GEO-DEMOGRAPHIC ANALYSIS OF THE ALABAMA BLACK BELT 1910 -2010

by

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A Thesis
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Master of Science
Geographic and Cartographic Science

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Geo-Demographic Analysis of the Alabama Black Belt 1910 -2010

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DEDICATION

This is dedicated to my wonderful wife Robin, her father A.T. Sims and her Uncle Ted whose stories of Central Alabama inspired me delve deeper into the history of Central Alabama.
ACKNOWLEDGEMENTS

I would like to thank Dr. Kevin Curtin whose infectious energy motivated me to start this program. I would also like to extend my appreciation to my committee who’s concise and timely feedback throughout the process has been invaluable in narrowing my expansive scope to a manageable project, especially Dr. David Wong. Finally, I’d like to thank Dr Barry Haack, whose traditional methods of instruction meshed with my learning style and enabled me to develop a deeper appreciation of Geography and Remote Sensing.
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ABSTRACT

GEO-DEMOGRAPHIC ANALYSIS OF THE ALABAMA BLACK BELT 1910-2010

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George Mason University, 2019
Thesis Director: Dr. David Wong

This thesis determines that the Alabama Black Belt evolved differently than other regions in Alabama during the post-cotton era 1910-2010. This thesis first quantifies the extent of Alabama Black Belt during the ante-bellum era and the cotton credit system era. It then analysis the population histories of counties inside the Alabama Black Belt relative to other Alabama counties with similar economic characteristics during the Post-Cotton era 1910-2010. The analysis uses population processes of migration, natality and mortality to determine that rural Black Belt counties despite having significantly higher birth rate lost 56% of their population during the post cotton period, while the population of similar rural counties outside the Black Belt increased by 8%. Analysis of mixed and urban counties showed similar differences. The thesis then uses two measures of population distribution taken at decadal intervals to determine if the hierarchical market system within the Black Belt evolved differently than the market system in similar counties outside the Black Belt. This analysis uses a graph of the Pareto coefficient for
rank-size distribution of settlements within each group of counties as one measure. Rural population density is a second measure. Together these two measures are proxies for employment and by extension the relative health of the regional economy. The results indicate the Black Belt counties, especially rural counties experienced centralizing markets with downgrading of market levels and a contracting economy in four of ten decades, while rural counties outside the Black Belt experienced decentralizing markets with upgrading market levels and an expanding economy in two decades. Similarly, mixed Black Belt counties experienced negative growth in two decades and strong growth in only one decade, while mixed counties outside the Black Belt experienced strong growth and upgrading markets in five decades. Comparative population analysis and measures of population distribution confirmed that the Alabama Black Belt counties evolved differently due to demographic differences, economic opportunities, and governance.
1. INTRODUCTION

This thesis will focus on the population dynamics of the Alabama Black Belt during the post-cotton era. Specifically, this thesis will determine if it is possible to quantify the extent of the Black Belt. It will then use a comparison of population dynamics of similar Alabama counties to show that the population of Black Belt evolved differently during the post-cotton era. One example, the Black Belt population increased by only 4% while similar counties outside the Black Belt had a population increase of 154%. The third focus of this thesis will be on using urban and rural population distribution measures to demonstrate that economic conditions in the Black Belt was worse than in similar counties outside the Black Belt during the post-cotton era.

Since the cotton rush that started in 1816, the Alabama Black Belt has been on the minds of scholars. Until 1860, it was the economic engine of Alabama and the center of the cotton culture. Following the Civil War, the Black Belt region once again became known for growing cotton, this time under the cotton credit system. However, since 1916 when the cotton credit system crashed due to the boll weevil infestation, the Black Belt region has struggled economically. The following brief history of the Alabama Black Belt establishes the historical context for the post-cotton era.

The Alabama Black Belt currently has some of the most poverty-stricken counties in Alabama. This is a dramatic change for this region of Alabama. The Black Belt
played a significant role in the formation of Alabama and the economic foundations of the state. Beginning with the Cotton Rush of 1818-1819 the Alabama Black Belt Region played a prominent role in cotton production through 1916 (Abernethy 1990; Cole 1927). By 1860 the Black Belt was the cultural center of Alabama and economic power house of the South (Hilliard, Duplechin, and Eggart 1984, 71; Watkins [c1908], 150). Following the Civil War the cotton growing regions in the south including the Black Belt region adopted the share cropper labor model to produce cotton which led to the establishment of the cotton credit system (Myers 1974). The cotton credit system was established as means for large land owners and tenants to use their future cotton crop as collateral to purchase farm supplies and food. The local merchant became the de facto lender (Sisk 1955). The wholesale failure of the cotton crop due to the boll weevil caused the cotton credit system to collapse (Sisk 1955). Unlike previous poor cotton harvests, the boll weevil infestation destroyed whole cotton crops across central Alabama. Cotton production in the Black Belt region decreased 70% from 1910 to 1920. The devastation was likely significantly worse, because the agricultural census numbers available for the 1919 crop was four years after the peak of the boll weevil infestation in 1915 (Sisk 1955; Tower 1950). Unlike previous crop failures and economic downturns in Alabama, this time industrialization had taken hold in Birmingham and in northern cities such as Detroit and Chicago and meanwhile significant foreign immigration restrictions had been instituted which resulted in a labor shortage in the north (Reimers 1981, 7). As a result for the first time those African Americans who did not own real-property had other economic opportunities and left the south in large numbers (Hamilton 1964). Although
after 1916, farmers in the Alabama Black Belt and elsewhere in Alabama continued to grow cotton, after 1916, cotton credit system disappeared and other crops began to challenge cotton as the primary crop in Alabama as the center of cotton production moved beyond Central Alabama (Sisk 1952; Tower 1950; Sisk 1955).

The post-cotton era economic struggles have caused economists and social scientists to study portions of the Black Belt region for periods ranging from 2 years to 20 years. However, none of these studies have examined the impact that the prolonged economic uncertainty has had on the population that resides in the Black Belt region of Alabama. Analyzing the population processes of migration, natality, and mortality offer insight into how economic pressures, governance pressures, and racial pressures affected the Black Belt. Historically, people migrate in order to improve their quality of life. Analysis of natality and mortality rates offers insight on how the fertility and health-mortality transition occurred in the Black Belt relative to other parts of Alabama. The availability of US Census data offers an opportunity to use empirical data to gain insight into how economic, governance/racial pressures impacted the population in the post cotton era Alabama Black Belt.

In mid-2004 the Governor of Alabama established the Black Belt Action Commission in recognition that the Alabama Black Belt is unique and requires focused attention. According to the Commission’s co-chair, the commission was formed to improve the lives of the citizens who reside in the Black Belt region (US Fed News Service 2006). However, the geographical extent of the Alabama Black Belt is open to interpretation. The intent of this thesis is to propose at the county level the boundary of
the Alabama Black Belt based on the extent of the “Cotton Culture” using empirical data from the US Census at the county level. This thesis will use the empirically defined Black Belt region to identify counties that have similar economic conditions in Alabama but outside the Black Belt to show that the Black Belt counties viewed through the lens of population dynamics evolved differently than other similar Alabama counties during the post-cotton era 1910-2010. Rural Black counties lost and average of 19% of their population each decade, while rural non-Black Belt counties lost an average of only 6% of their population. The thesis will then use population characteristics of urban and rural population change to demonstrate economic, and governance/racial pressures contributed to the hierarchical market system in the Black Belt centralizing and market levels downgrading during 30% of the post-cotton era, while the market system in similar counties outside the Black Belt experienced similar negative conditions during only 5% of the era. The hierarchical market system is studied through the lens of rank-size distribution, which reflects the economic health of the region. The combined analysis of settlement patterns and rural population density offers a new approach analyzing hierarchical market changes without having to rely on Voronoi diagrams or empirical data on central goods and services offered at central places. This analysis, coupled with comparative analysis of the population dynamics of the Black Belt at the county level, fill a gap in research regarding the Alabama Black Belt as well as the larger Southern Black Belt.

This thesis is organized as follows: A review of relevant academic research sets the conditions. The analysis section has three parts. Part one uses empirical indicators of
the “Cotton Culture” in 1860 and in 1900 to empirically establish the extent of the Black Belt region during each cotton growing period. Part two starts with a description the county classification system used to identify Alabama counties to compare with counties in the Black Belt. Part two continues with a comparative analysis of rural counties, mixed counties, and urban counties. Part three is a comparative analysis of the settlement patterns and rural population density for each of the three classes of counties. The conclusion follows with a summary of the findings and suggestions for future research.
LITERATURE REVIEW

This thesis addresses the following three research questions: What is the appropriate boundary of the Alabama Black Belt? Did the population in the Black Belt evolve differently than other Alabama counties? Viewed through the lens of settlement patterns and rural population density, did the hierarchical market system in the Black Belt progress differently than other similar places in Alabama? This section reviews the research that serves as a foundation for the concepts and analysis contained in this thesis.

There is a large body of academic research about the Black Belt as well as the Alabama Black Belt. Most of the research was completed after 1900. There are four major streams of research: Agricultural topics which range from crop diversification to the impact of mechanization. Sisk (1952) summarized crop diversification efforts following the boll weevil infestation. White (2000), and Ellenberg (1994) are examples of reviews of how tractors and farm equipment impacted southern farming including the Black Belt. A second stream focuses on the regional, mostly cultural geography of the Black Belt region. Cleland (1920), Kennedy (1934) and Gibson (1941) each described aspects of the unique Black Belt culture. Demographic topics is a third research area which is primarily the focus is on the Great Migration of African Americans from the South. The final research stream explores the causes of persistent poverty within the
Black Belt region. Quantifying the extent of the Black Belt and the comparative analysis of the Black Belt population will build on aspects of all four research streams.

In addition to the regionally focused research and population focused research, this thesis will leverage the extensive body of research on hierarchical market systems and the related research about the rank order distribution of population among of settlements. The final research question will pull from this functional body of research.

**Quantifying the Boundaries of the Alabama Black Belt**

Scholars have used multiple combinations of criteria to define the extent of the Black Belt. Webster and Samson (1992) reviewed a large number of the criteria used by scholars. The Criteria have included physical geographic characteristics, the “Cotton Culture”, and population percentages. Early definitions according to Webster and Samson used the physical characteristics of the soil to define the Black Belt. This continued into the 20th century with Gibson (1941) and more definitively by the US Department of Agriculture soil maps as Soil type 135A (Peaslee 2004). Jones and Patton (1966) confirmed using historical data and soil analysis, that the soil type 135A, also known as Black Prairie Soil, would not have supported a dense growth of trees. The lack of dense forest made the Black Belt most desirable because there were fewer trees and stumps to clear, making it possible to plant and grow cotton sooner. Scholars have also cited a second physical geographic characteristic in their definition of the Black Belt, the proximity to a navigable river which leads to an ocean port (Tower 1950; Kennedy 1934). These finding regarding the physical characteristics of the Black Belt make it
possible to establish the initial boundaries for the Black Belt. A second group of criteria highlighted in Webster and Samson’s (1992) review of Alabama Black Belt definitions is the existence of a Cotton Culture. These scholars generally describe Cotton Culture as the lifestyle associated with raising cotton and leave it to the reader to determine the specific characteristics of the “Cotton Culture” (Cleland 1920; Kennedy 1934; Tower 1950). The third and final group of criteria center on population characteristics. Starting from the early 1900s scholars began using the percentage of African American population as the primary criterion for determining the extent of the Black Belt (Phillips 1906; Key 1949). The specific percentage of African American population varies between 40% and 60% (Hackney 2010; Webster and Samson 1992). Additionally, scholars have used percentages population at different dates and socioeconomic characteristics to define a Black Belt which extends from Virginia to Louisiana (Ambinakudige, et al 2012; Webster and Bowman 2008; Shultz 2011). The multiple definitions of the “Black Belt” using a wide range of criteria, highlight the need for a clarification of criteria used to define the boundaries of the Black Belt. The existing research would benefit from the use of quantifiable indicators of the “Cotton Culture”. This thesis will use US Census data as indicators of the “Cotton Culture”. For a deeper understanding of rural African American culture that existed in the Black Belt during this period, the articles cited by Webster and Samson (1992) along with many of the articles referenced in the next section will give the reader a fuller understanding of African American culture that permeates the Alabama Black Belt.
This thesis will focus on the Alabama Black Belt because State of Alabama had a unique business, political, and governance climate during the post-cotton period. By 1900 Alabama had developed a unique business and political alliance which lasted until the early 1960s. Rural landowners joined with the owners of the Steel and coal industries in Birmingham to form an economic and political alliance (Permaloff, et al, 1995). This alliance was unique in that rural interests and urban business interests were not competing for legislation or for tax revenues. They were on the same side and except for brief periods in the 1920s and 1950s controlled and shaped the economic, education, and governance of Alabama from at least 1900 through 1960, when the civil rights movement resulted in the Federal government stepping in to take control (Flynt 2004). Additionally, Alabama, like all states have unique regional characteristics that arise from the physical geography. Thus, to facilitate comparison of the most similar counties both culturally and economically it makes sense to compare the Alabama Black Belt counties to other Alabama counties.

**Population Dynamics of the Alabama Black Belt**

The post-cotton era, the focus of this thesis, begins between 1910 and 1920 with confluence of a regional crop failure due to waves of boll weevil infestations and the need for labor in the industrial cities of the north. Population dynamics here is an examination of how the population processes of migration, natality, and mortality impact a population and its racial segments throughout the 100 year long post-cotton period. Data collected by the US Census Bureau at a ten-year interval makes this type of analysis
possible. This thesis uses US census data from the National Historical GIS (NHGIS) repository (Manson, et al. 2017).

The population process most relevant to the Black Belt is migration. Although percent population change is an indication of migration, an accurate quantification of migration requires accurate data on natality and mortality. The natality and mortality during the early part of the 20th century was hampered by a lack of consistent and reliable data (Siegel 1953). As a result, Siegel (1953) and others focused on national level rates and comparisons. Vernon Davies (1966) traced African American and White fertility rates at the nation level from 1850 through 1962. He highlights the high fertility rates among African Americans and the slow fertility transition among rural African Americans in the South.

Scholars since the early 1950s have focused on the population dynamics of the Great Migration of African Americans. The most comprehensive quantification the Great Migration was written by Hamilton (1964). This article quantifies the out-migration by State from 1900 through 1960. Hart (1960) provides a county level geographic analysis of African Migration between 1880 and 1950. Hart’s maps and narrative provide a useful overview of African American migration patterns both overtime and geographically for the entire country. Stinner and De Jong (1969) took a more focused approach and examined African American male net migration for 150 southern counties over a single decade, 1950-1960. Their purpose was to examine the relationship between five groups of factors and African American out-migration. The study determined that economic
“pull” factors and demographic “push” factors were the primary out-migration drivers. The study also determined poverty did not drive out-migration.

Since 1965 scholars have taken a more detailed approach to examining migration patterns. Bogie (1982) focused exclusively on the Alabama Black Belt counties to analyze the net migration patterns during the two decades after the Great Migration had ended. Bogie’s analysis offers insight into the rhetoric and issues which likely drove population dynamics during these two decades of civil rights change. McHugh (1987) studied the African American migration patterns during a fifteen year period 1965-1980. The level of analysis which is at state and census region offers useful insight into African American migration flows across the nation. The Economic Research Service of the US Department of Agriculture (USDA/ERS) as part of its rural economic and social research program studied rural Southern migration over a 30 year period 1965-1995 (Fuguitt, et al 2001) The study found that out-migration from Southern rural areas had dropped to 13% during the period 1990-1995. The study also confirmed that poverty was not a driver of migration. During the study period they found college educated African Americans out-migrate to metro areas and that rural counties in Alabama, Mississippi and Louisiana had the lowest population growth. Unfortunately, the USDA/ERS study uses county level data but presents results only aggregated at the Census Region level.

More recently, African American migration research has focused on county to county migration to identify factors associated with migration (Ambinakudige, et al 2012). These studies address the larger Southern Black Belt defined solely by the percentage of African American population. Scholars have addressed African American
population dynamics at the Census Region and State level, which provides useful context. Other Scholars have explored migration at the county level for the Black Belt defined solely by counties with a high percentage of African American population. Other research has detailed population dynamics of the Black Belt for a portion of the Post-Cotton era. However, the county level analysis of how the Black Belt population has changed throughout post-cotton era remains a knowledge gap. Additionally, a comparative analysis of the Black Belt population at the county level is another research gap. This thesis will analyze population change, net migration and vital statistics to understand how Black Belt population segments evolved between 1910 and 2010 and will add context to those changes through comparative analysis of comparable Alabama counties outside the Black Belt. By using net migration, the destination of departing migrants is not known, nor is the origin known of arriving migrants. Analysis of net migration at the State level done by Hamilton (1964) offers clues about the origin and destination of migrants. Anecdotal evidence from historical documents also offer clues regarding the origin and destination of migrants.

**Settlement Patterns as Economic Indicators**

The third and final research question seeks to determine if the hierarchical market system in the Black Belt changed differently than the market system in comparable Alabama counties outside the Black Belt. This thesis will attempt to determine this through the lens of settlement patterns and rural population density. This analysis
leverages two streams of research: Hierarchical market systems, and the rank order
distribution based on the population of settlements.

Christaller and Lösch developed theoretical models for a hierarchical market
system (Christaller 1966; Lösch 1954). The challenge for geographers and economists
has been to apply those models in the real world. Berry and Garrison (1958) used
empirical data to demonstrate that hierarchical market systems do exist. Parr (1978) took
a different approach to make the theoretical models more applicable to the real world. He
showed that the restrictive hierarchical market center models developed by Christaller
and Lösch were special cases of a General Hierarchical model. Kenyon (1967) showed
that empirical data on goods and services bundles associated with a specific settlement
size in one region does not necessarily apply in another region. The hierarchical market
center models are static models which apply to a single time period. Thomas Wier used
data from US Department of Commerce’s Bureau of Economic Analysis (BEA) to
determine that a hierarchy of central places exists for consumer services for the state of
Tennessee and the six surrounding states including Alabama during the late 1980s (Wier
1992). Since Wier’s focus was on transportation corridors and business services, his
findings only addressed one decade and did not include information about the size of
market areas outside urban corridors or in predominately rural areas such as the Western
Black Belt. Because it is beyond the scope of this thesis to collect historical data on the
bundles of goods and services associated with a range of settlement sizes, an alternative
approach was needed gain insight into how the hierarchical market system in Alabama
evolved as the transportation system and population changed over time. The rank order
distribution literature contains an alternative method.

In 1941 Zipf (1941), a linguist discovered that a mathematical relationship could
describe distribution of population amongst the populated places in the United States.
This rank-order distribution of cities based on their population became known as Zipf’s
law. Beckmann (1970) established the link between the population size-rank distribution
and a hierarchical market center system first described by Christaller and Losch (Parr
1978). Equation 1 describes the city size-rank relationship articulated by Zipf and
Beckman.

Equation 1 Zipf's Law
\[ u_R = \frac{u_1}{R^\alpha} \]

Where \( u_R \) is the population of a place of rank \( R \), and \( u_1 \) is a constant, the population of
the largest center, \( \alpha \) is a constant. When both size and rank are plotted on a logarithmic
scales, the coefficient \( \alpha \), the Pareto coefficient, is the slope of the power curve. Zipf’s
law is a special case where \( \alpha = 1 \) (Berry et al. 1988, 102). Rosen and Resnick (1980)
determined the Pareto distribution proposed by Zipf in 1941, and used by Beckman is an
accurate method to model the size-rank distribution of a nation’s urban places. They also
identified characteristics which would cause the Pareto coefficient to deviate from Zipf’s
special case value of 1. Parr then proposed using the Pareto coefficient as an indicator of
economic development over a period of several decades (Parr 1985). He hypothesized
that a decreasing value of the Pareto coefficient would be an indicator of economic
development, while an increasing value would be in indicator of slower economic
development or a decline of economic activity (Parr 1985). The value of the Pareto
coefficient will decrease when the population of larger settlements grows at a faster rate than the population of smaller settlements. This coefficient will increase when the reverse happens.

Evaluating how the value of the Pareto coefficient changes each decade offers partial insight regarding how the hierarchical market system changes over time. Rural population density has been a consistent factor affecting the number of levels and the bundles of services provided at each level (Berry et al. 1988, 105). When rural population density decreases, bundles of services are no longer profitable at the existing level transfer to the next level up in the hierarchy. The reverse occurs when rural population density increases. Since rural population density excludes the population of places with at least 2500 people, it is an independent indicator of how the population is distributed throughout a county or region (Truesdell 1949). This thesis will use the alternative approach Parr suggested of evaluating the value of the Pareto coefficient along with rural population density at the county level as indicators of how the hierarchical market system is changing in rural, mixed, and urban counties.
2. QUANTIFYING THE BLACK BELT REGION BOUNDARIES

The geophysical characteristics of a region along with economic factors and the people who reside in that region shape and develop a culture that is unique to that region. In this case, the Black Belt region of Alabama has been shaped by the region’s geophysical characteristics, the economics of commercial cotton farming, and both the African American and White populations who lived there beginning in the early part of the 19th century. In order to determine the extent of the “Cotton Culture” that is attributed to the Black Belt region it is necessary to use quantifiable indicators during both the slave-based period of cotton production and the sharecropper-based period of cotton production.

This thesis will use quantifiable indicators at two points. The one set of indicators will determine the extent of the slave-based Cotton Culture at the economic peak of that period in 1860. A second set of indicators will determine the extent the Cotton Culture in 1900 which was a high point of cotton credit sharecropper-based cotton production period. By using indicators from both periods of cotton production in the Black Belt it will be possible to quantify the extent to which the cotton culture spread beyond the physical geographic features of soil and navigable waterways.
Ante-Bellum Era

Throughout the history of Alabama, scholars and writers have defined the Black Belt region in multiple ways. These multiple definitions often conflict with each other. A definition is needed. Central Alabama along with most of the state was largely settled during the Cotton Rush of 1817-1820 (Cole 1927). At the time cotton prices were high and those who had money and a sense of adventure were seeking to make money raising cotton in the newly opened Alabama Territory. They were looking for fertile land that they could put into production quickly. These speculators were also looking for access to a navigable waterway connected to an ocean port. The Tennessee River Valley in Northern Alabama met two of these criteria: fertile soil and waterway access. It was the first area where cotton speculators sought land (Watkins [c1908]). Central Alabama along the major river valleys south of the piedmont region was the second area where cotton speculators bought land. The black prairie soil along the southern banks of the Alabama River and both sides of the Tombigbee River primarily supported prairie like vegetation unlike the surrounding alluvial plain with an acidic loam soil which supported dense forest growth (Jones and Patton 1966). The prospective cotton farmers eager to start producing cotton quickly bought up the Black Prairie land because it was relatively clear of trees. This land was even more attractive to potential cotton farmers because of its proximity to navigable rivers which led to the port of Mobile. Coastal ports were important because in the early 1800’s cotton mills in Great Britain were the primary consumers of American produced cotton. Thus the Alabama, Tombigbee, and Mobile Rivers provided cotton farmers with a means to transport their 400 pound bales of cotton.
through the coastal pine belt to cotton brokers waiting in Mobile (Abernethy 1990; Martin 1902). The physical geographic characteristics of the Black Belt depicted in Figure 1 attracted cotton farmers and enabled them to profitably raise cotton for the export market.

Figure 1 Alabama 1820 – Black Prairie Soil, Counties, Navigable Rivers
As Alabama grew into a state the number and size of cotton plantations increased and cotton farming spread beyond the Black Prairie soil. The region developed a unique Cotton Culture. Cotton Culture is a term that historically has been used to avoid referring to the slavery enabled economy that was used to commercially produce cotton for export until 1860. The Cotton Culture term was then adapted to refer to the sharecropper-based cotton production system used between 1870 and 1916 (Cleland 1920). Scholars have identified three characteristics of slave-powered cotton plantations: use of a work gang system, a high ratio of improved farmland to unimproved farmland, and high-volume production of cotton.

According to Fogel (1974) and others who have researched the economics of slave powered plantations, large farms were more efficient than smaller farms because they were able to employ a “work gang” system. Fogel determined a minimum of 16 slaves were required to implement a work gang system. He defined large farms as having at least 16 slaves as large farms (Fogel 1974, 141; Field-Hendrey 1995). The 1860 Census contains data regarding the number of slaves owned by a person tabulated at the county level. Thus, it is possible to find counties with large numbers of individuals who owned at least 15 slaves. Using the classification tool in ArcMap it is possible to find natural break points among the counties. The number of farms with at least 15 slaves ranged from 2 to 474 farms per county. The average was 158 with a standard deviation of 133. The upper left map in figure 2 uses natural breaks with 12 counties have 235 farms with 15 or more slaves. The upper right map in figure 2 shows these counties in dark red.
The second indicator of a slave powered farm is the ratio of improved farmland to unimproved farmland. For the most part, plantations were purchased by wealthy individuals who likely had the ability to survey the available land before purchasing. This enabled them to choose the parcels with the most farmable area. Additionally, economic historians have compared the percentage of improved land to unimproved land in cotton producing states. They determined that large farms with slaves sought to maximize the percentage of their land under cultivation (Foust 1967). The 1860 census lists the number of acres of farmland both improved and unimproved tabulated at the county level. Once again, the ArcMap classification tool was used to determine natural breaks in the data. The percentage of improved farmland ranged from 7% to 53%, the average was 31% with a standard deviation of 12%. There are 13 counties that were in the class with at least 39% of the farmland having been improved.

The quantity of cotton produced is the third criterion used to determine the extent of the Cotton Culture. As part of the agricultural census, the 1860 census recorded the number of ginned bales of cotton produced in each county. It also recorded the value of each farm and total value agricultural products produced in 1860. There is a high correlation between cotton production and total agricultural output $R^2 = .98$. The correlation between farm value and cotton production in 1860 is also relatively high with a $R^2 = .95$. This indicates cotton was the most valuable crop, and the most valuable farms produced the most cotton. At this time in the South slaves were the most valuable farm asset (Metzer 1975). Thus, the quantity of cotton produced which is correlated with farm value is a good indicator of the cotton culture, ownership of many Slaves and ownership
of many acres. In 1860 there were three levels of cotton production. The large plantations which produced the most cotton, smaller farms which produced cotton on a smaller scale, and the individual farmers who produced cotton in addition their main subsistence crops (Foust 1967). The smaller farms had fewer than 16 slaves and thus were unable to employ the work gang style of production (Fogel 1974; Field-Hendrey 1995). The county classifications in the lower right map in figure 2 uses natural breaks with three classes. The mean cotton production quantity was 19,038 bales, the standard deviation was 17,997 bales per county.

These three agricultural indicators: counties with concentrations of large slave holders, counties with the highest percentages of improved farmland, and counties with the highest cotton production, quantify the extent of the Cotton Culture and by extension the counties to include in the Black Belt region as of 1860. Table 1 shows the number of counties which met of the physical geographic criteria and the agricultural criteria. The column labeled core counties is derived from the review of Black Belt definitions compiled by Webster and Samson (1992). It lists the number of core counties that meet each of the criterion. Most of the Black Belt definitions agree on nine core counties of Sumter, Greene, Marengo, Perry, Dallas, Wilcox, Lowndes, Montgomery, and Macon. The additional column lists the number of additional counties each criterion added to the Black Belt. Cotton production and counties with a concentration of farms with large numbers of slaves are the criteria which most closely reflect the general Black Belt definitions reviewed by Webster and Samson. The combination of the other three criteria expand the number of counties considered to be quantified as part of the Black Belt
region to ensure inclusion of counties which reflect the extent of the cotton culture in 1860. The large number of counties meeting the navigable river criteria is due to the eight counties in North Alabama which border the Tennessee River. The additional counties with black prairie soil reflect the addition of counties with small amounts of black soil such as Barbour county in Eastern Alabama. The heavy black line on all four maps in figure 2 encompasses the 11 counties which met at least four of the five criteria: Sumter, Greene, Marengo, Perry, Dallas, Wilcox, Lowndes, Montgomery, Macon, Russell, and Barbour Counties.

<table>
<thead>
<tr>
<th>Category</th>
<th>Black Belt Definition Criteria</th>
<th>1860 Criteria</th>
<th>Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Has black prairie soil</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Transport</td>
<td>Borders a navigable river</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Cotton</td>
<td>Cotton production 1860 (at least 30,000 bales)</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Farm</td>
<td>Ratio improved farmland 1860 at least 39%</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Slaves</td>
<td>235 or more farms with at least 16 slaves</td>
<td>11</td>
<td>9</td>
</tr>
</tbody>
</table>
Figure 2 Criteria to Quantify the Alabama Black Belt Region as of 1860
Cotton Credit System Era 1870-1916

Following the civil war cotton was once again the primary agricultural crop in Alabama and cotton production remained centered in the Black Belt region. However, the new labor arrangement based on tenant farmers resulted in a slightly different configuration of counties in the Black Belt by 1900. Four new counties had been formed, Hale, Elmore, Bullock, and Lee out of parts of the counties that made up the 1860 Black Belt region. By 1900 the cotton credit system was well established in central Alabama. The large plantations were now farmed by tenant farmers, mostly sharecroppers. The quantifiable indicators are slightly different because the agricultural structure changed and because the US Census collected different types of agricultural data. In 1900 the US Census reported the amount of cotton produced as well as the number of acres planted in cotton. It also reported who operated each farm parcel by race and type of relationship to the land. Two indicators in addition to the physical characteristic of black prairie soil offer the most insight. First, the counties with the largest number of acres planted in cotton and second, the counties with the highest concentrations of African American farmers. Using African American farmers as opposed to the more general African American population ensures inclusion of only those counties where cotton was the predominate crop (Sisk 1952). By using the location quotient of African American farmers at the county level, it is possible to identify those counties with the highest concentration of African American farmers (Sisk 1955; Tower 1950). The location quotient (LQ) is a quantitative tool to determine which areal sub-units have a higher than regional average concentration of an activity of interest. A LQ value larger than 1
indicates the activity is more concentrated in that sub-unit than in the entire region (Castree, Kitchin, and Rogers 2013). For this thesis, the State of Alabama is the overall region and counties are the sub-units. Table 2 lists the criteria and the number of counties that met the criteria. Once again, Core column refers to the number of counties which most of the definitions in Webster and Samson’s (1992) review that meet the 1900 criteria. The criterion for the value of Cotton acres planted is one standard deviation above the mean. The criterion for the value of the African American farmers was selected using Jenks natural breaks and is slightly less than one standard deviation above the mean. Moving the value to one standard deviation would not change the number of counties included in the top quartile. The number of counties in 1900 which meet the black soil criteria increased by two because the State of Alabama adjusted county boundaries between 1860 and 1900. Only 12 counties meet at least two of the criteria. Autauga, Pike, Chambers, and Barbour counties met only one of the three criteria. The map in the lower right corner of figure 3 shows the updated Black Belt region based on the 1900 criteria. The Alabama Black Belt in 1900 consists of the following 12 counties listed West to East: Sumter, Greene, Hale, Marengo, Perry, Dallas, Wilcox, Lowndes, Montgomery, Macon, Bullock, Russell.

<table>
<thead>
<tr>
<th>Category</th>
<th>Black Belt Definition Criteria</th>
<th>1900 Criteria</th>
<th>Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Has black prairie soil</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Cotton</td>
<td>Cotton acres planted 1900 LQ at least 1.479</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Farmers</td>
<td>Black tenants &amp; farmers 1900 LQ at least 1.42</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>
Figure 3 Alabama Black Belt Region as of 1900
3. COMPARTATIVE COUNTY ANALYSIS

This chapter begins with a description of the method used to classify Alabama counties to allow comparison of the Black Belt counties to similar counties outside the Black Belt. Next a population history overview of Alabama as a whole from 1910 to 2010 provides context for the comparison of a subset of similar rural, mixed, and urban counties.

Method for Classifying Counties for Comparison

In order to compare the evolution of similar types of counties both inside and outside the Black Belt, it is necessary to classify Alabama Counties. This thesis will use a sequential classification technique. It will start by characterizing Alabama counties in 1910 using characteristics based on the predominate industry in each county as well as the urban versus rural characteristics of the counties. In 1910, the physical geography of Alabama played a major role in determining the primary industry in each county. The north central portion of the state where the Appalachian Mountains end is the piedmont region. Beginning in the 1870s the economies of counties in this part of the state were based on mining, steel and heavy industry. Surrounding these central counties were the piedmont counties characterized by low population density and small subsistence farms. Along the Georgia Border and across central Alabama to the Mississippi Border, county economies were largely crop based with cotton being the primary crop. South of this
region was the pine belt where turpentine and timber were the predominate industries (Flynt 2004). For classification purposes it made sense to combine the piedmont and pine belt counties into a single rural non-crop class.

The upper left map in figure 4 depicts the four classes of Alabama counties in 1910. The classes are roughly based on the primary industry in each county: Urban, Industrial, Rural-non-crop, and Rural-crop. The urban counties correspond to the three largest cities in Alabama: Birmingham, Mobile, and Montgomery and have the highest rural population density. The industrial counties have a high population density and a low percentage of farmland. The Rural non-crop counties have a low population density and a below average amount of improved farmland. The Rural-crop counties have the highest percentage of non-woodland farmland. The US Census data for 1910 listed three categories of farmland: improved, unimproved woodland, and other unimproved. The woodland category was an effort to capture timber plantations within the agriculture census (US Census 1910). Farmland covers at least 38.2% of Rural-Crop counties. This is slightly above the mean which is 36.4% where a natural break exists. This criterion captures the counties which have an above average amount of their land area dedicated to farming.

The Black Belt counties fall into two classes: Urban (1), and Rural Crop (11). The objective of the classification effort is to identify counties that are like the Black Belt counties. This classification method enables identification of counties with similar economies in 1910. The map in the upper right of figure 4 depicts the rural counties to which the Black Belt counties will be compared, along with the Black Belt counties.
The second step of the classification process is to classify these counties based on an urban-rural scale in 2010. The urban-rural classification represents a generalization of economic progress over the past 100 years viewed through the lens of population growth. The urban-rural classification scale is based on the US Census definitions of urban and rural. Since 1790, the US Census Bureau has defined rural as those areas which are not classified as urban (Ratcliffe, et al, 2016). The Census Bureau has struggled to accurately define urban areas. In 1949 Leon Truesdell (1949), the chief demographer for the Census Bureau, summarized historically how the Census Bureau had distinguished urban areas. His review codified that urban areas had a population of at least 2500 people. His work laid the foundation for subsequent changes, the most recent the work by Ratcliffe et al (2016) where they summarized the method used for the 2010 Census. In 2010 the Census Bureau used two urban classifications: urban clusters and urban areas. Urbanized areas have a population of 50,000 or more. Urban clusters have a population of at least 2500 people but less than 50,000 people. The Classification of counties depicted on the lower left map in figure 4 used the US Census definitions as a start point for defining the three classes: Rural, mixed, and urban. Rural counties have a population of less than 50,000 and at least 67% of the population living in a rural setting. In urban counties contain an urban area and less than 33% of the population lives in a rural setting. Mixed counties are those that fall in between these two criteria. The lower right map in figure 4 depicts the rural, mixed, and urban counties this chapter will compare. The green counties are rural, red counties are mixed and gray counties are urban. For clarity Table 1 lists the counties by class.
Figure 4 Map of Alabama County Classes in 1910, 2010, and combined
Population Analysis

Population analysis is a means to understand how the population of a geographic region has changed over time. Line graphs depicting population change coupled with graphs of birth, death, and migration provide an overview of the population dynamics. Population pyramids show how the population processes of natality, health and mortality, and migration have affected the structure of the population. Together they offer insight into how the population of an area has evolved. This chapter first provides baseline population analysis for the State of Alabama. Subsequent sections compare:

Table 3 List of Counties by Class and Black Belt Region as defined in 1910

<table>
<thead>
<tr>
<th>Rural</th>
<th>Black Belt</th>
<th>Mixed</th>
<th>Black Belt</th>
<th>Urban</th>
<th>Black Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greene</td>
<td>Yes</td>
<td>Bullock</td>
<td>Yes</td>
<td>Montgomery</td>
<td>Yes</td>
</tr>
<tr>
<td>Hale</td>
<td>Yes</td>
<td>Dallas</td>
<td>Yes</td>
<td>Lee</td>
<td>No</td>
</tr>
<tr>
<td>Lowndes</td>
<td>Yes</td>
<td>Macon</td>
<td>Yes</td>
<td>Madison</td>
<td>No</td>
</tr>
<tr>
<td>Marengo</td>
<td>Yes</td>
<td>Russell</td>
<td>Yes</td>
<td>Jefferson</td>
<td>No</td>
</tr>
<tr>
<td>Perry</td>
<td>Yes</td>
<td>Chambers</td>
<td>No</td>
<td>Mobile</td>
<td>No</td>
</tr>
<tr>
<td>Sumter</td>
<td>Yes</td>
<td>Coffee</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilcox</td>
<td>Yes</td>
<td>Dale</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barbour</td>
<td>No</td>
<td>Elmore</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherokee</td>
<td>No</td>
<td>Houston</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crenshaw</td>
<td>No</td>
<td>Landerdale</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geneva</td>
<td>No</td>
<td>Limestone</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Henry</td>
<td>No</td>
<td>Marshall</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawrence</td>
<td>No</td>
<td>Morgan</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Randolph</td>
<td>No</td>
<td>Pike</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tallapoosa</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Rural | 15 | 7 | 14 | 4 | 5 | 1 |
Rural counties inside and outside of the Black Belt; mixed counties inside and outside of Black Belt; urban counties inside and outside of the Black Belt¹.

**Baseline for State of Alabama**

The population of Alabama has grown at an average rate of 2.07% per year from 1900 to 2010. Figure 5 depicts the total growth as well as the growth of the African American population and the White population. The African American population declined in 1920 likely due the Boll Weevil devastating the cotton crop in central and southern Alabama. Until 1980 most of Alabama’s population growth was due to a growing White Population. Since federally mandated desegregation in 1970 the African American population in Alabama began to increase but at a slower rate than the White population.

¹ The National Historical GIS (NHGIS) Data repository is the source for the historical census data and county boundary files. The NHGIS repository is part of the IPUMS.Org which is maintained by the University of Minnesota and supported by the National Institutes of Health (NIH) and the National Science Foundation (NSF).
Migration was the primary reason that the African American population did not grow significantly between 1920 and 1960. Migration by African Americans during this period typically was the result of a differential in economic opportunities (Stinner and De Jong 1969, 467). To survive and improve their living conditions, people tend to move to places where they perceived economic opportunities to be better. In Alabama, during this period the quality of life experienced by African Americans due to racial segregation and often having to live in fear because of unjust application of laws contributed to the motivation for African Americans to migrate out of Alabama (Stinner and De Jong 1969). The collapse of the cotton credit system in the Black Belt gave tenant farmers the impetus to find a better way elsewhere to provide for their family. Equation 2 makes it possible to calculate migration based on knowing the population at the start and end of the period as well as the number of births and deaths during the period.
Equation 2 Migration
\[ P_2 = P_1 + B - D + (M_{in} - M_{out}) \]

It is then possible to solve for net migration \( M = M_{in} - M_{out} \) using equation 3

Equation 3  Net Migration
\[ M = P_2 - P_1 - B + D \]

Equation 3 is used to calculate migration for various segments of Alabama’s population for five 10-year periods 1940-1969 and 1990-2009\(^2\). As depicted in Figure 6, the Alabama population increased from 2.95 million in 1945 to 3.66 million in 1965. The increase was significantly faster from 1955 to 1965. A decrease in out-migration was likely the primary reason for the population growth. According to US Census data out-migration peaked during the 1950s with 349,354 individuals migrating out of Alabama. During the 1960s, out-migration had dropped to 182,142.

Figure 6 Population Processes for Alabama 1940-1969

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\(^2\) Because reliable birth and death records are not available before 1939 at the county level, it isn’t feasible to use this method to calculate migration before 1940.
Both figure 5, population trends, and figure 6, migration and vital statistics provide a useful understanding of how the population of a region, the State of Alabama, changes as a monolithic entity. It is helpful when analyzing a population to understand a point in time how the population is distributed across age groups. A population pyramid is a common depiction of age distributions. The bar graphs in figure 7 depict the population distribution for Alabama at forty-year intervals: 1930, 1970, and 2010. The population structure in 1930 shows that the demographic transition has begun to reduce the birth rate. The shape of graph is symmetrical indicating that both White and African American populations in Alabama have the same age structure.
Figure 7 Alabama Population Age distribution 1930, 1970, 2010
At the state level out-migration appears to have affected both White and African American populations equally. The smaller 30-34 age group in 1930 is likely smaller due to the initial out-migration following the collapse of the cotton credit system 1916-1920. The pyramid has triangular shape, which indicates a young but sustainable population.

The 1970 population pyramid shows a different structure. The large percentages in the 5-24 age is the post-World War II baby boom. The low percentages for African Americans for the ages 25-60 are likely the result of the Great Migration. The indentation in the graph caused by low population percentages in ages 30-39 is likely the result of the Great Depression. The 1970 population pyramid has the appearance of a beehive, which is the shape associated with developed countries that have completed the demographic transition and have a sustainable population structure.

The population pyramid for 2010 shows yet a different structure. The Baby Boom bump exists in the 45-64 ages. The indentation caused by the 30-34 age group was likely caused by high interest rates and malaise that existed in the second half of the 1970s. The African American population percentages are larger than the White population percentages for those born after desegregation. The lasting effects of the Great Migration are visible on the African American population percentages for ages 69 through 85. The 2010 pyramid has the general shape of a barrel. Which is the goal of a developed nation with a sustainable birth rate and a low death rate. The above overview of the population history of Alabama provides context for the population analysis of the classes of counties associated with the Alabama Black Belt.
Population Dynamics of the Black Belt Region 1910-2010

The previous section provided the big picture of the population dynamics for the State of Alabama during the post cotton era. This section will take a more focused look at the Black Belt region. Figures 8 and 9 provide an overview of the population trends for the Black Belt region from 1910 through 2010 for the total population as well as for each race.

![Black Belt Population 1910-2010](image)

Figure 8 Black Belt Population 1910-2010

Figure 9 illustrates how the three classes of counties experienced different population dynamics throughout the period. In 1910 rural Black Belt counties had the largest population followed by mixed counties. The steep population decline in rural counties 1940-1970 was likely a result initially of World War II mobilization, then farm mechanization in the 1950s when farmers began using automated cotton planters and
pickers. During the 1970s the population stabilized in rural counties as White families sought alternatives to urban desegregated schools. The population in the urban Black Belt county grew from 1920 until 1960 and again from 1970 to 2010. The turbulence and violence of the Civil Rights movement in Montgomery county was likely the reason the population in Montgomery county did not grow during the 1960s.

![Figure 9 Black Belt Population by County Class 1910-2010](image)

The following paragraphs outline the governance, economic, transportation pressures and events which impacted the population in twenty-year periods. The sections comparing rural, mixed and urban counties will refer to these pressures and events.

**1910-1930**

The census of 1910 captured the cotton industry in Alabama on a high note. The cotton credit system had been in place since the 1870s. The Jim Crow Constitution had
been implemented, separate institutions for African Americans were the norm (Flynt 2004). The primary mode for long distance transportation of people and freight was the railroad. Track mileage peaked in 1911 (Atack 2013; Jarvis 1972). Then disaster struck. Between 1911 and 1916 the boll weevil dealt a devastating blow to the cotton industry in Alabama. At the same time northern manufacturing was booming. For example, Detroit increased its manufacturing work force by 200% between 1910 and 1930 (Lyson 1991). As a result, for the first time poor African Americans and poor Whites had an opportunity to seek employment outside rural Alabama. Mobilization for World War I and immigration restrictions during the 1920s extended the demand for labor in the north until the Stock Market crashed in September 1929 (Reimers 1981; Bagley 2012).

**1930-1950**

During this twenty-year period the Great Depression and World War II were the significant events. The Great Depression resulted in multiple New Deal programs many of which were shaped by the Alabama Congressional delegation (Fishback 2017). When mobilization for World War II began the Army and Navy built 40 airfields in Alabama, many in Southern Alabama (Ress 2010). President Roosevelt called Birmingham the “great arsenal of the South” as steel factories, munitions depots, and textile companies doubled and tripled their workforce to support the war effort (Flynt 2004, 395–96). By the beginning of this period, automobiles had become ubiquitous as had tractors. But it was not until labor shortages in the late 1950s that more complex automated farm implements such as cotton pickers became widely used (Ellenberg 1994; Musoke 1977). The civil rights movement began during this period as African Americans returned from
overseas and resented being treated as second class citizens. The economy for the most part continued to grow during this period as the Marshall Plan to revitalize Europe was implemented and veterans attended college using the GI Bill benefits.

1950-1970

This period in the Black Belt was marked by turbulence and racial violence as religious leaders from the Black Belt such as Martin Luther King fought to gain equal rights for African Americans (Bagley 2012; Flynt 2004). The Vietnam War was raging and military installations in Alabama from Anniston to Ft Rucker operated at capacity to supply tanks and helicopter pilots. During this period the first elements of the interstate freeway system were completed. Long-haul trucks were beginning to compete with rail for carry freight long distances.

1970-1990

During this twenty-year period, federally mandated desegregation was implemented, and the first generation of Alabamians were born and became adults without having experienced segregated facilities for African Americans. The interstate freeway system was completed, and long-haul trucks became a primary option for movement of freight. During the 1970s the economy faltered with high unemployment and high inflation, and interest rates reach a 20%. In the 1980s the economy recovered from the “malaise”, unemployment declined, and military spending increased.

1990-2010

Long haul trucks and regional distribution centers resulted in further consolidation of manufacturing and processing plants throughout this period. The “peace dividend” following the end of the Cold War during the 1990s was followed in 2001 by global deployments to deny Sunni Muslim violent extremist groups safe havens. The decade ended with a credit crisis induced recession starting in late 2008.

**Comparison of Rural Counties**

There are fifteen counties in Alabama that had a crop-based economy in 1910 and in 2010 have two thirds of their population living in a rural setting. Figure 10 depicts those fifteen counties in green. The counties within the thick black border are in the Black Belt Region. The seven Black Belt rural counties are in the western portion of the region and are contiguous. Whereas the eight rural non-Black Belt counties spread across the eastern portion of the state and the Tennessee river valley.

Figure 11 depicts the population trends for these rural counties. The blue lines represent the White populations, while the tan lines represent the African American populations. Within the rural Black Belt counties in 1910, the population was 81.5% African American, while in the rural non-Black Belt counties, the population was 66.8% White in 1910. This is an immediate difference between the two groups of rural counties and is reflected in population dynamics impacted by racial issues.
Figure 10 Rural Counties in Green
1910-1930

Between 1910 and 1920 the White population increased by 4.2% while the African American population in Rural Black Belt counties declined by 18.1%. This decline was a direct result of boll weevil induced failure of the cotton credit system and reflects the difficulty African Americans had in purchasing property, as a result most were sharecroppers or tenant farmers. The lack of permanent ties to the land made it easier for African American tenant farmers to leave. During this decade according to US Census data the number of tenant farmers in these counties decreased by 21%. In the non-Black Belt rural counties, the number of tenant farmers changed very little. The African American population only declined 3.3%, while the White the population increased by 9%. White population in non-Black Belt counties continued to increase throughout this twenty-year period while the African American decreased only slightly. Migration was the most significant population process during this period.
1930-1950

The Great Depression and the resulting New Deal produced the largest impacts on the population. The trend lines in Figure 11 and the percent population change in figure 12 and 13 both reflect these impacts. The economic conditions following the Stock Market Crash in September 1929 caused a pause in the Great Migration. An illustrative example was Coretta Scott King’s father. In early September 1929 he departed for Detroit looking for a job. He was back in Marion, Perry County in December 1929, broke and hungry (Bagley, et al 2012). The most significant population change between 1930 and 1940 was a 5.3% increase in the White population in non-Black Belt counties.
Figure 12 Percent Population change by Region and Race Rural Counties 1910-2010

Figure 13 Rural County Percent Change by Region 1910-2010
World War II dominated the second decade of this period. During this decade the Great Migration resumed. Both groups of rural counties experienced significant out-migration during this decade. Rural Black Belt Counties’ African American population decreased by 19.2% while rural non-Black Belt African American population decreased by 12.7%. The White population also decreased but about half the rate of African Americans, 9.1% and 7.5% respectively. The higher population decrease of the African American population during the 1940s in the rural Black Belt was due to lack of military installations, and thus fewer jobs in these counties and better job opportunities elsewhere.

The 1940s is the first decade for which natality and mortality data was available at the county level for Alabama. This makes it possible to determine crude birth and death rates from which it is possible to calculate the actual migration numbers using equation 3. Figure 14 is a graphical depiction of the raw numbers for both groups of rural counties. The rural Black Belt Counties, net migration was 64,000, births were 51,000, and deaths were 18,000. These numbers appear to be similar to the non-Black Belt numbers; however, the crude birth rate (CDR) for the rural Black Belt was 3.6 times as large at 304 versus 83 for rural non-Black Belt counties. This is an indication that the rural African American population had not experienced the fertility transition in the 1940s, while the White rural population was further along in the fertility transition. Similarly, the crude death rate (CDR) for the rural Black Belt counties was 108 (deaths per 1000). The CDR for rural non-Black Belt counties was 28 (deaths per 1000) which about one quarter or the rural Black Belt rate. The significant difference in CDRs indicate that the
two groups were in very different places along the healthy-mortality transition continuum.

The age distribution for the two groups of counties in figure 15 is remarkably similar given the dramatically different CBR and CDR. Until age 34 the distribution is skewed slightly to the rural non-Black Belt counties by less than one percent in each age group. From age 35 the distribution is skewed toward the rural Black Belt counties once again by less than one percent. Although the shape of the distribution is somewhat concave, indicating both a high birth rate and a high death rate, we know migration is also a factor in the shape of the curve. The sharp decrease in the size of the 20-24, 25-29, and 30-34 age cohorts is likely a result of 15 years of out-migration. The older middle age groups 45-54 represent a larger cohort were in their late 20s in 1910. It is likely fewer of this cohort migrated. Thus, without the out-migration the population pyramid would have a triangular shape indicating a sustainable population.
1950-1970

The civil rights movement and solid economic growth were the primary population pressures during this twenty-year period. For the rural counties however, out-migration was still the major population process at work. Agriculture in Alabama was becoming more mechanized and the minimum wage forced large numbers rural laborers to seek work elsewhere (Ellenberg 1994). The African American population in rural Black Belt counties decreased by 16%, the White population decreased by 5% during the 1950s while in the rural non-Black Belt both White and African American population decreased by about 12%. Out-migration from rural Black Belt counties decreased from the previous decade by 30% to 43,000. The CBR for the rural Black Counties remained high at 300 per 1000, while the non-Black Belt Counties CBR dropped to 72 per 1000.
The Black Belt CBR was 4 times the non-Black Belt CBR. A similar ratio existed for the CDR during the 1950s. The rural Black Belt CDR was 135 while the rural non-Black Belt CDR was 31. During the 1960s the rural Black Belt county African American population decreased by 24%. The White population increased by 8.2%. The resulting out-migration was 27.5% of the population.

Population change in different directions indicates that issues other than economics were driving the population change. In this case it was likely that African American out-migration was the result of both economic and racial pressure. Whereas the White in-migration was likely driven by racial considerations. The White population moved from urban areas to rural areas to avoid the impact of mandated desegregation, primarily sending their children to integrated schools\(^3\). Because the population changes are all in the same direction during the 1940s and 1950s it is likely that economics not racial issues were the driving factor. The population decreases are likely an indication of a rural to urban transition. During the 1960s white and African American population changes are opposite, thus it is likely that racial issues were a more significant factor.

**1970-1990**

The first decade of this period was turbulent. Mandated desegregation was still being implemented throughout Alabama. The war in Southeast Asia had become a flashpoint, and a military drawdown followed the pullout in 1975. Inflation was high and the decade ended with the Iranian take over of the US Embassy in Tehran. The second decade was almost the opposite. Interest rates declined, military spending rebounded,

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\(^3\) Personal experience, my wife’s family along with several other families moved from Mobile to rural Baldwin County to avoid what they perceived to be a failing school system.
and the economy expanded. The rural counties responded differently in each decade. During the 1970s the populations in the rural Black Belt counties changed very little, while the population in the rural non-Black Belt counties grew. It is likely that those that could leave rural Black Belt counties did so during the previous decade. It is likely the civil rights changes wrought during the previous decade lessened the motivation to leave, while the realization that opportunities outside the rural Black Belt were not plentiful. Figure 12 shows that the White population in non-Black Belt counties grew by 15.7% and the African American population in those same counties grew by 3.8%. The significantly different population changes between races and regions during the 1970s are an indication that more than economic pressures were affecting the population dynamics of the region. Although the national economy was booming, Alabama was experiencing the impact of not valuing education (Flynt 2004, 141–46). During the 1980s the populations in both groups of rural counties decreased. This was likely a result of economic conditions because all four population segments experienced similar decreases.

The distribution of population across age groups offers a record of how population dynamics impacted specific population segments. Figure 16 depicts the age distribution for Rural Black Belt counties in orange, and non-Black Belt counties in blue as of 1970. The distribution generally resembles a beehive with a wide base. This is an indication that the populations have reduced the number of people dying due to communicable diseases. This results in larger percentage of the population in the older age groups. The post-World War II baby boom is evident in the wide base. Graph is

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4 Birth and death records for the 1970s and 1980s were not available at the county level for Alabama
skewed markedly toward the Black Belt counties through the 15-19 age group. The skew is toward the non-Black Belt counties from age 20 through 64. The top part of the graph is relatively symmetrical. The narrow waist of the graph ages 20-39 is an indication rural youth in both groups of counties leave as soon as they finish high school. More of these age cohorts depart form Black Belt counties than non-Black Belt counties. This record matches with the population trends in figure 11, and the percent population change by decade shown in figures 12, and 13 which show significant out-migration during the 1940s and 1950s. The age distribution for 1970 in of the population for rural counties both in and out of the Black Belt region in figure 16 are similar. The wide base is the post WW II baby boom which was largest in the rural black Belt counties. The age distribution for ages 20-64 is noticeably skewed toward the rural non-Black Belt counties. This is a reflection of the Great migration affecting the rural Back Belt counties more than the rural non-Black Belt counties. The 75-79 age group is smaller because members of this cohort out-migrated during their twenties when the boll weevil disaster occurred. The 60-64 age group is smaller because lower birth rates during the boll weevil induced economic stress and because a portion this cohort out-migrated during the 1940s. The 20-25 age group was in their early twenties during height of the civil rights movement when a significant portion of the African American population left rural Black Belt counties, see figure 16. This age cohort was the last significant out-migration from the rural Black Belt counties for non-economic reasons
The 1990s started on a high note when the Cold War ended, and Desert Storm was a quick win. The North American Free Trade Agreement (NAFTA) went into effect in 1995 with result of additional low skill manufacturing jobs to leaving Alabama.

Analyzing the age distributions at different points in time offers a longer view of the impact of population dynamics. Figure 17 shows the age distribution of rural Black Belt counties and rural non-Black Belt counties. It is significantly different from the distribution in 1970, figure 16 although artifacts do exist. The shape is the first noticeable difference. It is more barrel shaped than triangular shaped. It is also more symmetrical than the 1970 pyramid. The age distribution for rural counties skews toward the Black Belt from birth to age 24. It then skews toward non-Black Belt counties for ages 30-49, and from 60-79. The distribution is even for ages 25-29, 50-59, and 80-84. This indicates there are less job opportunities in rural Black Belt counties, thus youth
leave home for better opportunities outside the rural Black Belt. Rural non-Black Belt counties attract and maintain adults in ages 30-49 and in retirement. The shape of the age distribution is rectangular below the age 70 with two age bulges; the post baby boom bulge (45-64), and a current youth bulge (5-19). The current youth bulge is likely the result of young adults departing rural areas following their high school years. It is noteworthy that both Black Belt and non-Black Belt regions have the similar age distibutions. Yet they have dramatically different racial compositions. This is an indication that rural out-migration after high school is independent of race. The non-Black Belt is predominately White (78% in 2010), while the Black Belt region is mostly African American (59% in 2010)

![Figure 17 Population Age Distribution for Rural Counties 2010](image)
Focusing on population changes during the period 1990-2010, figures 18 and 12 show that during the 1990s the African American population in rural Black Belt was unchanged, while the White population in the rural Black Belt counties decreased. During the 1990s the rural population outside the Black Belt increased for both White and African American populations 7.1% and 5.4% respectively.

![Figure 18 Rural County Population Processes 1990-2009](image)

The first decade of the new century saw the White population in the rural Black Belt counties decrease by 10%, similarly, the African American population also decreased by nearly 10% indicating that economic conditions affecting both races was likely the cause of the population loss. In rural non-Black Belt counties, African American population decreases mirrored the White population decreases during the 2000s. This is also likely a result of economic pressures, a lack of jobs; however, the magnitude of the population loss was significantly less outside the Black Belt.

**Summary**

The above analysis has highlighted how the population processes of migration, natality and mortality occurred at different rates in rural Black Belt counties and rural
non-Black Belt counties during the post-cotton period. During the post-cotton period in only two decades did White and African American population change occur in opposing directions. In 1910 the White population increased while the African American population decreased. In both cases the opposing migration was the result of a significant event. In 1910s it was an economic event, crop failure resulting from the boll weevil infestation which because of racial pressures and governance caused the White to increase and African American populations to decrease. In 1960s the event was desegregation which caused opposing population change. African American out-migration was the result of better economic opportunities in mixed and urban counties; while the White population moved to rural counties to avoid what they perceived to be the adverse impact of desegregation on their children’s education. During the other eight decades population change occurred in the same direction for both communities although in different magnitudes.

In order to confirm that the populations of the Black Belt rural and non-Black Belt rural counties evolved differently, analysis of the variance test was conducted. Statistical analysis requires a null hypothesis to test. In this case the null hypothesis is that the population in both groups of rural counties evolved during the post cotton period in a similar way. The mean population for each group of counties was calculated for each decade. Because the population means are considerably different for each group statistical analysis of the variance is the appropriate test. The variance of those means were then analyzed to determine if the two samples came from the same overall population. Table 4 depicts results of the variance test. The F statistic is a measure of
variance between the samples divided by the variance within each sample. If the P-value, is less than alpha, then it is possible to reject the null hypothesis. The P-value is the probability based on the variance that the samples came from the same population. In this case the P-value for the total population means and the population means for both races was smaller than alpha. Comparing the value of the F-statistic to the value F-critical is a second measure used to determine if it is possible to reject the null hypothesis. If the F-statistic is less than F-critical, it is possible to reject the null hypothesis. This second measure confirms based on analysis of the variance of the decadal population means, that the total population and both racial populations of the two groups of rural counties evolved differently.

Table 4 Results of ANOVA for Two Samples: Rural Counties Population Means

<table>
<thead>
<tr>
<th>Statistic</th>
<th>African American</th>
<th>White</th>
<th>Total</th>
</tr>
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<tr>
<td>Alpha</td>
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<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>F-value</td>
<td>16.1210</td>
<td>6.6038</td>
<td>7.9445</td>
</tr>
<tr>
<td>F-critical</td>
<td>2.9782</td>
<td>2.9782</td>
<td>2.9782</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0001</td>
<td>0.0031</td>
<td>0.0015</td>
</tr>
</tbody>
</table>

**Comparison of Mixed Counties**

As described earlier, mixed counties are those which in 1910 had crop based economies, and in 2010 did not fall neatly into either the urban class or the rural class of counties. Figure 19 is a map of Alabama with the mixed counties depicted in red. The Black Belt region is outlined in black, and the extent of the black prairie soil depicted in
dark gray. Dallas is the only mixed county in the Black Belt region west of Montgomery. The other three Black Belt mixed counties are in eastern Alabama and are contiguous. The fourteen mixed counties reacted to the pressures and events of this period differently than the rural counties. Figure 20 depicts the population trends for White and African American populations in the Black Belt mixed region inside and outside the Black Belt region. The non-Black Belt mixed counties added White population at a steady rate throughout the period. The following sections describe the population dynamics in each twenty-year period. Figure 21 shows how non-Black Belt mixed counties add population in every decade during the post-cotton period, while the Black Belt mixed counties lost population in six of the ten decades. In the other four decades the percentage population change for the Black Belt mixed counties was less than the non-Black Belt mixed counties.
Figure 19 Map of Mixed Counties in Red

Data Source: IPUMS NHGIS, University of Minnesota. www.nhgis.org
Datum: NAD 1983, State Plane Alabama West, Transverse Mercator
Created by John Prior, Spring 2019
Figure 20 Population trends for Mixed Counties 1910-2010

Mixed Counties Percent Population Change Black Belt (BB) vs Non-BB

Figure 21 Mixed County Percent Population Change by Region 1910-2010
1910-1930

During this period most of these counties still had crop-based economies and experienced the economic hardship brought on by boll weevil induced crop failures. Figure 22 shows that African American population in the Black Belt mixed counties declined during the teens by 6.9%. This was likely a result of the boll weevil induced crop failures and the pull of industrial areas outside the Black Belt. According to the US Census the number of tenant farmers in mixed counties in the Black Belt decreased by 14.1% between 1910 and 1920, indicating that some tenant farmers remained the area and transitioned to non-farming jobs. The African American population continued to decline in the 1920s by 4.8%. The White population in the Black Belt mixed Counties; however, increased in both decades at a 12.7% rate. The African American population in mixed non-BB counties increased marginally in the 1910s and 1920s from 164,000 in 1910 to 174,000 in 1930. White population in non-Black Belt mixed counties increased dramatically during the period 21.5% in the 1910s, and 17.3% in the 1920s. During the 1910s the number of tenant farmers increased by 9% according to the US Census Bureau. This highlights a difference between the Black Belt region and the non-Black Belt region, which could be due in part to the physical characteristics of the soil. The soil in the Black Belt region had been depleted and eroded after 80 plus years of growing cotton, whereas the land outside the Black Belt had not been used as intensely for crops (Tower 1950).
Analysis of the distribution across age groups provides a longitudinal perspective of a population. In the case of the mixed counties the distribution depicted in Figure 23 is mostly symmetric from a regional perspective, the left graph. The shape of the graph is triangular indicating a population with a high birth rate and a decreasing mortality rate. The distribution is slightly skewed toward the non-Black Belt counties until the age of 39. The older age groups are slightly skewed toward the Black Belt Region. Age groups 20-24 through 40-44 have markedly smaller percentages of the population. This is an indication that individuals in these cohorts migrated out of the area. The 40-43-year-old cohort would have been in their early twenties when the boll weevil induced crop disaster occurred. As a result, it was relatively easy for members of this cohort to leave for
economic opportunities elsewhere. The right graph in figure 23 depicts the White population in the Black Belt (blue) and the African American population in the Black Belt (orange). The lower percentage of the population for the age cohorts 20-44, aligns with the out-migration of these age cohorts following the collapse of the cotton credit system depicted in figure 22.

![Figure 23 Age distributions for Mixed Counties in 1930 by Region and Race](image)

**1930-1950**

This period started with the Great Depression, endured World War II, and concluded with a growing economy transitioning from war to rebuilding Europe. Once again during this period the White population in Black Belt mixed counties increased. The increase peaked in the 1940s at 25% per decade rate. This growth was likely associated with jobs in towns and cities as the economy in these counties transitioned away from crop agriculture. During the 1930s the African American population in Black Belt mixed counties grew only slightly, see figure 22. Although the White population grew by
23.8% during the 1930s, its size relative to the African American population, that growth translated into only 8% population growth for the Black Belt during the 1930s. Between 1930 and 1950 the Black Belt population grew by 7%, which equates to a 0.7% annual rate.

The 1940s saw African Americans once again out-migrating from mixed counties both in and out of the Black Belt (see figure 24). Black Belt mixed County out-migration during the 1940s was 26,000, about 18% of the population during the decade. The crude birth rate (CBR) for the Black Belt mixed was 307. This is nearly three times the CBR for non-Black Belt mixed counties which had a CBR of 114. There was a similar ratio for the crude death rate (CDR) for the two regions. The CDR for Black Belt mixed counties was 88, for non-Black Belt mixed counties the CDR was 30. This is evidence that the predominately African American population within the Black Belt exported their excess population resulting from a still high fertility rate, while the predominately White population in non-Black Belt mixed counties had already experienced both a natality and mortality transition and had less excess population.

Figure 24 Mixed County Population Processes 1940-1969
The civil rights struggle was the dominate force impacting population dynamics during this period. Although the transportation system for passengers had transitioned to private automobiles from rail, long distance freight was still mostly moved by rail. The economy throughout this period was strong.

During the 1950s the population segments in the Black Belt mixed counties experienced dramatically different growth patterns. Although the overall population of the Black Belt remained the unchanged during the 1950s, the White population increased by 25% while the African American population decreased by 5% (figure 22). The Black Belt mixed counties experienced a CBR of 308 essentially the same as the previous decade and a CDR of 77 and an out-migration of 33,000 or nearly a quarter of the population. Although these numbers are for the Black Belt as a whole, because African Americans comprise 63% of the Black Belt population, these numbers are representative of African American population dynamic trends. non-Black Belt mixed counties experienced a different set of changes. In these counties both African American and White population increased. In these counties 81% of the population during the 1950s was White according to US Census Bureau data. Although the total population of Black Belt mixed counties grew during the 1950s, these counties also experienced out-migration of 25,000 or 2.6% of the population. The CBR and CDR were once again much lower than the Black Belt region. The CBR was 107 and the CDR was 32.

During the 1960s mixed counties and in and out of the Black belt region experienced differential population change. African American population decreased, and
White population increased. Figure 22 shows the percent population change. The 1960s are the end of a three-decade trend of African American population loss in Black Belt mixed counties. During the 1960s the African American population in Black Belt mixed counties decreased by 11.6%. This decrease was in spite a high birth rate. Figure 24 depicts total population for each group of counties. The Black Belt mixed counties experienced out-migration of 25,000 about 18% of the total population. The fact that White population increased is an indication that the 18% decrease was mostly from the African American population segment. Although the CBR decreased to 252 it remained three times the CBR (81) of non-Black Belt mixed counties. The CDR increased for both groups of counties but maintained the same ratio. For the Black Belt mixed Counties, the CDR was 112. For the non-Black Belt counties, the CDR was 36. These numbers indicate that the African American population in the Black Belt region had begun its fertility transition and the excess population was out-migrating, likely to urban areas.<sup>5</sup>

The age distribution in 1970 for mixed counties in the Black Belt and mixed counties outside the Black Belt by race offers an opportunity to see the longitudinal impact of migration, the primary population process at work in these counties. The age distribution of the population in mixed counties both in and out of the Black Belt is similar. Figure 25 depicts the age distribution in 1970 for Black Belt mixed counties on the left, and non-Black Belt mixed counties on the right (blue = White, Orange = African American). The shape of the age distribution for rural counties in 1970. The distribution is a Beehive shape from the 30-34 age cohort and older. This age distribution is indicative

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<sup>5</sup> Natality and mortality data were not available for the 1970s and 1980s at the county level for Alabama.
of a mortality transition indicating improved healthcare. The Youth bulge in the 9-24 age cohort is the post WWII baby boom. The age distribution is nearly identical for 70 and older age cohorts. Both age distributions skew toward the African American population in the 0-19 age cohorts. This indicates that a significant percentage of youth depart Black Belt mixed counties soon after completing high school. The low percentages in these same age cohorts for the White population indicate youth of both races depart the mixed counties. This indicates an economic motivation in addition to a racial motivation. Both age distribution skew toward the White population for age cohorts 20-69. This is likely a result of the out-migration that started in 1910.

1970-1990

This period begins with federally mandated desegregation, the post-Vietnam military drawdown, high interest rates, and gas rationing. The second decade is characterized by
a military buildup, and a strong economy. The interstate highway system is complete and long-haul trucks now haul significant of freight via interstate highways.

During the 1970s all population segments in mixed counties increase. Most of the increase is in non-Black Belt counties. The African American population in non-Black Belt mixed counties increased by 9.4% during the 1980s. While the White population in the same counties increased at double that rate. This is an indication economics was the primary motivation behind the population increases, because the population change for both races was in the same direction in each group of counties. The fact that the percent population increases in Black Belt mixed counties during the 1970s lagged significantly is an indication the economy in the Black Belt mixed developed at a slower pace than the economy in the non-Black Belt mixed counties during the 1970s.

During the 1980s Black Belt mixed counties lost both African American and White population. African American population decreased by 3.4%, White population decreased by 8.5%. This an indication that economics were the primary motivation for population decline, because percent population change was in the same direction for both races. The non-Black Belt mixed counties added population in both segments. The African American population increased by 2.7% while the White population increased at nearly double that rate, at 4.9%. The fact that both population for both races increased is an indication that economics was a stronger motivator than racial pressures.
1990-2010

The 1990s started in the middle of the road economically and continued as a mixed bag. NAFTA resulted in the loss of low skill manufacturing jobs, and the Cold War peace dividend reduced federal spending. Following the terrorist attacks in September 2001 federal dollars once again began to flow into Alabama as operations at military depots and training based expanded. The transportation industry matured and has embraced a multi-mode blend of rail, river and road into an integrated regional distribution system.

During this period the population of the Black Belt mixed counties remained mostly unchanged at 130,000, see figure 20. The most significant change was a continued loss of White population. Black Belt mixed counties lost 15% of their White population along with 4% of their African American Population during the two decades. These changes are likely are result of economic pressures. The left graph in figure 26 shows the migration, birth, death and population change during the 1990s and 2000s. For Black Belt mixed counties. The number of people out-migrating, being born and dying in Black Belt mixed counties is about a tenth the numbers the 1960s. The non-Black Belt mixed counties population dynamics are dramatically different. The non-Black Belt mixed counties have experienced significant in-migration during this period. In-Migration has accounted for 10% of the total population of these counties. The number of births and deaths are close to the numbers for 1960s. The major difference is that the deaths are about double. The crude death and birth rates for both groups of counties make a direct comparison of the natality and mortality rates possible.
Table 4 lists the Crude Birth Rate (CBR) and Crude Death rate (CDR) for the mixed counties for the 1990s and 2000s. The CBR for Black Belt mixed counties for the 1990s at 158, two and half times the CBR for non-Black Belt mixed counties.

The difference remains during the 2000s where the Black Belt CBR is 2.4 times the non-Black Belt CBR. Although, the CBR rates for the Black Belt mixed counties are half what they were during the 1960s, but they are still much higher than the non-Black Belt mixed counties. The CDR for both groups of counties has similar ratios.

Table 5 Mixed County Birth and Death Rates 1990-2009

<table>
<thead>
<tr>
<th>Mixed Counties</th>
<th>1990s</th>
<th>2000s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black Belt</td>
<td>Non-Black Belt</td>
</tr>
<tr>
<td>CBR</td>
<td>158</td>
<td>62</td>
</tr>
<tr>
<td>CDR</td>
<td>116</td>
<td>41</td>
</tr>
</tbody>
</table>

The combined impact of the three main population processes births, deaths, and migration are visible in a population age distribution graph. Figure 27 is the age
distribution for the mixed counties. The overall shape is mostly symmetrical, and barrel shaped below the age of 65 with two bulges. The Post WW II baby boom (50-45) and current youth (15-19). Like the rural and urban counties, the health-mortality transition continues to increase the life span of this population. The birth rate for the non-Black Belt mixed counties is slightly below replacement. The distribution is skewed toward Black Belt counties at younger age cohorts 0-29, and toward non-Black Belt counties in two areas: age cohorts 30-49, and 60-79. The young age skewed toward the Black Belt could be a result of young families departing for better opportunities.

Figure 27 Population Age Distribution for Mixed Counties in 2010

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Figure 27 Population Age Distribution for Mixed Counties in 2010
Summary

The mixed counties in 1910 had agriculturally based economies with predominately rural population. These counties began the transition away from an agricultural economy as early as 1920. The steady increase of population each decade depicted in figure 20 is an indication the transition has been gradual. The percent population change depicted in figure 22 indicates the Black Belt mixed counties added most of their population during the 1930s and 1940s. While the non-Black Belt mixed counties increased by an average of 12% per decade. This trend coupled with African American population increases in seven of ten decades indicates that economic growth. Additional jobs were the primary motivation for the dramatic population growth in the non-Black Belt mixed counties. Since 1910 during seven of ten decades Black Belt mixed counties experienced differential population changes. That is White population increased while African American population decreased, or the opposite occurred. Differential population change is an indication among races is an indication that more than economic motivations are likely influencing the population change. Since 1970 in only one decade have the Black Belt mixed counties experienced differential population change, that was during the 1990s.

The Black Belt mixed counties 1910 were 82% African American, while the non-Black Belt mixed counties in 1910 were 73% White. In 2010 the Black Belt mixed Counties are 60% African American, and the non-Black Belt mixed counties are 80% White. This racial difference is evident in the aggregate natality and mortality data detailed earlier. The Black Belt mixed counties had crude birth and death rates that was
nearly three times as high as the non-Black Belt mixed counties. The rates for the 1990s and 2000s indicate the fertility transition is still in progress in Black Belt mixed counties.

In order to confirm that the populations of the Black Belt mixed and non-Black Belt mixed counties evolved differently, analysis of the variance test was conducted. Statistical analysis requires a null hypothesis to test. In this case the null hypothesis is that the population in both groups of mixed counties evolved during the post cotton period in a similar way. The mean population for each group of counties was calculated for each decade. Because the population means are considerably different for for each group statistical analysis of the variance is the appropriate test. The variance of those means were then analyzed to determine if the two samples came from the same overall population. Table 4 depicts results of the variance test. The F statistic is a measure of variance between the samples divided by the variance within each sample. If the P-value, is less than alpha, then it is possible to reject the null hypothesis. The P-value is the probability based on the variance that the samples came from the same population. In this case the P-value for the total population means and the population means for both races was smaller than alpha. Comparing the value of the F-statistic to the value F-critical is a second measure used to determine if it is possible to reject the null hypothesis. If the F-statistic is less than F-critical, it is possible to reject the null hypothesis. This second measure confirms based on analysis of the variance of the decadal population means, that the total population and both racial populations of the two groups of mixed counties evolved differently.
Thus, it is possible to state that the population process of migration, natality, and mortality affected the Black Belt mixed counties differently than the non-Black Belt mixed counties.

**Comparison of Urban Counties**

This section compares Montgomery county the sole urban county in the Black Belt to five other counties which have been classified as urban. Jefferson and Mobile counties in 1910 were along with Montgomery the only urban counties in Alabama. Since 1910 two of the counties which were determined to have agriculturally based economies in 1910, have become in 2010 urban counties based on the criteria used for this thesis. Figure 28 is a map depicting the 5 urban counties in Alabama in gray.
Figure 28 Map of Counties Classified as Urban in Gray
The urban counties of Alabama as you would expect have experienced growth in each decade since 1910. Figure 29 shows the population trends for Montgomery county and the other urban counties. The

![Urban County Population Trends 1910-2010](image)

**Figure 29 Urban County Population Trends 1910-2010**
This twenty-year period marked the end of the cotton credit system which impacted both retail and wholesale markets. In the urban counties were concentrated the wholesale centers which were at the pinnacle of the system (Sisk 1956). Thus, over the course of five years of crop failures the wholesale market system that supported rural Alabama was in disarray. On the governance side, separate but equal had been fully codified and implemented. Transportation was on the cusp a change. Throughout the period rail was the preferred method of long-distance travel for both passengers and freight, although waterways continued to compete with rail.

Figure 30 depicts the overall percentage population change for urban Black Belt and urban non-Black Belt counties for each decade from the 1910s through the 2000s. Figure 31 breaks those percent population changes out by race for each group of counties.
Together these two graphs offer insight into which population segment has the largest impact on population change for each group of counties.

In 1910 a large part of Montgomery county was dedicated to growing cotton with many tenant farmers. Figure 31 shows that between 1910 and 1920 Montgomery county lost 15% of its African American population and according to US Census data 7% of its tenant farmers. It is likely these African Americans departed for the prospect of a better life in one of the northern industrial cities. During the 1910s the White population increased 28%. This was likely a result of the city of Montgomery offering a better economic opportunity as well as social services for the poor. The urban non-Black Belt counties also experienced significant growth between 1910 and 1920. Once again it is likely a lack of jobs and opportunity in more rural counties drove this surge in both African American and White population segments to industrial Jefferson County and to a lesser extent Mobile County. The trend continued during the 1920s the only difference in this decade is that African Americans population segment increased by 7.6%, likely as a result of African Americans moving to the city of Montgomery.
Graphing the age distribution of a geographically defined population offers a longitudinal insight into how the population process have impacted the population structure. Figure 32 depicts the percent of the population in each five-year age cohort as of 1930. The blue bars represent the population in urban non-Black Belt counties. The orange bars represent the population in Montgomery County. The shape of the graph is generally triangular the 0-4 age cohort being smaller than the older cohorts. This likely an indication of a fertility transition, which usually occurs first in urban populations. The graph is generally symmetrical. The distribution skews slightly to non-Black Belt counties in age cohorts 25-44, and slightly to Black Belt counties in age cohorts 45-75. There is no evidence of the out-migration rural and mixed counties experienced.
1930-1950

This period opened with country coming to grips with the Great Depression. The 1940s brought War mobilization and five years later demobilization. The decade ended with the start of the Marshall Plan to rebuild Europe. During this period the truck and automobile became ubiquitous in urban areas.

This period experienced population growth across all four population segments. Figure 31 shows the population changes that occurred in the 1930s were smaller than the previous two decades. Montgomery County White population experienced the largest
change 23%. This was likely a result of the continued rural to urban transition resulting from poor economic opportunity in rural areas.

During the 1940s large population increases were once again the norm. Except for the African American population in Montgomery county which only increased 5.7% compared to a 37% increase for the White population in Montgomery county. Similar large increases for both the White and African American populations occurred in the urban non-Black Belt counties. The smaller increases for the African American population in Montgomery County are likely due to the general out-migration during this period and the attraction in Alabama of Jefferson county with its coal mines and steel foundries.

Using vital statistics to calculate migration as well as crude birth and death rates offers additional insight into the population process that are shaping the population or a location. Figure 33 depicts in the left graph, the numbers for Montgomery County. The right graph depicts the numbers for other five urban counties. Montgomery County experienced in-migration during the 1940s of 6,200 which equates to about 5% of the population. The urban non-Black Belt counties experienced in-migration of 74,644 which equates to 8% of the population. The crude birth rate (CBR) for all urban counties was 250 births per 1000. The crude death rate (CDR) for Montgomery County was 105 during the 1940s. For the urban non-Black Belt counties, the CDR was 16% less at 89. The fertility transition appears to have been occurring at the same rate in both groups of urban counties. The health-mortality transition appears to have lagged in the Black Belt.
During the 1950s and 1960s Montgomery County and Jefferson Counties were at the center of the civil rights movement. The 33% decadal average population percent increase which Montgomery county had experienced from since the 1920s came to an end in the 1960 (see figure 30) as the civil rights movement gained momentum. During the 1960s the White population in Montgomery county increased a paltry 2%. This was likely due to the turbulence surrounding the civil rights movement and mandated desegregation. Those white families who were able to move did so primarily to avoid sending their children to substandard schools, which resulted from desegregation. During the 1960s the African American population in Montgomery declined by 6%. Once again, this decline was likely the result of the violence and turbulence surrounding the civil rights movement which was centered in the county.

Figure 33 and the numbers behind the graphs help with understanding the specific population dynamics. During the 1950s Montgomery County experienced in-migration of 3736. While the urban non-Black Belt counties experienced in-migration of 37,386, about half of migration that occurred the previous decade. During the 1960s both
Montgomery and the urban non-Black Belt counties experienced out-migration. Montgomery County lost 12.5% of its population during the 1960s due to out-migration. The urban non-Black Belt counties lost 3.2% of their population or 42,000 people. Racial pressure is likely the primary pressure which caused the shift from in-migration to out-migration during the 1960s for both groups of urban counties. Figure 31 shows a sharp decline in the percent increase in White population during the 1960s. It is likely that a large portion of population that left Montgomery county during the 1960s was White. Figure 31 also shows that the African American population decreased 6%, indicating that African Americans also moved away from Montgomery county during the 1960s.

The numbers for the other population process, CBR and CDR remained stable during the 1950s. However, in the 1960s the CBR for urban non-Black Belt counties and Montgomery county decreased by 19%. The decreasing birth rate during the 1960s is in line with the nation-wide decline following the post-World War II baby boom. Mortality for both groups of counties remained stable during the 1950s. In the 1960s the CDR increased slightly, 5% for both groups of urban counties.

Figure 34 depicts the urban county age distribution for Black Belt and non-Black Belt counties in 1970. The graph is generally symmetrical and has a beehive shape which indicates above replacement fertility due to the post WW II baby boom, followed by the low fertility rate during the Great Depression and decreased mortality at older ages. The distribution skews slightly to Black Belt region for age cohorts 0-14, and to the non-
Black Belt counties for age cohorts 15-34. For the age cohorts 35-85 the distributions are essentially the same.

**1970-1990 Urban Counties**

For the urban counties this period desegregation was being implemented, the economy during the 1970s was in the doldrums and the interstate freeway system was beginning to change travel patterns. During the second decade, the economy picked up,

After a decade of turbulence, the White population segment in Montgomery County once again posted a large increase, 10.5%. However, the African American population posted the largest gain with a 28% increase, see figure 31. It is likely that desegregation was likely the cause of this new trend of large increases by the African
American population in Montgomery County. As evidenced by the large positive population gains posted by urban non-Black Belt counties, there was also an economic component of these across the board increases.

Figure 30 shows that during the 1980s the population in urban counties experienced less change than during any other decade between 1910s and 2000s. The African American population in Montgomery County experienced the largest change with an increase of 12.5%. Figure 31 shows this change continued the trend for this population segment which started during the 1970s.

1990-2010 Urban Counties

At the start of this period, Alabama experienced a significant loss of low-skill manufacturing jobs as a result of NAFTA. Throughout the period Alabama struggle to increase the number of people employed. In 1996 based on per-capita income, Alabama ranked 48th among states (Flynt 2004, 117). The job market improved during the 2000s when the State attracted multiple auto manufactures to locate production facilities in Alabama. On the transportation front, the ocean ports, rail, and interstate system moved toward an interconnected freight transportation system.

Figure 31 shows that during the 1990s a new pattern of population change emerged. The White population in Montgomery County remained unchanged or decreased, while the other three population segments posted increases. The White population in urban non-Black Belt counties in 1990 also experienced lower growth. It is likely this pattern change, which started during the 1960s is the result of both economic and racial motivations, as the White population moves to the suburbs.
Figure 31 shows the population trends from the 1990s continuing into the 2000s. The White population in Montgomery County continued to be the only population segment to experience a decline, and that decline increased to 17%. Montgomery County ended the 2000s with a population composed of 54.7% African Americans according to US Census data. This is the highest percentage of African American population since 1920. The urban non-Black Belt counties ended the 2000s with a population with 62.9% African Americans, this is down from the high of 71.2% in 1970.

In addition to looking at how population segments have changed it is useful to examine the three population processes, migration, births, and deaths, which caused those changes. The graph on the left in figure 35 shows the values for Montgomery County while the graph on the right shows the values for urban non-Black Belt counties. Montgomery county experienced a small amount of out-migration during the 1990s and only 3.4% out-migration during the 2000s. The urban non-Black Belt counties experienced in-migration of 4.5% in the 1990s and 6.0% during the 2000s. Based on the percent population change the White segment accounted for the out-migration from Montgomery County, while the African American segment accounted for most of the in-migration of the urban non-Black Belt counties.
Table 7 shows the crude birth and death rates for urban counties. The CBR for Montgomery County was 250 in the 1960s. It decreased by 48% since the 1960s, while the CBR for the urban non-Black counties decreased by 67%. The CDR for both remained unchanged.

<table>
<thead>
<tr>
<th></th>
<th>Urban Counties</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tr>
<td></td>
<td></td>
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<td>2000s</td>
<td></td>
<td>1990s</td>
<td>2000s</td>
</tr>
<tr>
<td></td>
<td>Black Belt</td>
<td>Non-Black Belt</td>
<td>Black Belt</td>
<td>Non-Black Belt</td>
<td>Black Belt</td>
<td>Non-Black Belt</td>
</tr>
<tr>
<td>CBR</td>
<td>165</td>
<td>126</td>
<td></td>
<td>CBR</td>
<td>150</td>
<td>112</td>
</tr>
<tr>
<td>CDR</td>
<td>93</td>
<td>79</td>
<td></td>
<td>CDR</td>
<td>90</td>
<td>77</td>
</tr>
</tbody>
</table>

As stated before, an age distribution is a cross section which shows artifacts of how the process of migration, births, and deaths shaped the structure of a population. Figure 36 is an age distribution comparison for urban Black Belt and urban non-Black Belt populations. The graph is symmetrical with only a slight skewing either direction. For the urban counties an age distribution comparing race offers more insight than one which compares Black Belt to Non-Black Belt, because both sets of urban counties have
large populations of each race. The graph on the left in figure 37 depicts the age
distributions for the White and African American populations in Montgomery County in
2010. The graph on the right depicts the same for the urban non-Black Belt counties.
Both distributions have similar skewed shapes. In both graphs the distribution is skewed
toward the African American population from birth to age 39. The age cohort 40-45 in
both graphs is equally distributed. From age 45 to 85 plus the distribution is skewed
toward the White population.

Figure 36 Age Distribution Urban Black Belt versus Urban Non-Black Belt Counties
There are two bulges in the age distribution graph. The first bulge is the age cohort 15-24 in both graphs. This bulge is likely the result of an influx of young adults who have recently finished with high school and have moved to an urban area to find a job and escape the perceived “dead end rural lifestyle”. The second bulge is the aging post-World War II baby boom. The skew toward the White population in the older age cohorts is likely an artifact of the Great Migration, especially at the older ages. Additionally, the smaller percentages on the African American distribution at older ages reflects the higher CDR for this population.

**Summary**

Figures 32, 33, 34, and 36 highlight the impact migration had on the structure of the urban population both in the Black Belt in Montgomery County, and in the urban non-Black Belt counties. From 1910 to 1960 urban counties experienced tremendous growth as a result of poor economic conditions in rural areas. The White population in Montgomery county increased in every decade from 1910 to 1960, with an average increase of 33% per decade. Except for the 1960s the urban counties absorbed a portion
of the excess population from the Black Belt where the crude birth rate (CBR) was up to three times the CBR in non-Black Belt counties. Non-economic motivations such as racial pressures, and governance were likely the motivations behind population changes which occurred during the 1960s. It is also apparent that the economic attraction of the northern industrial cities diminished the number of African Americans migrating to Montgomery before the Civil Rights Act was implemented in 1965.

In order to confirm that the populations of the Black Belt urban and non-Black Belt urban counties evolved differently, analysis of the variance test was conducted. Statistical analysis requires a null hypothesis to test. In this case the null hypothesis is that the population in both groups of urban counties evolved during the post cotton period in a similar way. The mean population for each group of counties was calculated for each decade. Because the population means are considerably different for each group statistical analysis of the variance is the appropriate test. The variance of those means was then analyzed to determine if the two samples came from the same overall population. Table 4 depicts results of the variance test. The F statistic is a measure of variance between the samples divided by the variance within each sample. If the P-value, is less than alpha, then it is possible to reject the null hypothesis. The P-value is the probability based on the variance that the samples came from the same population. In this case the P-value for the total population means and the population means for both races was smaller than alpha. Comparing the value of the F-statistic to the value F-critical is a second measure used to determine if it is possible to reject the null hypothesis. If the F-statistic is less than F-critical, it is possible to reject the null
hypothesis. This second measure confirms based on analysis of the variance of the decadal population means, that the total population and both racial populations of the two groups of urban counties evolved differently.

<table>
<thead>
<tr>
<th>Statistic</th>
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<th>White</th>
<th>Total</th>
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<tr>
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<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>F-value</td>
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<td>4.9571</td>
<td>3.7433</td>
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<tr>
<td>F-critical</td>
<td>2.9782</td>
<td>2.9782</td>
<td>2.9782</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0076</td>
<td>0.0092</td>
<td>0.0244</td>
</tr>
</tbody>
</table>

**Summary**

The empirical evidence of population changes resulting from the three population processes of migration, natality and mortality indicate that the populations of the Black Belt counties followed a different path than the populations of the similar counties outside the Black Belt. The results of the analysis indicate that the populations of rural, and mixed counties outside the Black Belt were affected differently by the population processes than the counties of the same classes inside the Black Belt region.

Migration was the most apparent difference between counties of the same class inside and outside the Black Belt. The African American population in rural counties in the Black Belt lost population in all 10 decades between 1910 and 1990, while rural non-Black Belt counties lost population in only 50% of the decades. During the 1910s rural Black Belt counties lost 18% of their population, while non-Black Belt counties only lost 3.3% of their population. This was likely a result of different farm ownership patterns in
the regions. The Black Belt had a larger percentage of sharecroppers who’s ties to the land were weaker than those who owned land. In mixed counties the difference was more noticeable. Mixed Black Belt counties lost population in 50% of the decades which equated to an annual average of -0.5% population loss. Meanwhile mixed non-Black Belt counties gained population in every decade with an annual growth rate of 1.8%. Mixed Black Belt counties lost 20% of their population each decade between 1940 and 1969, while 1% of the mixed non-Black Belt counties’ population migrated into mixed non-Black Belt during the same time. In urban counties the population growth in non-Black Belt counties exceeded Black Belt urban counties in 8 of 10 decades. In two decades urban Black Belt counties lost population, while urban Black Belt counties gained population in all 10 decades of the period.

Migration during the post cotton era masked different natality and mortality rates inside and outside the Black Belt. The rural and mixed counties inside the Black Belt lagged significantly behind their counterpart counties outside the Black Belt. During the 1940s natality and mortality rates in rural Black Belt counties were 3 times higher than rural non-Black Belt Counties. Although the rates decreased by two thirds natality rates in rural Black Belt counties between 1990 and 2010 remains 3.6 times the rate in rural non-Black Belt counties. The natality rates for mixed counties were also significantly higher inside the Black Belt. During the 1990s and 2000s mixed Black Belt counties natality rates were 2.4 times higher than mixed non-Black Belt counties. Mortality rates between 1990 and 2010 were 2.7 times higher for mixed Black Belt counties. The natality rates for urban Black Belt were also higher than urban non-Black Belt counties.
Between 1990 and 2010 urban Black Belt natality rates were 1.3 times higher than urban non-Black Belt counties.

Statistical analysis of the variance of population means confirmed the empirical evidence that the population Black Belt counties is different than the population of counties outside the Black Belt. The value of the F statistic was calculated for total population means and the population means for both races. The results indicate that based on the variance within each group and between groups within each class (rural, mixed, urban), the population inside the Alabama Black Belt followed a different path during the post-cotton era than did the population in similar Alabama counties outside the Black Belt.
4. ANALYSIS OF SETTLEMENT PATTERNS

The previous chapter analyzed how population processes during the post-cotton era affected the populations of rural, mixed and urban counties. The focus of this chapter is on economic vitality of these same counties. The chapter will use the lens of settlements as the basis for the analysis. Specifically, how the rank order distribution of settlements based on population changed each decade. As discussed in chapter 2, economists and geographers have demonstrated the linkage between a hierarchical market system such as the Central Place hierarchy described by Christaller and Losch (1966; 1954). Rosen and Resnick (1980) and others have demonstrated that the rank order distribution of settlements based on population follows a Pareto distribution (equation 1). The coefficient in equation 1, the Pareto coefficient is the slope of the curve. The slope of the curve becomes steeper when larger cities grow faster than smaller settlements. Similarly, when smaller settlements grow faster than the large cities in a region the slope of the curve will become shallower. Parr (1985) hypothesized that the shape of a graph of the Pareto coefficient for a region over a long period would reflect how economic conditions in that region changed over time. The Pareto coefficient is a measure of the slope of the curve representing rank-size distribution of settlements in a region plotted on a log vs log scale. The inclination of the line will become steeper if larger settlements add population at a faster rate than smaller settlements. Population is
assumed to be a proxy for the number of jobs in a settlement. Thus, if a settlement adds population that is an indication of economic growth. Similarly, if smaller settlements add jobs at faster rate than larger settlements the inclination of curve will become shallower, indicating that largest settlements in a region have slower job growth, which is an indication the economy is not growing as fast, or that the economy is decentralizing.

This analysis will use two data sets. The first data set consists of rural population density calculated from US Census gathered data. The second data set consists of US Census gathered population data for populated places in Alabama at 10-year intervals from 1900 to 2010. These places have been associated with counties so the unit of analysis will be counties and groups of counties. These two data sets are not independent because the populated places tabulated by the US Census Bureau included all incorporated places (Hunt 1912). Since 1910 the US Census Bureau has considered populated places with a population of at least 2500 to be urban places (Truesdell 1949). As a result, the rural population density levels will include the population of incorporated places with a population of less than 2500. However, because the rural population is much larger than the population in small incorporated places, inclusion of these numbers does not affect the population density calculations.

Rosen and Resnik (1980) among others have demonstrated that the values of the Pareto coefficient are close to 1 for the United States. Additionally, when White (1978) conducted simulations of central place dynamics using realistic values the result was a system of centers which had a regular rank-size distribution of close to 1. Figure 37 is a
graph of the Pareto coefficient for all populated places in Alabama with a population of at least 2500 from 1900 to 2010.

![Pareto coefficient graph](image-url)

**Figure 38** Pareto’s coefficient $\alpha$ for Size Rank Distribution of places with size greater than 2500 (1900-2010)

The value for the coefficient varies initially because in 1910 there are only 23 places in the distribution. Not until 1960 are there 100 settlements in the distribution. Multiple scholars have noted that the Pareto coefficient is sensitive to small changes in the size of the sample (Rosen and Resnick 1980). Figure 37 demonstrates that the rank order of distribution of populated places in Alabama fit the expected Pareto distribution with a coefficient of 1.

Together rural population density and the value of the Pareto coefficient trend values over time provide general indications regarding how the population in a region is distributed among settlements and the hierarchical market system. Those indicators also make it possible to make general statements about the health of the regional economy.
changing. Table 9 summarizes nine situations resulting from the combined indicators. When the value of $\alpha$ decreases that indicates the larger settlements in a region are growing the fastest, which causes the inclination of the line to steepen. When the larger settlements are adding population faster than smaller settlements that is an indication hierarchical markets are centralizing (Berry et al. 1988, 105). When rural population density is increases, that indicates markets are decentralizing as the increased rural density results in level 1 markets being able to profitably sell level 2 bundles of goods and services. Thus, upgrading level 1 markets to level 2 markets. This is a description of situation 3 in table 9, where $\alpha$ is decreasing and rural population density is increasing. The combination of these two trends point to a strong and expanding economy.

At the opposite extreme is situation 4 in table 9, which indicates the worst-case economic situation, the value of $\alpha$, is increasing and the population density is decreasing. An increasing $\alpha$ indicates in this case that the larger settlements are losing population at a faster rate than smaller settlements. The decreasing rural population results in market areas expanding to reach the number of customers required to be profitable. Eventually market levels will disappear which results in a centralizing of the hierarchical market system. The increasing $\alpha$ results in an opposing decentralization pressure on the market system as the relative size of smaller settlements increase faster than the largest settlements. As the population in the region and decreases markets will only be profitable selling goods from the next level down.
Table 9 lists three situations where the economy is likely to be contracting or at best stagnant and five situations where the economy is likely to be expanding. The contracting economic situations have either a decreasing rural population density or an increasing value of $\alpha$. The situations where the economy is likely to expand have a growing rural population and or a decreasing value of $\alpha$. The remainder of the chapter will apply the above analysis to class of counties to determine if the situation in Black Belt was different from the situation in counties outside the Black Belt.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Indicators</th>
<th>Population Process</th>
<th>Centralization</th>
<th>System Change</th>
<th>Economy</th>
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</thead>
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<tr>
<td>1</td>
<td>$\alpha$ decreasing and Rural Density decreasing</td>
<td>Larger Places growing fastest, Rural out-migration</td>
<td>All market levels centralizing</td>
<td>Lower level markets downgrading</td>
<td>Rural to Urban, adding urban jobs</td>
</tr>
<tr>
<td>2</td>
<td>$\alpha$ decreasing and Rural Density unchanged</td>
<td>Larger places growing fastest, urban in-migration</td>
<td>urban centralization Rural equilibrium</td>
<td>No change</td>
<td>2nd strongest urban job growth</td>
</tr>
<tr>
<td>3</td>
<td>$\alpha$ decreasing and Rural Density increasing</td>
<td>Larger Places growing fastest, Rural in-migration, suburban sprawl</td>
<td>Higher markets centralizing Lower Level markets Decentralization</td>
<td>market levels upgrading</td>
<td>Rapidly growing</td>
</tr>
<tr>
<td>4</td>
<td>$\alpha$ increasing and Rural Density decreasing</td>
<td>Urban and Rural Out-Migration</td>
<td>urban decentralization Rural centralization</td>
<td>market levels downgrading</td>
<td>Worst case</td>
</tr>
<tr>
<td>5</td>
<td>$\alpha$ increasing and Rural Density unchanged</td>
<td>Smaller places growing fastest, Urban In-Migration</td>
<td>Urban decentralization Rural equilibrium</td>
<td>Urban markets downgrading</td>
<td>Static to decline</td>
</tr>
<tr>
<td>6</td>
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<td>Smaller places growing fastest, Urban to Rural migration</td>
<td>Decentralization</td>
<td>Lower level markets upgrading</td>
<td>Suburban growth</td>
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<tr>
<td>7</td>
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<td>Rural in-migration</td>
<td>Decentralization</td>
<td>Lower level markets upgrading</td>
<td>Rural growth</td>
</tr>
<tr>
<td>8</td>
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<td>Rural out-Migration</td>
<td>Centralization</td>
<td>markets levels downgrading</td>
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</tr>
<tr>
<td>9</td>
<td>$\alpha$ unchanged and Rural Density unchanged</td>
<td>No Migration</td>
<td>Equilibrium</td>
<td>No change</td>
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</tr>
</tbody>
</table>
**Settlement Analysis of Rural Counties**

In 1910 except for Montgomery County the Black Belt region had a rural agricultural economy. Most of the population was poor, both African American and White. The local general store served as the primary source of retail goods, farm supplies and credit (Sisk 1955). Long-distance travel was a rare event for most of the population and it was difficult due to poor roads. The primary means of long-distance travel for both freight and passengers in 1910 was the railroad. The map in the upper left corner of Figure 38 depicts the railroads that existed in 1911 along with incorporated towns. Notice that most rural towns are along a railroad. As Alabama developed in the late 19th century railroads were built in places where paying freight and passengers existed (Atack et al. 2009). However, along those routes additional towns sprang up as collecting points for freight and passengers. Some of these collecting points became central places. These places competed with existing towns and cities to provide the local population with goods and services.

Figure 39 is a graph of the Pareto coefficient for rank order by population distribution of the settlements depicted on the upper left map (rural counties 1910). The dark green line graphs the values associated with settlements in rural Black Belt counties. Between 1910 and 1930 slope of the curve is mostly level and has a value of 1. This indicates the economy is not expanding or contracting. Figure 40 depicts the average rural population density for this same group of counties. The dark green line is the average rural density plot for rural Black Belt counties. As expected, the rural population density decreased following the boll weevil induced crop failure and subsequent out-
migration of tenant farmers and their families. There are two possible explanations for the coefficient not changing. The first possibility is that enough population that departed rural areas moved to settlements in a rural Black Belt county. The second possibility is that distributed rural retail network which supported the departed tenant farmers was not associated with settlements captured on the upper left corner map in figure 38. This second possibility is the most likely explanation because as Sisk (1955) explains a local general store served at most 15 farms and was connected to a wholesaler in either Selma or Montgomery. These road intersections were not served by a railroad and likely did not have a large enough population to and resources to enable them to incorporate as a town. Thus, when the local population departed, the country store did as well with minimal impact on the surrounding settlements.
The value of the Pareto coefficient decreases from 1930 to 1960. The average rural density also decreased but not as smoothly. A decreasing coefficient indicates the
absolute value is increasing. That is an indication the larger towns are gaining population at a faster rate than smaller towns. This indication combined with a decrease in rural population density indicates that a rural to urban transition is taking place in the rural Black Belt counties.

The distribution of population among settlements and rural population density in rural non-Black Belt counties show similar but not identical trends. The light green lines in figure 40 and 42 depict these trends. The boll weevil induced cotton crop failures affected different regions of Alabama differently. Figure 11 shows that the rural non-Black Belt counties gained population through 1940. The coefficient trend line reflects the population gain in 1910-1940 with a decreasing value. The rural population density for these same counties shows a different trend. The population density curve is unchanged until 1930, indicating rural population remained rural, while the in-migration settled in larger settlements. During the 1920s the larger settlements lost more population than smaller settlements. During the 1930s, population once again moved to larger settlements at a faster rate. During the 1940s rural density increased at the same time the population move to larger settlements. During the 1950s rural population density decreased for both groups of rural counties and the population moved to the larger settlements.

Figure 40 shows that during the 1960s rural Black Belt counties continued lose rural population; however, figure 39 shows that the population moved to smaller towns at a faster rate than they moved to larger towns. This indication aligns with desire of the White population to avoid putting their children in integrated schools which lowered the
quality of the education. This trend continued through the 1970s. The rural non-Black Belt counties experienced similar trends but to a lesser extent.

During the 1980s figure 39 shows the rural Black Belt population once again moving toward larger settlements, while the rural population density remained mostly unchanged according to figure 40. During the 1980s through the 2000s The rural non-Black Belt counties the coefficient remained about the same indicating no change in the distribution of population amongst settlements; however, figure 40 shows a significant increase in the rural population density during the 1990s for these counties. Figure 39 and 40 show in the 2000s that the rural Black Belt counties losing population in their larger settlements at the same time rural population density decreased. This is an indication of economic decline during this decade.

Since 2000 the rural Black Belt counties settlement pattern has diverged from settlement pattern of the rural non-Black Belt counties. The rural population density trend lines for both groups of counties is similar since the 1930s through the 2000s.
Summary

A combined analysis of settlement patterns and rural population density trends indicate that the rural Black Belt counties experienced a different economic journey between 1910 and 2010 than did the rural non-Black Belt counties. Based on the situations summarized in table 9, rural Black Belt counties experienced four decades of economic stagnation or contraction, while the rural non-Black Belt counties experienced only one decade of stagnation or economic contraction. Moreover, during the civil rights struggle in the 1960s and 1970s rural Black Belt counties experienced two decades of situation 4, the worst-case economic situation as the larger settlements lost population at a higher rate than smaller settlements and the rural population decreased. Following the collapse of the cotton credit system during the 1910s implementation of NAFA in the 1990s the rural Black Belt counties also experienced economic stagnation or decline, while economies of rural non-Black Belt counties expanded.
On the positive side, rural non-Black Belt counties experienced two decades of strong economic growth during the 1940s and 1970s. From 1920 through 1960 rural Black Belt counties also experienced growth, but less than the non-Black Belt counties. As stated earlier the 1970s rural Black Belt economies contracted as the population left those counties.

Statistical analysis confirms that the rural Black Belt counties and the rural non-Black Belt counties experienced different rural population density patterns. Table 10 shows the results of a two sample paired means T test of the mean population density of rural Black Belt counties and rural non-Black Belt counties. Because the T-value is larger than T-critical, and the P-value is less than Alpha it is possible to reject that null hypothesis that the counties experienced the same rural population density evolution.

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**Settlement Pattern Analysis of Mixed Counties**

The mixed counties depicted on the map in figure 41 in 1910 were rural with agriculturally based economies. During the post-cotton era between 1910 to 2010 they added population and settlements such that in 2010 they no longer met the criteria to be
classified as rural counties. Neither did they meet the criteria to be classified as urban counties. The following sections will analyze the settlement patterns and rural population density that resulted in a mixed classification. This section will conclude with a comparison of the settlement patterns of Black Belt mixed counties to Non-Black Belt mixed counties.
Figure 42 depicts four curves. The solid gray curve is the value of the Pareto coefficient for settlements in mixed counties which have a population of at least 2500. In 1900 nine settlements met the criteria. The number increased gradually to 35 settlements.
in 2010. Even with this small sample size the Pareto coefficient approaches 1. The dotted gray line is a plot of the value for all settlements in mixed counties. The number of settlements of all sizes in mixed counties ranges from 41 to 102. The light orange line is a plot of the value for Non-Black Belt mixed counties. The number of settlements in this group of counties ranges from 27 to 81. The dark orange line represents the value for mixed counties in the Black Belt. The number of settlements in Black Belt mixed counties ranges from 14 to 21.

In 1910 both groups of mixed counties had similar rural population density. During the 1900s the distribution of population among settlements in both groups did not change. However, during the 1910s the Black Belt Counties and non-Black Belt counties took different paths. The Black Belt mixed counties lost rural population as people moved to larger settlements at a faster rate than to smaller settlements. The non-Black Belt mixed counties gained rural population and the population distribution among settlements remained the same. During the 1930s both groups of counties lost rural population and their larger settlements increased at a faster rate than their smaller settlements.
During the 1940s the larger settlements in the Black Belt mixed counties lost population at a much faster rate than smaller settlements. However, this anomaly did not occur in the non-Black Belt mixed counties. In these counties the larger settlements continued to add population faster than smaller settlements. Both groups of counties experienced a growing rural population.

During the 1950s as Alabama farms mechanized harvesting tasks rural population declined, more so in non-Black Belt mixed counties. The larger settlements in the Black Belt mixed counties during this decade added population at a much faster rate than smaller settlements. The larger settlements in the non-Black Belt mixed counties continued growing at essentially the same rate as they had since 1920.

During the turbulent 1960s the growth of larger settlements slowed in Black Belt mixed counties, while settlements in non-Black Belt mixed counties continued the same
The growth rate of the previous 4 decades. The 1960s marked a divergent pattern or rural growth for the two groups of counties. Rural population in Black Belt mixed counties continued the pattern of decline that had started during the 1950s and continued through the 1970s. The rural population in non-Black Belt mixed counties began to grow during the 1960s. The growth continued through the 2000s at the same average rate.

![Average Rural Population Density for Mixed Counties 1910-2010](image)

Figure 42 shows that the settlement pattern trend during the 1970s, 80s, 90s and 2000s was similar for both groups of counties, but each group followed a different path. Larger settlements non-Black Belt mixed counties lost population faster than smaller settlements during the 1970s. Then for the next 3 decades larger settlements in non-Black Belt mixed counties grew at a slightly faster pace than smaller settlements. During the 1970s larger settlements continued to grow at the rate they had during the 1960s.
During the 1980s and again in the 2000s larger communities in these counties lost population faster than smaller communities.

Figure 43 shows that the rural population density for Black Belt mixed and non-Black Belt mixed counties follows similar paths between 1920 and 1960. Racial pressures bought to a head by the Civil Rights act of 1965 likely caused the rural populations of the two groups of mixed counties to respond differently. The predominately African American rural population in the Black Belt mixed counties left rural areas for opportunities in urban areas that federally mandated desegregation made available. The predominately rural White in the Non-Black Belt counties increased as the White population moved away from larger cities to avoid the educational turbulence resulting from mandated integration. The rural population trends which started during the 1960s have for the most part continued through 2010.

The graph of value of the Pareto coefficient over time is a useful indicator of how over time the settlement patterns of a region change in response to economic and other pressures. The curve for all settlements in Mixed counties closely follows the curve for settlements in the Non-Black Belt counties which comprise 79% of the settlements. The curve for smaller group of settlements in the Black Belt counties tracks with the aggregate curve but shows the sensitivity the Pareto coefficient to changes in small samples. The resulting curve for settlements in Black Belt mixed counties provides useful information about the distribution of population amongst settlements in the region.
Summary

Combined analysis of the settlement patterns and rural population density trends indicate that mixed counties experienced a more positive economic trajectory than the rural counties. However, the mixed Black Belt counties continued to lag behind the mixed non-Black Belt counties. Mixed Black Belt counties experienced the conditions associated with situation 5 in table 9 during the 1980s and 2000s, while mixed non-Black Belt counties experienced conditions associated with situation 3, the strongest economic conditions. Mixed non-Black Belt counties experienced conditions associated with situation 3, strong economic growth during 50% of the decades in the period while mixed Black Belt counties experienced those conditions only once during the period. Based on the combined population-based indicators, mixed Black Belt and mixed non-Black Belt counties had different economic histories during the post-cotton period.

Statistical analysis confirms that the mixed Black Belt counties and the mixed non-Black Belt counties experienced different rural population density patterns. Table 10 shows the results of a two sample paired means T test of the mean population density of mixed Black Belt counties and mixed non-Black Belt counties. Because the T-value is larger than T-critical, and the P-value is less than Alpha it is possible to reject that null hypothesis that all the mixed counties experienced the same rural population density evolution.
Table 11  Results of Two Sample Means Paired T-Test for Mixed Counties

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Settlement Pattern Analysis for Urban Counties

It is not possible to compare the settlement patterns in urban counties in the same manner as was done for rural and mixed counties; because the sole urban county in the Black Belt is Montgomery County and Montgomery County has only one place that is either incorporated or has a population of at least 2500 until the 2000 Census. The 2000 and 2010 Census list two places, the City of Montgomery and Pike Road Town. This section will only analyze the Pareto coefficient value trend line for urban non-Black Belt counties. It will analyze and compare the rural population density for urban non-Black Belt counties to Montgomery County.

Figure 44 shows the five counties classified as urban along with the populated places at three points in time 50 years apart. In 1910 it is reasonable to assume the distribution of population reflected a mature economic system. The cotton credit system was well established. The steel and mining industry in Jefferson County and the surrounding areas had matured since its founding in 1870. Railroads provided the primary means to move passengers and freight over long distances, and the automobile had yet to make a significant appearance in Alabama (Jarvis 1972).
Figure 44 also depicts populated places by population size in 1960, fifty years later. At this point the Alabama Economy is growing, the rural population has been leaving rural areas. State and US Highways have been the primary road network since 1940 (Jarvis 1972). Most importantly in 1960 the Civil Rights movement had yet to gain momentum. Finally, figure 44 depicts the populated places by size fifty years later in 2010 with the Interstate Freeway system in Alabama.

The curve depicting the values Pareto’s Coefficient for settlements in urban counties represents the distribution of population among 10 settlements in 1900 and 62 settlements in 2010. Except for the 1920s smaller settlements in the urban counties were adding population a faster rate than larger settlements. The rural population depicted in figure 46 shows a much more turbulent population dynamic. However, the rural population changes in Montgomery County are like other urban counties except in two periods: 1910 – 1930 and 1970 – 1990.
Figure 45 Map of Populated Places in Urban Counties in 1910, 1960, and 2010
The decrease in rural population in Montgomery County during the 1910s was due to the boll weevil induced crop failures. Outside of the city most of Montgomery County was cotton farms, figure 31 showed a large decline in the African American population during the 1910s. Population increased during the 1920s. The rural population decreases from 1920 through 1940 for the urban non-Black Belt counties coincides with slow minimal increases in Rural county population during the same period. This likely another indication of rural to urban transition as a result of poor economic conditions in rural areas and the perceived opportunity in urban areas, especially during the 1930s.

The rural population trend line in figure 46 generally follows the rural population trend line for rural counties, figure 40, and for mixed counties, figure 43, although the magnitude of the changes for Montgomery county are larger. This could be attributed to the sensitivity of the Coefficient to small sample sizes.
Summary

The settlement patterns for the urban non-Black Belt counties and the rural population density for all urban counties indicate that the urban counties added population to smaller settlements at a faster rate than larger settlements did in every decade except the 1920s. This indicates a decentralization of the market centers in the urban non-Black Belt counties around the regional market center. The growth pattern for the urban non-Black Belt counties depicted in gray in the maps in figure 44 shows that a large portion of the urban growth occurred in settlements surrounding the central city.

The rural population density for urban counties, especially Montgomery county was much more turbulent than for mixed or rural counties. This turbulence likely reflects the smaller sample size for urban counties.

Statistical analysis confirms that the urban Black Belt counties and the urban non-Black Belt counties experienced different rural population density patterns. Table 10
shows the results of a two sample paired means T test of the mean population density of urban Black Belt counties and urban non-Black Belt counties. Because the T-value is larger than T-critical, and the P-value is less than Alpha it is possible to reject that null hypothesis that all the urban counties experienced the same rural population density evolution.

Table 12 Results of Two Sample Paired T-Test for Urban Counties

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Summary

Analyzing how two independent measures of settlement patterns change over time it is possible to make general statements about the type of migration is occurring, how the hierarchical market system is evolving, and how state of the economy. This chapter used the value of the Pareto coefficient and rural population density as independent measures taken at decade intervals to trace how the hierarchical market system and economy changed in rural counties, mixed counties, and urban counties during the post-cotton era.

The combined indicators when applied to rural counties showed how the rural Black Belt counties followed a different economic path than did the rural counties outside the Black Belt. The combined indicators showed that the economies of the rural Black
Belt counties slowed as expected during the collapse of the cotton credit system during the 1910s and again during the 1990s when low wage manufacturing jobs disappeared. The combined indicators also show that the civil rights struggle had strong negative effect on the rural Black Belt counties, while the rural non-Black Belt counties experienced much less disruption during the 1960s and actually experienced strong economic growth during the 1970s.

The combined indicators show how sustained population growth in mixed non-Black Belt counties enabled their transition from rural counties to mixed counties during the post-cotton era. In five decades the value of Pareto’s coefficient and rural population density indicated strong economic growth. Although the mixed Black Belt counties also experienced sustained indicators of economic growth, in only one decade did both conditions occur indicating strong economic growth. These indicators which are derived from settlement growth and population density clearly show the mixed non-Black Belt counties taking a different economic path than the mixed Black Belt counties.

Findings regarding the differences between urban counties inside and outside the Black Belt are not as robust, because the urban county in the Black Belt, Montgomery for most of the post-cotton era had only one settled place. Thus, it is only possible to compare how rural population density. The population in the non-Black Belt urban counties exhibited a pattern of change different from the population in the rural and mixed counties. In all decades except the 1920s, the population was added at a higher rate in smaller settled places than in the regional city. From the 1930s onward the urban non-Black Belt counties experienced urban sprawl as smaller cities on the edge of
Mobile, Huntsville, Opelika, and Birmingham gained population at a faster rate than the city center. The rural population of Montgomery County followed a different path from the other four urban counties. In 50% of the decades the rural population density changed in a different direction than the mean rural population density of urban non-Black Belt counties.

Statistical analysis determined that based on rural population density, the Black Belt counties are different from the non-Black Belt counties. Statistical analysis used the rural population density mean for each group of counties to determine if the sample means came from different populations. A paired mean T-test was used for all three classes of counties. The T-test results indicate that the rural counties, mixed counties, and urban counties inside the Black Belt are different than their counterparts outside the Black Belt.

It is possible to use a graph of the value of Pareto’s coefficient at decade intervals in combination with graph of rural population density to identify changes in the hierarchical market system and the health of the regional economy. When applied to the Alabama Black Belt, two of the three classes of counties, rural and mixed counties, exhibited economic histories that were noticeably different from similar counties outside the Black Belt.
CONCLUSION

This thesis sought to answer three research questions: Is it possible to quantify the boundary of the Alabama Black Belt during each of the cotton producing periods? Did the population in Alabama Black Belt follow a different path during the post-cotton period than the population in similar counties outside the Black Belt? And, Is it possible to use population measures as proxies to determine how if the hierarchical market system in the Alabama Black Belt evolved differently than the hierarchical market system in similar counties outside the Black Belt.

It is possible to quantify at the county level the extent of the Alabama Black Belt. This thesis showed that it is possible to identify quantifiable indicators of “cotton culture” during the ante-bellum period and during the cotton credit system period. When those indicators are combined with geophysical characteristics that attracted cotton growers to the Black Belt it is possible to quantify the extent of the Black Belt at the county level. The quantified extent of the Black Belt served as the basis for the population analysis of Black Belt.

The population in the Alabama Black Belt did follow a path different from the path followed by similar Alabama counties outside the Black Belt. By dividing the Black Belt counties into three classes, rural, mixed, and urban, it was possible to find similar counties outside the Black Belt provided context. By examining the population processes
of migration, natality, and mortality it was possible to examine at decadal intervals how events, racial pressures, economic pressures, and governance pressures impacted the population in each class of counties. Migration was the most impactful population process. A combination of economic, racial, and governance pressures during the 1910s started the rural Black Belt counties along a different path than rural counties outside the Black Belt. Various combinations of these pressures along with events such as the Great Depression, World War II, the civil rights struggle, and NAFTA impacted the Black Belt counties differently than the counties outside the Black Belt. The most noticeable differences were in the mixed counties. During the post-cotton era these counties transitioned from rural agricultural economies to a mixture of agricultural and urban economies. The mixed counties outside the Black Belt grew at an annual rate of 1.8% for the entire 100 years, while mixed counties in the Black Belt lost population at an annual rate of 0.05%.

In addition to migration, the natality and mortality processes were significantly different among the population inside the Black Belt and the population outside the Black Belt. For rural counties the crude birth rate (CBR) and crude death rate (CDR) from 1940 to 1969 was 3 times the rates for rural counties outside the Black Belt. For mixed Black Belt counties, the CBR and CDR was 2.4 times higher than rates for mixed counties outside the Black Belt. For urban counties the CBR and CDR was similar for both groups of counties. Although by the 1990s and 2000s the rates had decreased by 50%, the difference was still 3.6 times higher in rural Black Belt counties and 2.7 times
higher in mixed Black Belt counties. This indicates that the fertility and mortality transitions are occurring at different rates.

A statistical comparison of population means for each group of counties was done. An F-test of the variances within and between groups of rural counties confirmed that the rural Black Belt counties had different population histories from rural non-Black Belt counties. F-tests on mixed and urban counties returned the same results.

Finally, the hierarchical market system and the economy of the Black Belt evolved differently than in similar counties outside the Black Belt. By using measures for how population is distributed throughout a region as proxies for employment and economic growth, it was possible to show that the three classes of Black Belt counties followed different economic paths during the post-cotton era.

Rural Black Belt counties experienced four decades of economic contraction. Two of those decades 1960s and 1970s based on the combined indicators were particularly bad. Rural non-Black Belt counties only experienced one period of economic contraction in the 1960s and two periods of strong economic growth. It is clear based on the combined indicators that the rural Black Belt has experienced more economic turbulence than the rural counties outside the Black Belt. Additionally, it is likely that the market turbulence and continued decrease in rural population density in rural Black Belt counties has resulted centralization of the hierarchical market system and downgrading of market levels, which means it is likely market levels have disappeared in these rural counties. The indicators show that of rural non-Black Belt counties did not experience the same economic shocks and turbulence.
The combined population distribution indicators for the mixed counties tell the same story as the population dynamics. Mixed counties outside the Black Belt experienced sustained economic growth throughout the post-cotton era. Mixed counties inside the Black Belt also experienced periods of sustained growth, but not as strong and interrupted by periods of stagnation or economic decline. The rural population in Mixed Black Belt counties increased in only two decades, whereas rural population increased in 7 out of 10 decades in mixed non-Black Belt counties. This is the strongest indicator that the mixed Black Belt counties economic history was different from mixed non-Black Belt counties.

The unique population distribution within Montgomery county, the sole urban Black Belt county precluded comparison with urban non-Black Belt counties. However, a comparison of rural population density shows a different path for Montgomery county. In only 50% of the decades did rural population density change in the same direction for both groups of counties. Alone this measure doesn’t provide enough information to compare urban counties.

A statistical comparison of mean population density for each group of counties was done. A T-test of paired means was done for rural counties, then for mixed counties, finally for urban counties. The results of all three statistical tests confirmed that the Black Belt counties had different rural population density histories from their counterpart non-Black Belt counties.
As with all research efforts, there is more work to be done. Dynamic migration analysis for the 12 Black Belt counties during the Great Migration and during the last 50 years would provide additional insight regarding the migration patterns. Additional analysis of the birth rates and death rates for the Black Belt counties, especially the rural counties would help to understand why the mortality and fertility transition was significantly delayed relative to other Southern African American rural communities. This thesis demonstrated that it is possible to use a combination of population distribution both urban and rural as proxies for employment, which can be extrapolated as indicators of how a hierarchical market changes over time as well as the relative health of region’s economy. Future research should focus on incorporating percent population change as a factor to refine the indicator value of the method.
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BIOGRAPHY

John W Prior II graduated from South Eugene High School, Eugene, Oregon, in 1975. He received his Bachelor of Science in Engineering Mechanics from The United States Air Force in 1979. He served 27 years in the Air Force as a pilot rising to the rank of Colonel. While in the Air Force, he received a Master of Science degree from the University of Southern California and attended the Naval Postgraduate School as the Air Force Special Operations Fellow. He is married to the former Robin Sims of Loxley Alabama. They have two daughters Mclaine Christine, and Aubry Lilly.