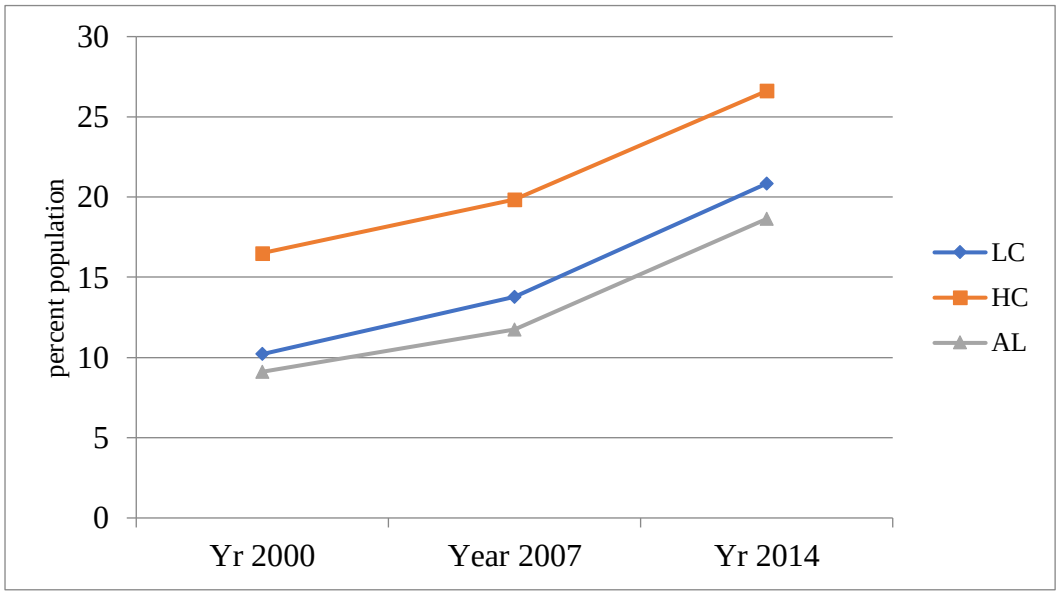

Figure 8. Percent K12 Students Benefiting from Students Meal for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership, 34 Alabama Counties.

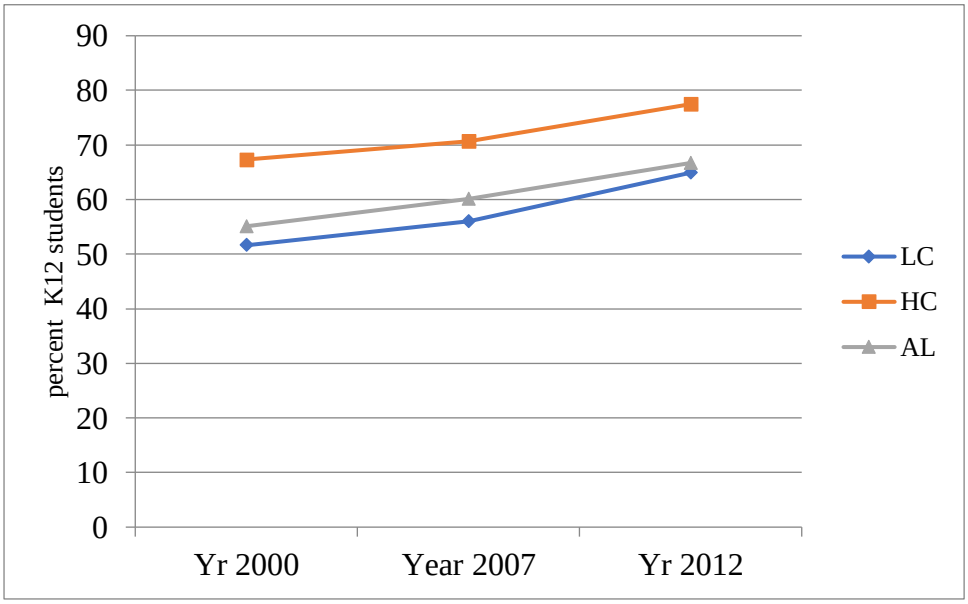

Figure 9. Population Density (Square Miles) for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership, 34 Alabama Counties.

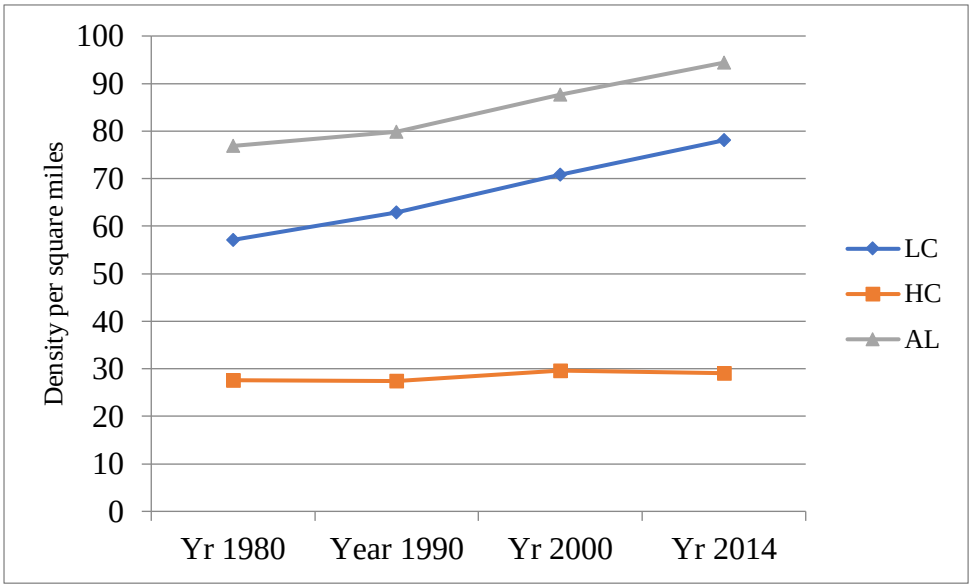

Figure 10. School Attainment (percent high school graduates and above, for population 25 years and over) for Alabama State and Counties Categorized as High and Low Concentrated Pattern of Timberland Ownership, 34 Alabama Counties.