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DETERMINANTS OF POVERTY: AN ANALYSIS ACROSS U.S. METRO AREAS

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Abstract

The United States is one of the richest countries in the world, and yet one out of ten American families was in poverty in 2008 to 2010. Not only is this a high level nationally, but poverty varies greatly across metro regions. In McAllen-Edinburg-Mission, Texas 30.5 percent of families were in poverty. Casper, Wyoming, however, only had 4.6 percent in poverty. What causes this variation? Lack of education? Single-headed families? This research searches for these causes of poverty at the U.S. metro level. Data from metro areas throughout the entire country were analyzed and economic, demographic, and other theorized causes of poverty were tested using least squares regression. Specifically employment measures, age categories, education levels, family structure, ethnicity, and other traits of a metro area were theorized to impact poverty levels. In addition, the difference between industrial employment breakdowns and occupational employment breakdowns were examined in order to tell if examining occupations is a better method to determine poverty rates than examining industry. Ultimately the research identifies determinants that cause or inhibit poverty at the metro level and could be used to tackle poverty issues in a more efficient manner.

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I. Introduction

Poverty is a concern in all regions of the United States and the world. In the U.S. it may not be as widespread or as desperate as in developing countries, but it is still an important ethical concern and is the focus of this thesis. The poverty rate in the U.S. also varies throughout the country. In Casper, Wyoming the poverty rate was 4.6 percent in 2008 to 2010, while it was 30.5 percent in McAllen-Edinburg-Mission, Texas. What causes this variation?

Specifically, this thesis seeks to determine the causes of poverty across U.S. metropolitan areas based on economic, demographic, and other factors. This report focuses on the regional metro level in the United States and builds on the existing literature that has sought the determinants of poverty.

Specifically, this project builds on *Causes of Poverty at the U.S. Metro Level* by Brunot (2011). This report analyzed many of the existing variables that are thought to determine poverty rates while using new American Community Survey data that does not appear to have been used much in previous research. In the end, this report verified many of the existing variables.

This thesis expands on Brunot (2011), by examining the difference between industry and occupation employment measures on levels of poverty. Several different models are created and compared against each other to identify determinants of poverty across metro areas. After the results are presented, policy suggestions are made based on the results.

II. Literature Review

Much research has been conducted on the topic of poverty. From a local to an international level, many areas have been examined. This thesis focuses on metro regions in the United States in particular, and will build on this existing research.

A. Poverty Measure

In order to examine poverty, it is first necessary to understand how poverty is measured.

1. History of Poverty Measure

The modern standards used to measure poverty in the United States began in the 1960s with the work of Molly Orshansky. Orshansky developed the standards eventually used when she was developing a model to measure the risks of families in low economic standing. This model was not based on a standard budget or market basket, because minimum amounts or costs of most items required for living were not available. Instead Orshansky was forced to base the thresholds on food plans developed by the Department of Agriculture. These plans stated the required food needs for people and families. Orshansky then used the Household Food Consumption Survey and determined that at the time families used approximately a third of their income on food expenses. In order to develop the ultimate thresholds, the food plan requirements were multiplied by three in order to determine the income needs of families (Fisher 1997).

Around the same time as Orshansky developed her models, a War on Poverty was started in the U.S. and the new Office of Economic Opportunity adopted the standards developed by Orshansky as a working definition of poverty in 1965. In 1969, the Bureau of Budget declared after some revisions that the standards were to be the official statistical poverty measure in the United States (Fisher 1997). These standards are still in use today.

> "The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using [the] Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps)" ("Poverty Definitions").

The poverty thresholds used are absolute thresholds meaning that they are not changed for differences in consumption patterns, but simply adjusted for changes in price levels through time as determined by the CPI-U ("Poverty Definitions"). The thresholds are identical

everywhere in the United States regardless of any differences in the cost of living in different regions. A family in a rural town or small city that experiences generally low costs is put to the same standard as a family in New York City where costs are quite high.

Table 1 provides the 2010 poverty thresholds. The appropriate threshold income level for a family is found by selecting the size of the family in the first column and going across the columns to the appropriate one based on the number of children in the family.

Table 1 – Poverty Thresholds for 2010 by Size of Family and Number of Related Children Under 18 Years

Size of family unit	Weighted average thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual).....	11,139									
Under 65 years.....	11,344	11,344								
65 years and over.....	10,458	10,458								
Two people.....	14,218									
Householder under 65 years.....	14,676	14,602	15,030							
Householder 65 years and over.....	13,194	13,180	14,973							
Three people.....	17,374	17,057	17,552	17,568						
Four people.....	22,314	22,491	22,859	22,113	22,190					
Five people.....	26,439	27,123	27,518	26,675	26,023	25,625				
Six people.....	29,897	31,197	31,320	30,675	30,056	29,137	28,591			
Seven people.....	34,009	35,896	36,120	35,347	34,809	33,805	32,635	31,351		
Eight people.....	37,934	40,146	40,501	39,772	39,133	38,227	37,076	35,879	35,575	
Nine people or more.....	45,220	48,293	48,527	47,882	47,340	46,451	45,227	44,120	43,845	42,156

Source: U.S. Census Bureau, Poverty Definitions

Many of the studies that researched poverty in the United States used the poverty threshold system developed by Orshansky. This does not necessarily imply, however, that this threshold system is the best way to measure poverty. This method may be used simply because much of the data available from the government on poverty uses this standard.

In fact, there are many arguments against this standard measure of poverty. Triest (1997) and Powers and Dupuy (1994) point to the differences in cost of living across the United States, both between metro areas as well as between urban and rural areas, as problems with the current measure of poverty and in effect, perhaps a cause of poverty. Citro and Michaels (1995) argue for the official poverty definition to be changed to include differences in both cost of living and noncash benefits. They also recommend that the official thresholds should be redesigned to reflect actual costs of food, clothing, shelter, and a small amount for other necessities rather than just an approximation based solely on food costs. Citro and Michaels also point out the problem with using poverty thresholds determined from after-tax income data while the resources that are measured to determine poverty status are measured before taxes.

2. Alternative Poverty Measures

In response to the inherent problems in the official poverty rate, there are alternative poverty measures used in some situations. The U.S. Department of Health and Human Services developed and uses an alternative to the official U.S. government poverty rate. These guidelines are basically a simplified version of the poverty thresholds developed by Orshansky and are used by many different governmental agencies ("The 2011 HHS Poverty Guidelines").

There are also non-governmental groups that have developed alternative poverty or need-based standards. One of these is the Self-Sufficiency Standard developed by the Center for Women's Welfare based in the School of Social Work at the University of Washington. Most notably, the Self-Sufficiency Standard is different from the federal poverty measure in that the Standard is based on the cost of housing, child care, food, health care, transportation, taxes, and miscellaneous costs rather than just the cost of food. The Standard also uses local costs of goods to create the standards used so that geographical differences in prices are taken into account. Another interesting difference is that the Standard adjusts based not only on the number of children in families, but also by the age of the children to factor in the differences in the cost of childcare at different ages ("The Self-Sufficiency Standard"). The Self-Sufficiency Standard is a much more delicate measure of basic need than the federal poverty thresholds and addresses some of the large issues inherent in the federal thresholds.

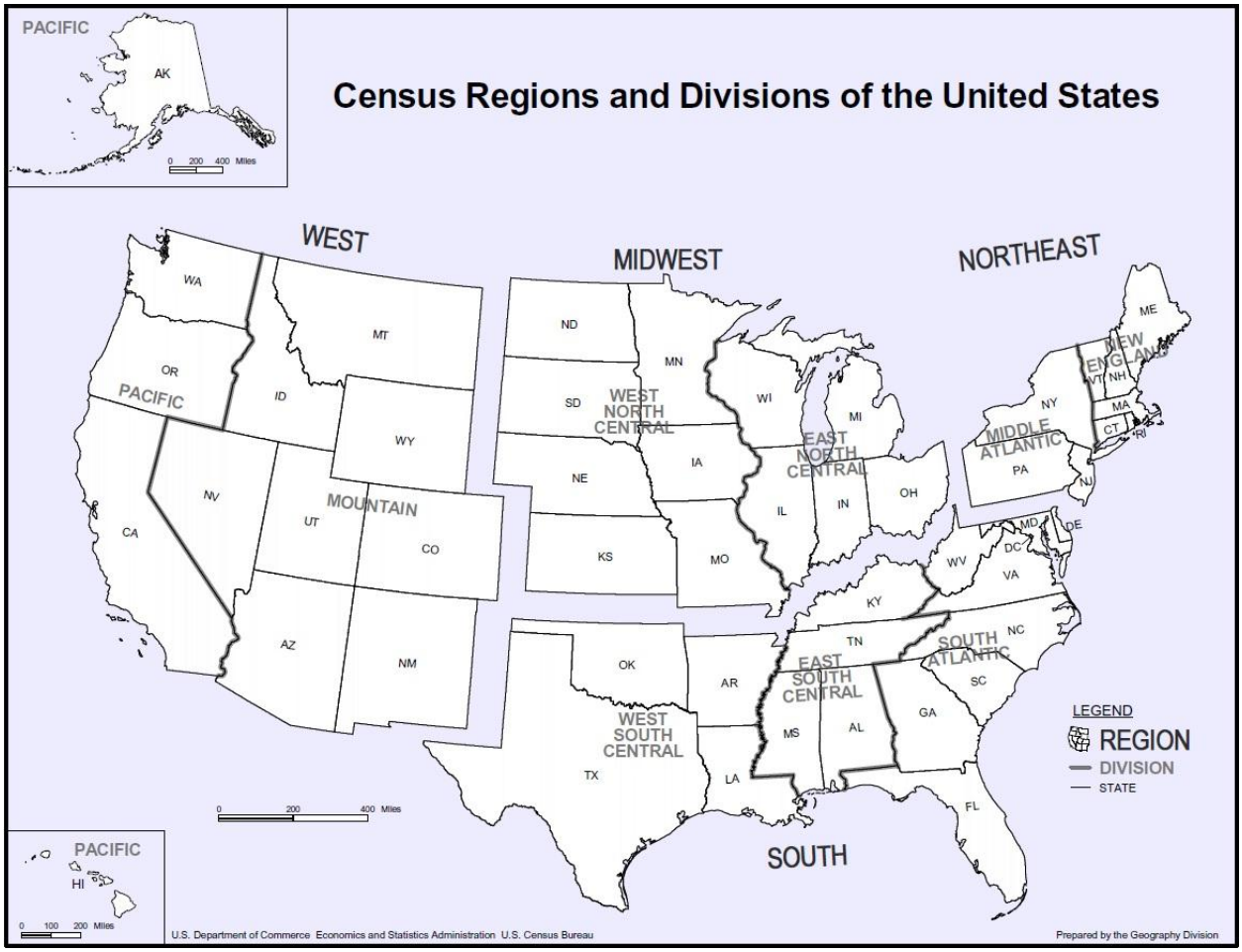
There is disagreement over what the "best" measure of poverty is or should include, but for data purposes there is little option. The poverty rates published by the Census Bureau based on Orshanksy's poverty thresholds are consistent across the entire United States and are available down to small geographic levels. For these reasons, the poverty rates available from the Census Bureau are used in this thesis.

B. Geography

As stated, poverty is an international issue and as such, it is examined at every geographic level in the world. Research has been conducted on the international level and on countrywide levels, especially on third world countries. Research has also been conducted below the country wide scale, and this thesis will focus specifically on poverty research conducted below the country level in the United States.

There are several possible levels at which sub-national research can be conducted. Perhaps the most obvious geographic breakdown would be to the individual state level. There are, however, other breakdowns possible. The U.S. Census Bureau breaks down the United States into Census Regions and Divisions. Figure 1is a map of this breakdown.

Figure 1 – Census Regions and Divisions of the United States



Source: Geography Division, U.S. Census Bureau

There are four Regions and nine Divisions by this breakdown. Triest (1997) and Powers and Dupuy (1994) used these breakdowns in their research in order to determine regional differences in poverty rates.

The U.S. can be disaggregated into smaller levels below states, Census Divisions, or Regions. Using political boundaries, below states are counties. Counties are small areas and have been used in some research articles. Levernier, Partridge, and Rickman (2000) and Rupasingha and Goetz (2007) both used counties as the basis of their research.

There is also another way to divide the United States. This is by Metropolitan Statistical Area (MSA or metro area). The Office of Management and Budget officially defines MSAs:

> A "Metropolitan Statistical Area [is] a Core Based Statistical Area associated with at least one urbanized area that has a population of at least 50,000. The Metropolitan Statistical Area comprises the central county or counties containing the core, plus adjacent outlying counties having a high degree of social and economic integration with the central county or counties as measured through commuting" (Office of Management & Budget).

Metro areas are basically small economies. They are labor markets. Metro areas do not cover the entire United States, but they do cover the majority of it geographically and especially by population.

Below even metro areas or counties, poverty could be examined at the township, city, or even Census tract or block level. These geographic areas are quite small, but there is some research that has been conducted at this level. This research includes Nizalov and Schmid (2004) who used Census block regions.

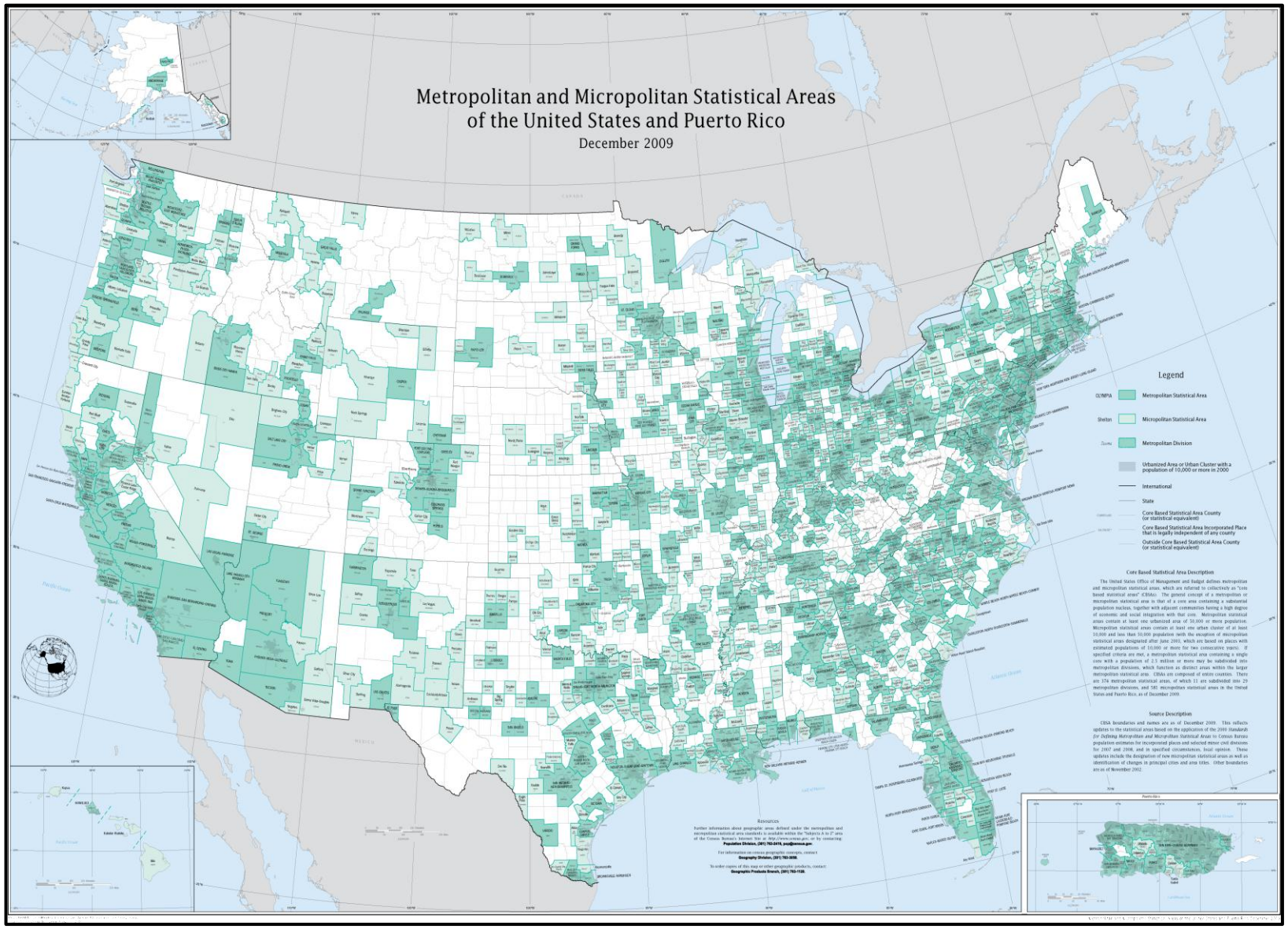
Metropolitan statistical areas were determined the best geographic method to examine poverty rates. One reason is that they reflect economic boundaries rather than political. In addition, they are small areas, yet still large enough to allow the use of more recent data that wouldn't be available for smaller regions such as micropolitan statistical areas, counties, or census tracts. Lastly, metro areas cover the majority of the U.S. population.

Figure 2 displays the metropolitan and micropolitan statistical areas in the United States. Metro areas are shown in the darker green color, while micropolitan statistical areas are shown in the lighter green. Micropolitan statistical areas were not utilized in this research because of data constraints[1].

As of 2012, there are 366 metro areas in the United States. In the following figure, it can be seen that these metro areas only cover a portion of the U.S. geographically; there is a portion especially in the central U.S. not covered. However, when examining by population coverage rather than land coverage, metro areas do cover a majority of the United States. Using 2008-2010 American Community Survey data from the U.S. Census Bureau, these 366 metro areas covered 83.6% of the total population of the country.

[1] Micropolitan statistical areas (micro areas) are very similar to metoropolitan statistical areas except that the micro areas are smaller both in overall and core area size. Micro areas have a population between 10,000 and 50,000 (Office of Management and Budget). The data used in this project are three year American Community Survey estimates. These estimates are only recommended for use for areas that have a population of 20,000 or greater ("When to Use"). Because of this discrepancy and the belief that more current data would be better to use rather than utilizing data from a larger time period, the micropolitan statistical areas were not examined in this research.

Figure 2 – Metropolitan Statistical Areas of the United States and Puerto Rico



Source: Geography Division, U.S. Census Bureau

C. Determinants of Poverty

Poverty is a complex issue and as such, there are many determinants that have been tested to see if they cause poverty. The following sections explain what some of these previously-discovered factors are.

1. Economic Determinants

a) Employment

Various measures of employment have been examined as determinants of poverty. Rupasingah and Goetz (2007) and Brunot (2011) found that the higher the percentage employed out of the total population, the lower the poverty rate. Rupasingah and Goetz (2007) and Levernier, Partridge, and Rickman (2000) also tested employment growth rates over time, but the employment growth rates could not be determined to affect poverty rates. These two studies also looked at the labor force participation rate in metro areas and determined that the higher the labor force participation rate of females, the lower the poverty rates observed. Overall, past literature indicates that the higher the percent employed and female labor force participation rates are, the lower poverty rates are.

Rupasingah and Goetz (2007) also examined proprietorship employment specifically. Total employment can be separated into those workers that earn wages and salaries and those that are proprietors. Rupasingah and Goetz theorized that some proprietorships are the result of entrepreneurs and could signal the strength of local economies. Stronger local economies could lead to less poverty. They found that there was a negative relationship between the number of proprietorships and poverty rates in metro areas.

b) Industry

Previous research not only looked into how many people were working, but also into which industries they worked. Rupasingah and Goetz (2007) found that the percentage of the population employed in agriculture, manufacturing, transportation, trade, and finance and insurance were negatively related to poverty rates. This reinforces the research done by Levernier, Partridge, and Rickman (2000) which also found that the percentage of the population employed in trade and finance, insurance, and real estate were negatively related to poverty, but contradicts their finding that the percentage of the population employed in agriculture was negatively related. In addition, Levernier, Partridge, and Rickman found that the percentage in the goods producing industry was negatively related to poverty, the percentage in the services industry was positively related, and the percentage in the transportation and public utilities industry was either positively related or insignificant. Slack et al (2009) in a study of poverty in the Texas borderland and lower Mississippi delta, found that there was a positive relationship

between poverty and the percent employed in the agriculture industry, meaning that farming communities tended to be poorer. In summary most research shows a negative relationship between the percentage of employment in most industries examined and poverty rates. Agriculture and the transportation and public utilities industries are the exceptions with some studies showing percentage of employment in these industries to increase poverty rates while others show decreasing poverty rates.

Past research also examined how industry employment changed over time in metro areas. Rupasingah and Goetz (2007) support the research by Levernier, Partridge, and Rickman (2000) that found that short-term shocks destabilize local job markets and therefore increase poverty rates through the use of the industrial dissimilarity index. This industrial dissimilarity index measures the changes in employment in industry categories between 1988 and 1999.[2] If there are a lot of changes in employment from people switching industries, the index will be high and this is theorized to indicate that there was a shock to the local job market and higher poverty rates will result.

c) Occupation

Occupation is a similar category to industry, but there does not seem to be as much previous research into the effect of occupations on regional poverty levels in the United States. Nizalov and Schmid (2004) factored occupation into their analysis of poverty rates in Michigan by using an occupation structure variable. This variable measured the share of production, transportation and material moving occupations out of the total in the regions. This variable proved to be inconsistent as well as insignificant across all regional types examined except for the metro adjacent Census block groups where the occupation structure variable increased poverty rates. These metro adjacent Census block groups are those that are in southern Michigan along with the metro areas located in Michigan. The metro adjacent Census block groups are somewhat rural in nature. This means that Census blocks with higher shares of people in production, transportation, and material moving occupations in areas outside of cities in southern Michigan experience less poverty. Occupation did not have an effect on other types of Census blocks.

d) Income Inequality

Income inequality is a closely related subject to poverty. Madden (1996), Rupasingah and Goetz (2007), and Brunot (2011) all found that income inequality is positively related to the poverty rate in metro areas. When income inequality is higher, the poverty rate is higher.

[2] Specifically, the industrial dissimilarity index used was the sum of the absolute changes in the share of one-digit industry employment during 1988 to 1999, divided by 2.

There is some debate as to whether there is reverse causation between income inequality and poverty rates. De Sousa-Brown and Gebremedhin (2004) tested for this in their analysis of poverty and income inequality in West Virginia. Hausman's test examines the dependent variable and variable under question and tests to see if there is reverse causation or simultaneity between the variables. In their research, De Sousa-Brown and Gebremedhin, utilized this test which gave a residual that was not significant and suggests that there was no simultaneity or reverse causation between the poverty rate and income inequality.

e) Past Dependence

Previous shocks to economies can persist over time and influence present poverty rates. Nizalov and Schmid (2004) and Partridge & Rickman (2003) recognized this and included the poverty rate from the previous Census to control for the effect. The previously reported poverty rate in Nizalov and Schmid's analysis proved significant in a model of rural areas. This led to the conclusion that there is connection between rural poverty and poverty traps. One explanation of this event is that local education may be funded by local finance rather than the state in these areas. This local-financed education would be of lower quality because the citizens are already poor themselves and this lower quality education would increase the chances of these children remaining in poverty.

A related variable was used by Madden (1996). She examined the relationship between the poverty rate in 1980 and the percent change in poverty rates in 1979 to 1989 in metro areas. Madden concluded that there was a negative relationship between the poverty rate in 1980 and the change in poverty rate over the next ten years. This means that the higher the beginning poverty rate, the smaller the increase in poverty observed afterwards.

These studies suggest that both the previous duration of observed poverty and the magnitude of the poverty in the past affect the current poverty rates observed across areas.

2. Demographic Determinants

a) Age

Many researchers examined the effect of the age composition of the areas of study on poverty. Brunot (2011) and Rupasingah and Goetz (2007) used three age groups. These were children or those under 18 years, young adults from 18 to 24 years, and seniors aged 65 and over. Rupasingah and Goetz concluded that the less than 18 years and 18 to 24 years age groups increased poverty rates and Brunot found that all three of these age groups increased poverty rates. Levernier, Partridge, and Rickman (2000) used slightly different age groups. These were 18 to 24, 60 to 64, and 65 and over, but there was not a consistent result across the models analyzed. Madden (1996) only studied the 65 and over age group, but found a significant positive relationship between the group and poverty rates. Previous research has been unable to

find a consistent effect of age groups on poverty, but it appears that higher percentages of both the young and old contribute to poverty rates in areas.

b) Race or Ethnicity

The race or ethnicity of a population could also be thought to determine poverty rates. Brunot (2011) found that the percentage of African Americans or blacks in a metro area were negatively related to poverty rates. Levernier, Partridge, and Rickman (2000) and Madden (1996) also reached this conclusion across many of their models examined. The greater the percentage of African Americans in a metro area, the lower the poverty rate will be.

The percentage of non-African American minorities can also be examined. Levernier, Partridge, and Rickman (2000) found that the percentage of non-African American minorities was positively related to poverty rates across counties in the United States. Brunot (2011) also examined the percentage of other minorities besides black or African American in a metro area as a percent of total population, but he found that in all models the variable ended up being insignificant. The study by Rupasingha and Goetz (2007) split the difference between these two other studies. They found that non-African American minorities were determinants of poverty rates across all counties, but when examining only those counties in metro areas non-African American minorities were actually negatively related to poverty rates. There is not a clear consensus on the effect non-African American minority populations have on poverty rates.

The percentage of the population that is foreign-born has also been researched. Brunot (2011) found that higher percentages of foreign-born people led to decreased poverty rates in metro areas. Rupasingah and Goetz (2007) had alternating results depending on the geographic areas examined. When examining all U.S. counties, they found a significant negative relationship. When examining only metro areas in the U.S., they found a significant positive relationship. This means that when looking at all counties a higher percentage of foreign-born people leads to decreased poverty, but when examining only counties in metro areas the opposite occurs. Slack et al. (2009) also examined foreign-born residents and their impact on poverty rates in the Texas Borderland and Mississippi Delta. They found a significant positive relationship between the percentage of foreign-born residents and poverty rates among married couple-headed families. These three studies find different results so it is unclear what the true role is that ethnicity plays in determining poverty rates.

c) Education

Education is an important variable that many researchers include in poverty studies. Brunot (2011) broke down education levels by percent of the population that had at maximum less than a high school diploma, some college, a bachelor's degree, and more than a bachelor's degree. His research showed that higher percentages of the population with less than a high school degree increased poverty rates. The other categories were insignificant at least some of

the time, but in some models the percent of the population with a bachelor's degree displayed the negative relationship expected by intuition. Rupasingah and Goetz (2007) and Levernier, Partridge, and Rickman (2000) broke down education level similarly and found that the percentage of the population that had a high school education plus some college and the percentage of the population that had a college education were both related to lower county poverty rates. Slack et al. (2009) examined the percent of the population with less than a high school degree and found that it was positively related to poverty among married couple-headed families in the Texas Borderland and Mississippi Delta regions. Overall, research indicates that the more educated a population is, the lower the incidence of poverty observed in that population.

d) Single-Headed Households

Households headed by single individuals have been researched as sources of poverty. Brunot (2011), Triest (1997), and Levernier, Partridge, and Rickman (2000) all examined the percent of female-headed families and the relationship to poverty rates. All three studies found that there was a significant positive relationship between female-headed families and the poverty rates observed in the region meaning that the more female-headed households in a region, the higher the poverty rate. Madden (1996) somewhat opposes these studies because although she found a significant positive relationship between female-headed households and poverty rates at first, when she controlled for other variables female-headed households became insignificant in her analysis. Nizalov and Schmid (2004) used a slightly different variable to determine the effect of the number of adults in a family on poverty rates. This variable measured the average number of working age adults per household in a region and was positively related to poverty rates in rural areas and negatively related to poverty rates in metropolitan areas. This means that the more working age adults in a family in rural areas, the higher the poverty rates observed while in metropolitan areas the opposite occurs. Overall, much research indicates that single-headed families—and especially female-headed families—increase poverty rates, but there is some dissenting research.

e) Migration

Migration rates have also been studied in previous literature. Rupasingah and Goetz (2007) and Madden (1996) show that increased migration rates lead to lower poverty rates. Levernier, Partridge, and Rickman (2000) also examined migration rates, but were unable to find a consistent result across models. Testing that included all their determinants indicated that areas with more long-term residents had increased poverty rates. But models that did not include some of the economic variables such as industry mix, found that migration rates were an insignificant cause of poverty. Brunot (2011) supports this second conclusion from Levernier, Partidge, and

Rickman (2000) when he examined the percent of the population that moved into a metro area from an outside county in a previous year, but found that the relationship was insignificant.

Nizalov & Schmid (2004) also included in-migration rates in their analysis. They noted, however, that there is a selective migration phenomenon that occurs naturally which may be especially noticeable at small geographic levels of analysis such as the Census Block Groups their research used. To control for this, Nizalov and Schmid (2004) included the percentage of retirees in the local population and a dummy variable that captured whether there was a college or university present in order to control for migration of students. These controls proved significant in some models with the share of retirees decreasing poverty rates and the college town dummy variable increasing poverty. The in-migration variable, however, was insignificant across models.

There is no consistent result across previous research as to whether migration rates determine poverty rates and if so in what direction.

4. Conclusions

Poverty is a complex issue and as such there are many different economic and demographic variables that have been tested in order to see if they cause the differences in poverty rates across regions in the United States. In the following theory section, some of these criteria will be selected for use in this analysis and explained further.

III. Theory

This research theorizes that family poverty rates in metro regions are a function of economic, demographic, and geographic determinants. Equation 1 illustrates this:

Equation 1: Theoretical Model

$$\text{Family Poverty Rate}_i = f(\text{Economic Causes}_i, \text{Demographic Causes}_i, \text{Other Causes}_i)$$

where $_i$ = metro area

The family poverty rate and the three types of causes are broken down into individual variables and explained further in the following sections.

A. Poverty Rate

Families work together and care for each other. At a basic level the family is the fundamental economic unit. One member of a family could provide the actual income for the unit, while the other members could be providing other benefits to the unit, but may not be providing actual income from outside the household. Families include the very young and old, but also those in their prime with lower than average poverty rates. On an individual level, one member could have no outside income and therefore be considered in poverty while another one might not, but in reality neither member might be considered to be in poverty by their own judgments or those of society at large. Family poverty rates are therefore the most appropriate measure of poverty to use because they reflect those families actually dealing with poverty.

B. Independent Variables

In the literature review section, previously tested determinants from other research were listed. The following sections explain the chosen determinants to be tested in this thesis.

1. Economic Determinants

Economic variables were examined in previous research and several of them will also be examined in this thesis to test which determine poverty rates across U.S. metro areas.

a) Employment

There are two separate theories regarding employment. One is that metro areas with lower employment rates would likely have higher poverty rates because earned income is the

majority of income people receive on average[3]. If people are not earning wages, then they are more likely to be in poverty.

The other theory regards the type of employment. Total employment can be divided into wage and salary employment which includes both full and part-time workers, or proprietors employment which includes both nonfarm and farm proprietors. This theory suggests separating out workers by employment type so that the per capita percentage of proprietorships can also be examined across metro areas as a possible determinant of poverty rates. The reason behind this theory is that proprietorships are often the result of entrepreneurs and as such an increase in the number of proprietorships could indicate a healthy economy that is able to develop and grow. This will elevate all people in the economy including those in poverty and therefore decrease the poverty rates experienced in that metro area.

b) Industrial Mix

The industrial mix in metro areas has been proposed to be a determinant of poverty rates. Many previous researchers have included percentages of the population employed across industries in their analysis. Proponents of this approach believe that in general those metro areas with higher concentrations of people employed in growing industries such as health care, education, or other professional service industries should have lower poverty rates. Oppositely, those metro areas with higher concentrations of people employed in declining industries such as agriculture or in some cases goods producing industries will experience higher poverty rates. This is caused by the declining need for these workers and the resulting unemployment and reduced income that occurs while those people find alternative jobs or enter into different industries.

In this research the top tier of industry categories will be examined. This includes thirteen categories such as manufacturing, retail, and information. A full list of these categories is included in the data section.

c) Occupation

Although much research has been conducted using industry breakdowns, disaggregating by industry may not be the best method. Occupational breakdowns could be better. Occupation is a similar category to industry, but at the same time, altogether different. There can be many different people with a wide range of occupations that all work in the same industry. For example, hospitals require doctors to examine and perform procedures on patients. At the same time, hospitals require janitorial and food service employees to run the hospital. These employees work in different occupations with quite different skill and wage levels, but within the

[3] In 2010, 64.4 percent or $7.97 trillion of all income was employee compensation. Employee compensation includes both wages and salaries and also supplements such as employer contributions to pensions, insurance, or government social insurance (Table 2.1 Personal Income and Its Disposition).

same industry. A person's income is not determined so much by her industry as by her occupation.

Metro areas with higher employment percentages in higher paying occupations should experience lower rates of poverty. Conversely, metro areas with higher percentages of employment in lower paying occupations should experience higher levels of poverty. Occupation will be compared against industry as a measure by running alternative models that only include occupation variables and comparing the results to the models containing the industry breakdown variables. It is theorized that the occupational breakdowns will be a better determinant of poverty rates than the industry breakdowns because they better reflect wage differences.

The second tier of the occupation breakdowns are used in this analysis. The first tier only breaks down occupations into a few categories that are still too aggregated to be of policy-making use. The second tier breaks these categories down further and provides a similar breakdown to the industry breakdown. Because one of the goals of the subsequent analysis in this thesis is to compare how well using occupational breakdowns is against industry breakdowns, the more similar the breakdowns are, at least aggregation-wise, the better.

d) Income Inequality

Income inequality is closely related to poverty and should be examined because of these close ties. If there is strong income inequality in a metro area, then there will be both more wealthy people and more people in poverty. If there is less income inequality, then people will be clustered more around the average income and there should be fewer people in poverty.

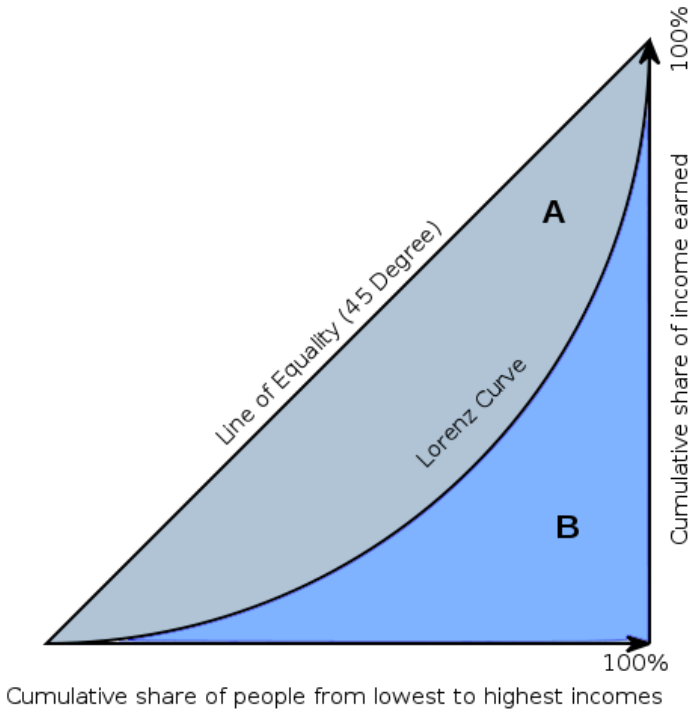
An issue arises though as to whether income inequality actually causes poverty. De Sousa-Brown and Gebremedhin (2004) examine the issue as to whether there is reverse causation between income inequality and poverty rates. However, Rupasingah and Goetz (2007) and Madden (1996) both examined income inequality in their research and there is much literature solely connecting income inequality to poverty rates. These facts support the examination of the effect of income inequality on metro area poverty rates.

Income inequality is commonly measured by the Gini Index. The Gini Index is a number theoretically between zero and one. At the extreme value of zero, the Gini Index represents that in the set being examined that income is equally spread among all people. Everyone has an equal share of earnings. At the opposite extreme of one, the Gini Index states that there is one person out of the N possible people in the set that has all the income earned in the set.

This method can be represented in a graph as shown in Figure 3. Along the horizontal axis is the population being examined lined up in order from left to right by low to high income. The vertical axis represents the cumulative shares of income earned. If incomes were completely equal, then going from left to right, income earned would increase along a perfect 45 degree line known as the line of equality. A population with any inequality will be visually represented by alternative Lorenz Curves. These curves are convex to the axes, representing that the left most

people in the population contribute less to the cumulative share of income earned than people with higher incomes to their right. The actual Gini Index is equal to A divided by the sum of A plus B in the graph below. The closer to the 45 degree line, the smaller is A, and the lower is the Gini Index.

Figure 3 – Gini Index/Lorenze Curve Diagram



2. Demographic Determinants

Along with economic variables, some demographic variables have also been found to determine poverty rates. The following demographic variables are theorized in this thesis to affect poverty rates across U.S. metro areas.

a) Age

The young and old are often thought to have higher poverty rates than their middle-aged peers because they have lower incomes perhaps from lack of experience or higher expenses perhaps from higher medical costs. Because of this theory, it follows that metro areas with higher concentrations of people in those age groups would experience higher poverty rates. Rupasingah and Goetz (2007) found in their research that the age groups of 18 and under and 18 to 24 years were significant, but the age group of 65 plus was not shown to determine poverty

rates across counties. Levernier, Partridge, and Rickman (2000) also examined age groups, but were unable to obtain consistent results.

It is theorized that those areas with higher percentages of the population in younger and older age groups will have higher rates of poverty, but with the uncertainty among past research a breakdown that allows the comparison of the three age groups will be tested.

b) Race or Ethnicity

Minorities and foreign-born residents are often thought to experience higher poverty rates and much research has been conducted to determine whether this is true. It follows that if minorities and foreign-born residents do indeed experience higher poverty rates, then metro areas with higher concentrations of minorities and foreign-born residents will also experience overall higher poverty rates. Levernier, Partridge, and Rickman (2000), Rupasingah and Goetz (2007), and Madden (1996) all examined at least some minority category and found that higher concentrations of non-African American minorities lead to increased poverty rates across regions while higher concentrations of African Americans lead to decreased poverty rates. Brunot (2011) found a contrasting conclusion in that higher populations of foreign-born residents actually decreased poverty rates in metro areas.

For this thesis, it is theorized that a higher percentage of non-black minorities increases poverty rates in U.S. metro areas, while higher percentages of black or African Americans, and foreign-born residents actually lower poverty rates.

c) Education

Education is widely viewed as a key to success and this also holds true with reducing poverty rates. The more educated a population is overall, the lower the observed poverty rate. Many previous researchers including Rupasingah and Goetz (2007) and Levernier, Partridge, and Rickman (2000) have found that higher concentrations of more highly educated people in counties cause lower poverty rates. This is logical because the more educated a person becomes, the more employment options there are available and in addition, better decisions can be made in all situations. Higher percentages of more highly educated people in metro areas should decrease poverty rates.

d) Female-Headed Households

In the United States women still experience lower salaries than their male counterparts in some occupations. This can place women and their families at a disadvantage if they are the head of household. This disadvantage can lead to more female-headed households experiencing poverty and a relatively higher concentration of female-headed households in a metro area could

lead to higher poverty rates for that metro area. Levernier, Partridge, and Rickman (2000) reached this conclusion in their research.

e) Migration

There are alternative theories as to how migration affects poverty rates. One theory is that migration leads to increased poverty rates because as individuals and families move, they lose their social safety nets and are more likely to end up in poverty if unfortunate events occur. If a family moves, they may experience lower income and a higher likelihood of being laid off from a new job which could increase the chances of entering poverty. Families also may not have the social ties in their new local communities that may have otherwise helped the family avoid poverty. These situations increase poverty rates.

An opposing theory is that migration reduces structural unemployment problems and allows people to find the best job match for their skills. In other words, people move from places that have fewer opportunities for them to places with more opportunities. This leads to greater efficiency and rising incomes and therefore a decrease in poverty rates.

At the same time not all people may have the same ability to relocate. People who are already well off would not face the same economic hurdle that a person already in poverty would face. This may lead to areas experiencing high outward migration to see a reduction in people with high incomes relative to those in poverty, which would increase the poverty rate in those metro areas.

Out of these three theories, the theory that migration reduces structural unemployment and results in decreased poverty rates provides a better or stronger implication for migration. When families migrate, they should almost always migrate in such a way as to make their lives better off. While the first theory may also be true, it does not apply to all situations and should be overpowered by the characteristics of the second theory. Rupasingah and Goetz (2007) and Madden (1996) both support this theory by finding that those areas with more long term residents had higher rates of poverty observed. In this study, migration rates are theorized to decrease poverty rates in metro areas.

3. Summary

Table 2 provides a summary of the theorized variables and the expected effect on family poverty rates across U.S. metro areas.

Table 2 – Summary of Variables and Expected Relationship with Family Poverty Rates

Variable	Description	Expected Sign
Dependent Variable:		
Family Poverty Rate	Poverty rate of families in metro areas	
Independent Variables:		
% Pop. Employed	Percent of the total civilian population employed	-
Proprietorships	Percent of the total civilian population self-employed	-
Income Inequality	Gini Index stating how unequally distributed income is	+
< 18, 18 to 24, & 65+	Percent of total population in respective age groups	+
Black	Percent of total population that is African American	-
Non-Black Minorities	Percent of total population that are of a non-African American minority	+
Foreign-Born	Percent of total population that is foreign-born	-
Less than High School	Percent of population aged 25+ with less than a high school diploma	+
High School	Percent of population aged 25+ with a high school degree or equivalent	-
Some College	Percent of the population aged 25+ with some college education	-
Bachelor's Degree	Percent of population aged 25+ with a bachelor's degree	-
Female Head	Percent of total families headed by females	+
Migration Rate	Percent of total population that moved into a county in the metro area from another county within the previous year	-
Industry Variables	Percent of civilian population 16 or older working in each industry	+/-
Occupation Variables	Percent of civilian population 16 or older working in each occupation	+/-

C. Modeling Issues

There are several modeling issues that need to be accounted for during the modeling and subsequent analysis of a model such as this one. The following provides a summary of the issues involved and what past research and theory suggests be done in order to correct for the issues.

1. Endogeneity

Endogenous variables are those that are simultaneously determined in a model versus those that are not (the exogenous variables). Endogenous variables cause feedback effects or dual causality, and require the application of simultaneous equations. An endogenous variable (Y) is one in which at least one of its own determinants (X) is also dependent on the variable itself (Y). Endogeneity creates a cycling effect where if one variable changes, the other changes, which then causes the initial variable to change again. This leads to the coefficients in the resulting equation to be biased. Simultaneity bias is the condition where "the expected values of the OLS-estimated structural coefficients (βs) are not equal to the true βs. These estimated coefficients are also inconsistent. That is, the expected values of the β do not approach the true β even if the sample size gets quite large" (Studenmund & Cassidy, 344).

Endogeneity is a problem of theory. Do poverty rates depend in part on the number of people without a high school degree? Or does the number of people without a high school degree depend on the poverty rate? Two opposing theories could logically be argued and both would likely be partially true.

In models with such unclear directions of causation, there are two approaches that could be taken to help eliminate some of the bias involved. One is the use of two-stage least squares (2SLS) regression as opposed to ordinary least squares. The other is the use of lagging independent variables.

Two-stage least squares regression involves the use of instrumental variables. "An instrumental variable replaces an endogenous variable (when it is an explanatory variable); it is a good proxy for the endogenous variable that is independent of the error term" (Studenmund & Cassidy, 348). These instrumental variables are used because when using ordinary least squares regression, simultaneity bias occurs.

The first stage in the process of two-stage least squares regression is to "find the reduced-form equations[4] for each of the endogenous variables that appear as explanatory variables in the structural equations in the system, and then apply OLS to each of these reduced-form equations." The resulting estimated dependent variables are the "instrumental variables that are used as proxies in the structural equations of the simultaneous system." (Studenmund & Cassidy, 348)

[4] Reduced form equations are "equations that express a particular endogenous variable solely in terms of an error term and all the predetermined (exogenous plus lagged endogenous) variables in the simultaneous system" (Studenmund & Cassidy, 343).

Stage two of the process involves substituting "the reduced-form…(instrumental variables) for the [variables] that appear on the right side only) of the structural equations, and then estimate these revised structural equations with OLS" (Studenmund & Cassidy, 348).

The problem with using two-stage least squares regression is that the estimates are still biased in the resulting equation, although they would approach the true values as the sample size increased. In addition, this process is quite involved and yields results that may ultimately not be much better. Simply lagging the endogenous independent variables could be more appropriate.

Lagging the independent endogenous variables also helps eliminate some of the bias created in models with endogeneity issues. Lagged endogenous and exogenous variables are together called predetermined variables. These predetermined variables are "implied to be determined outside the system of specified equations or prior to the current period." (Studenmund & Cassidy, 340) If the variables are determined outside of the system of equations, then the simultaneity in the system is theoretically eliminated, the endogeneity issue is avoided, and the estimated coefficients in the model using OLS regression should be appropriate. In practice, not all endogeneity bias will be removed from the resulting model, but it does help correct the issue.

Given the marginal costs involved in using two-stage least squares regression and the fact that the results may be no better than simply lagging the endogenous variables in the model, thereby making them predetermined variables, the dependent variables in the models estimated in this thesis will be lagged in an effort to eliminate endogeneity bias. This choice is supported in past research by Rupasingha & Goetz (2007) in which all the dependent variables were also lagged. In addition, Madden (1996) notes the issue of endogeneity, although she chose not to correct for it in her research.

2. Heteroskedasticity

Heteroskedasticity is the violation of the condition of OLS which requires that "the error terms are drawn from a distribution that has a constant variance" (Studenmund & Cassidy, 244). Studenmund and Cassidy state three results of heteroskedasticity:

1. It does not cause bias in the coefficients estimates, but the estimates may not be accurate due to the following two results.
2. It increases the variances of the β distributions.
3. It causes OLS regression to underestimate the variances of the coefficients.

In summary, heteroskedasticity gives falsely high t-stats, and tends to give higher level of significance than is appropriate. There are multiple methods to test and correct for heteroskedasticity, but in this thesis the White test and correction will be used.

3. Multicollinearity

Multicollinearity is "the violation of the assumption that no independent variable is a perfect linear function of one or more other independent variables" (Studenmund & Cassidy, 179). Perfect multicollinearity is avoided in part by avoiding the use of all categories of a breakdown such as age group. The consequence of multicollinearity is that the variances of the variables will increase and the resulting t-statistics will fall, but the overall estimates will remain unbiased and the ultimate fit of the equation will not be affected much (Studenmund & Cassidy, 184-186). In other words, the results underestimate the statistical significance of the variables involved.

To fix multicollinearity, there are four approaches that could be used according to Studenmund and Cassidy:

1. Do Nothing – since the overall fit and estimates may not largely change even with the multicollinearity, doing nothing to correct the multicollinearity may be the best option. There would be some bias in the resulting model, but any of the other methods of correction could introduce even more bias into the model and create an even worse case. The problem is that with the incorrect t-statistics, the hypothesis tests on individual variables are wrong.
2. Drop One or More of the Multicollinear Variables – "multicollinearity is caused by correlation between the explanatory variables; without all the multicollinear variables in the equation, the correlation no longer exists, and any multicollinear consequences also cease to exist."
3. Transform the Multicollinear Variables – This method is commonly done by creating a linear combination of the multicollinear variables or by transforming the equation into first differences or logs. A problem with using linear combinations is that the estimated coefficient is forced to be used on both of the original variables, which may not be reliable. A problem with first differences is that it may change the variable being measured into something that is not desired to be modeled.
4. Increase the Sample Size – multicollinearity is a sample problem and as such, increasing the sample size would eliminate some of the issue. However, given data restrictions this is ultimately usually not a solution and is not an option in this research.

The specific methods taken to address multicollinearity in the resulting models in this thesis are addressed as they occur in the analysis section.

IV. Data

A large portion of the data used in this thesis was obtained from the American Community Survey (ACS) from the U.S. Census Bureau. The American Community Survey data are estimates conducted instead of true census counts. Previous research to a large extent relied on decennial census data. At the time of these studies, this database was most likely the best available. The American Community Survey was just beginning to issue estimates in 2000 and the data was limited until even more recently than that. Starting with the 2010 Census, however, the Census Bureau stopped conducting the long form census and is instead relying solely on the ACS estimates. The long form census traditionally measured poverty rates and other economic and demographic characteristics. As a result of these actions, the ACS data are used in order to have the most recent data in this study.

The American Community Survey offers three different ranges of estimates. These are one, three, and five year estimates. Each estimate range has benefits. The one year estimates are more current, but at small geographic levels the margins of error are quite large. The five year estimates are the most accurate especially for small geographic areas, but they are also the farthest from the recent period and are estimates for the entire five year period rather than just a single year. The three year estimates provide a middle ground on these estimates. Metro areas are large enough to be measured accurately by the three year estimates and as such, data from the most recent 2010 three year ACS estimates are used for the poverty rate and the previous three year period measured in the 2007 three year ACS estimate is used for the independent variables[5].

There are 366 metro areas in the United States and there is data available for every characteristic examined for 360 of these metro areas with the exception of the industry and occupational breakdowns. Information on the omitted metro areas in each of these categories is provided in each respective section on the following pages.

It also needs to be noted that this data is taken from a time when the U.S. was experiencing a severe recession. As such, this data and the subsequent analysis may not represent a "typical" period of time, although many of the results would be assumed to hold true.

A. Poverty Rate

The 2010 ACS 3-Year Estimate of Family Poverty Rates were calculated from the data table B17010, which contains the poverty status in the past 12 month of families by family type by presence of related children less than 18 years of age. Specifically, the number of families in poverty was divided by the total number of families in each metro area in order to find the percent in poverty. These percentages are the rates used.

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[5] The 2010 three year ACS estimates are from the years 2008 through 2010. The 2007 three year ACS estimates are from the years 2005 through 2007. All independent variables use the 2007 ACS data. This process is done to introduce a lag in order to avoid simultaneity bias.

B. Determinant Variables

1. Economic Determinants

a) Employment Rate

Employment rate data were calculated using data from ACS tables B24080 and B02001. Table B24080 contains data on employment of civilians aged 16 and older. Table B02001 provides data on the total population of each metro area. Dividing the employment levels by the total population levels in each metro area to find the percent employed are the employment rates used in this research.

b) Proprietorship Employment

ACS Table B24080 provides data on the number of people aged 16 and above employed by different business types, including those self-employed in unincorporated businesses. This number of self-employed in unincorporated businesses is used to measure the number of proprietors in metro areas.

The number of people employed by proprietorships was divided by the total population for each MSA in order to calculate the proprietorship employment rates, so this variable actually measures the percent of local population employed in proprietorships.

c) Industrial Mix

Employment by industry for the civilian population aged 16 and over is provided in the ACS table B24030. This table provides estimates of the number of people employed in each of the 13 major NAICS industries[6]. Employment rates were calculated and are the percentages of people employed in each industry out of the total civilian population aged 16 and over. Figure 4 shows the correlation between the poverty rate and the percentage of the civilian population aged 16 and over employed in the education, health care, and social assistance industry. It is determined that there is a positive correlation between employment in this sector and the poverty rate.

One issue with this industrial data is that there are 59 metro areas that do not have employment by industry data available. For the model utilizing industry data, this creates a total of 65 metro areas not included from the total of 366[7]. Although these 65 metro areas are almost a sixth of the total metro areas in the U.S., they contain much less of the total metro area population. Only 3.3 percent of the total population of the 366 metro areas is in the missing 65

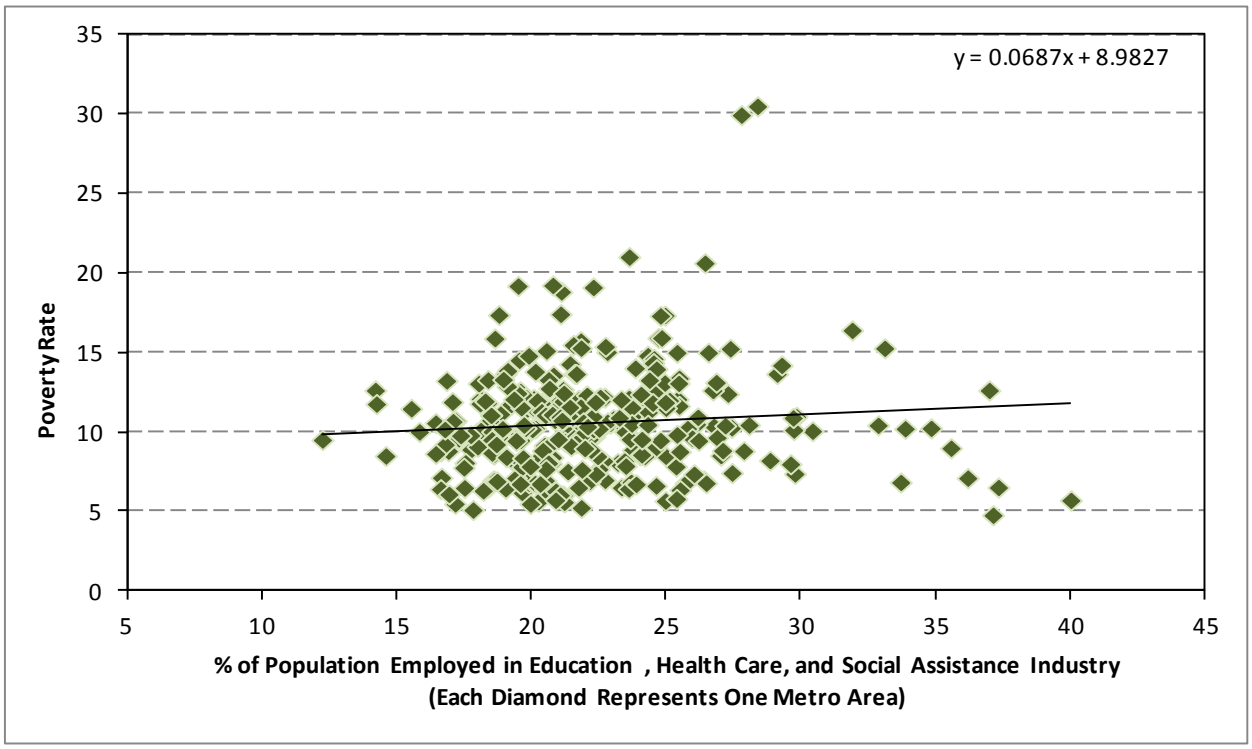
[6] The 13 major NAICS industries are: agriculture; construction; manufacturing; wholesale; retail; transportation; information; finance and insurance; professional, scientific, and technical; education, health, and social assistance; arts, entertainment, and recreation; other services; and public administration.

[7] There are 59 metro areas missing industry data plus the 6 original metro areas that were missing. This creates a total of 65 metro areas excluded from the industry analysis model.

metro areas. This means that by using the 301 remaining metro areas in the analysis, 96.7 percent of the total population of all metro areas is still captured. The metro area populations can also be compared to the entire U.S. population. Metro areas accounted for 83.6 percent of the entire U.S. population and the omitted metro areas in this study only made up 2.8 percent of the entire U.S. population. The majority of the U.S. population is covered in this analysis.

In addition, these omitted metro areas do not seem to have strong commonalities. The metro areas range in size from just a little over 50,000 people to over half a million and they are scattered across the United States geographically. These differences lessen the chance even further that omitting these metro areas skews the results of this analysis. A listing of the 59 omitted metro areas along with the population in each and the percentage breakdowns is included in Table 3 in the Appendix.

Figure 4 – Correlation between Poverty Rate and the Education, Health Care, and Social Assistance Industry



d) Occupational Mix

Similar to industry, table B24010 provides data on occupations for the civilian population aged 16 and above. These numbers were then divided by the total population aged 16 and above in order to find the percentages of employment in each occupation. These percentages by occupation are the data used in this research.

These occupational mix data also do not report employment levels for some metro areas, but not to the same extent as with the industry mix data. Only three metro areas are missing

data. These specific metro areas are listed in the Appendix in Table 2 along with percentages of the population missing. These omitted metro areas only exclude 0.6% of the total metropolitan population and only 0.5% of the total U.S. population.

e) Income Inequality

Income inequality data for each MSA were obtained from the 2005-2007 ACS datasets from table B19083. Income inequality is expressed in the Gini Index.

The Gini Index is a measure of income inequality where a value of one represents perfect inequality, or where one person has all the income and everyone else has none. A value of zero in the Gini Index represents perfect income equality where every person has the exact same income. This means that higher Gini Index values indicate greater income inequality and lower Gini Index values indicate greater income equality.

2. Demographic Determinants

The following demographic determinant data are all from the 2005 to 2007 ACS 3-Year Estimates from the U.S. Census Bureau.

a) Age

Table B01001 provides data on population by age. Age breakdowns are reported in five year breaks with special breaks for ages such as 21. Select ranges of ages were calculated to be used in this study. These ranges were: under 18 years, 18 to 24 years, 25 to 65 years, and 65 plus years. The 25 to 65 age group is not included in this analysis to avoid perfect collinearity.

b) Female Heads of Household

The number of households led by single women was available from the ACS in table B11003. This table provides a breakdown of families by family type and age of children. The percentage of female headed households with children present was calculated by taking the number of families reported in the category divided by the total number of families for each metro area.

c) Education

Data on education attainment of people was provided in table B15003 of the ACS. This table provides data on the number of people over the age of 25 by each year of possible educational attainment from none to twelfth grade and then by level of college education. This breakdown allowed percentages to be calculated for those with less than a high school diploma, those with a high school diploma, those with some college education or an associate's degree, those with a bachelor's degree, and also those with education beyond a bachelor's degree. The

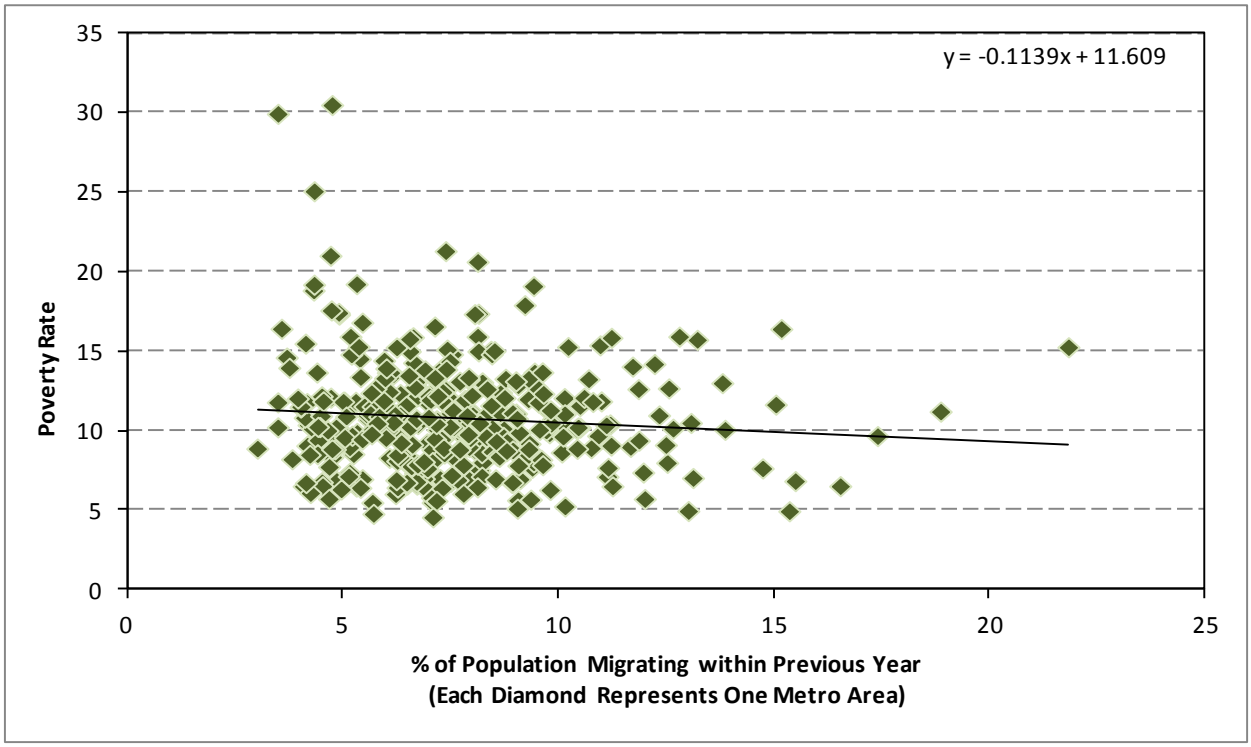
percentages were specifically calculated by taking the number in each education level and dividing by the total population

d) Migration

Table B07003 of the ACS provides data on where citizens lived in the previous year. The number of the population aged one year and over that lived in the same house in the previous year, moved to a different house within the same county, moved from a different county within the same state, moved from a different state, and moved from abroad are included in this table.

Ideally for this determinant, it would be best to have data on people that moved from another metro area or from outside a metro area into a metro area. This is not possible with the data provided, so instead the sum of the people that moved from another county, state, or from abroad was used. This method may count people that actually moved from one county to another but stayed in the same metro area, but this is the best approximation able to be made with the data available. The sum obtained is divided by the total population of the metro area aged one and over to convert to a percentage. Figure 5 shows the relationship between the poverty rate and migration rate across metro areas. This graph indicates a negative relationship meaning that higher migration rates in metro areas are correlated with lower poverty rates.

Figure 5 – Correlation between Poverty Rate and Migration Rate



e) Minorities and Foreign-Born Residents

Data on ethnicity is provided by the ACS in table B02001. The number of black or African American citizens is reported as well as the number of other minority citizens. These other minorities were then summed. This summed category and the number of black citizens categories were both divided by the total population in each metro area. These gave percentages of black or African Americans as well as the percentage of other minorities in each metro area.

Data on foreign-born residents were obtained from ACS table B05002. This table provides data on place of birth by citizenship status. Those categories that estimated the number of people born outside the U.S. were summed and then divided by the total population per metro area in order to give percentages of foreign-born residents per metro area.

C. Empirical Model

An empirical model was established based on the theory and data available. The variables used as well as a shortened name used in the actual equations and models are listed below in Table 3.

Table 3 – Variable Names with Shortened Equation Names

Dependent Variable:	
PovR	**Poverty Rate**
Independent Variables:	
EmpR	Employment Rate
SEmpR	Percent of Population Employed in Proprietorships
IIneq	Income Inequality (Gini Index)
FHoH	Female Head of Household (% of Total Families)
MigPop	% Population Migrating (Aged 1 year and older)
Age	
Child	Under 18 (% of Population)
YAd	18-24 (% of Population)
Sen	Over 65 (% of Population)
Education	
LHS	Less than a High School Diploma (% of Population >25 years old)
HS	High School Degree (or equivalent, % of Population >25 years old)
LBach	Some College (% of Population >25 years old)
Bach	Bachelor's Degree (% of Population >25 years old)
Race or Ethnicity	
Black	Black or African American (% Population)
NBMin	Other race besides white or black (% of Population)
For	Foreign Born (% of Population)

Industrial Breakdown	
Ag	% Employment in Agriculture Industry
Cont	% Employment in Construction Industry
Man	% Employment in Manufacturing Industry
Dur	% Employment in Durable Manufacturing Industry
NonDur	% Employment in NonDurable Manufacturing
Whole	% Employment in Wholesale Industry
Retail	% Employment in Retail Industry
Trans	% Employment in Transportation Industry
Info	% Employment in Information Industry
FinIn	% Employment in Finance & Insurance Industry
PrScTech	% Employment in Professional, Scientific, and Technical Industry
EdHSA	% Employment in Education, Health, and Social Assistance Industry
Ed	% Employment in Education Industry
HSAS	% Employment in Health & Social Assistance
ArtsEntRec	% Employment in Arts, Entertainment, and Recreation Industry
OthServ	% Employment in Other Services Industry
PubAdm	% Employment in Public Administration
Occupational Breakdown	
Oman	% Employment in Management, Business, Science, and Arts Occupations
OServ	% Employment in Service Occupations
OSales	% Employment in Sales and Office Occupations
ONRCon	% Employment in Natural Resource, Construction, and Maintenance Occupations
OProd	% Employment in Production, Transportation, and Material Moving Occupations

Using the shortened names of the variables listed above, the empirical model can be developed below. In the actual models produced in the following Analysis section, the first model examines all variables except for the industry and occupation breakdown variables. The second model includes the industry breakdown variables and the third model includes the occupation breakdown variables.

Equation 2: Empirical Model

$$PovR_i = \beta_0 - \beta_1 EmpR_i - \beta_2 SempR_i + \beta_3 IIneq_i + \beta_4 Child_i + \beta_5 YAd_i + \beta_6 Sen_i + \beta_7 FHoH_i + \beta_8 LHS_i - \beta_9 HS_i - \beta_{10} LBach_i - \beta_{11} BachD_i - \beta_{12} MigPop_i - \beta_{13} Black_i + \beta_{14} NBMin_i + \beta_{15} For_i +/- \beta_{16} \text{Industry Breakdown Variables}_i +/- \beta_{17} \text{Occupation Breakdown Variables}_i$$

where $_i$ = metro area, β_0 = constant

V. Descriptive Statistics

The following table provides a summary of the variables used in the models developed. Included in this table are the mean, minimum, and maximum values across all 360 metro areas examined. Also included are the names of the metro areas for each minimum and maximum value for the variable.

Out of these descriptive statistics there are several interesting relationships to note. The first one is that McAllen-Edinburg-Mission, Texas which has the highest poverty rates out of the 360 metro areas also has the largest percentage of the population with less than a high school degree. This tends to confirm the connection between poverty rate and lack of education.

College towns appear multiple times in the table. Ithaca, New York contains the smallest percentage of the population aged 18 and younger, but the largest share of those aged 18 to 24. The makes sense since Ithaca, New York contains both Ithaca College and Cornell University. Ithaca is also the largest metro area in terms of the percentage of people employed in the management, business, science, and arts occupations. State College, Pennsylvania also appears in the table with the highest percentage of people employed in the education industry out of all the metro areas in the country.

Dalton, Georgia also appears in the table in several locations. This metro area has the lowest percentage of population employed in the manufacturing and service occupations, but the largest percentage in the production, transportation, and material moving occupations. This shows that based on occupation, Dalton, Georgia is fairly specialized.

Table 4. - Variable Descriptive Statistics

		Mean	Minimum		Maximum	
Dependent Variable:						
PovR	**Poverty Rate**	10.7356	4.573	Casper, WY	30.499	McAllen-Edinburg-Mission, TX
Independent Variables:						
EmpR	Employment Rate	46.5448	31.446	Jacksonville, NC	57.101	Fargo, ND-MN
SelfEm	Proprietor's Employment Rate	6.5491	3.267	Vineland-Millville-Bridgeton, NJ	12.918	Santa Cruz-Watsonville, CA
IIneq	Income Inequality	0.4424	0.380	Monroe, MI	0.540	Bridgeport-Stamford-Norwalk, CT
FHoH	Female Head of Household % of Total Families	11.2708	4.751	St. George, UT	22.261	Hinesville-Fort Stewart, GA
MigPop	% Population Migrating	7.6671	3.031	Bay City, MI	21.856	Hinesville-Fort Stewart, GA
Age						
Child	Under 18	24.3695	15.756	Ithaca, NY	37.191	Laredo, TX
YAd	18-24	10.8762	5.939	Punta Gorda, FL	28.243	Ithaca, NY
Sen	Over 65	12.8136	5.034	Hinesville-Fort Stewart, GA	31.452	Punta Gorda, FL
Education						
LHS	Less than a High School Diploma	15.3881	4.512	Ames, IA	40.657	McAllen-Edinburg-Mission, TX
HS	High School	31.4512	15.438	Boulder, CO	49.020	Altoona, PA

LBach	Some College	28.5024	17.723	Lebanon, PA	39.836	Longview, WA
Bach	Bachelor's Degree	15.6816	6.709	El Centro, CA	31.792	Boulder, CO
Race or Ethnicity						
Black	Black or African American % of Total Population	10.5154	0.084	Lewiston, ID-WA	49.424	Albany, GA
NBMin	Other race besides white or black as percent of total population	11.5922	2.220	Johnstown, PA	94.749	Honolulu, HI
For	% Foreign Born of Total Population	7.5198	0.977	Parkersburg-Marietta-Vienna, WV-OH	36.888	Miami-Fort Lauderdale-Pompano Beach, FL Metro Area
Industry						
Ag	% Empl. in Agriculture Ind.	1.9950	0.147	New York-Northern New Jersey-Long Island, NY-NJ-PA	17.009	Visalia-Porterville, CA
Cont	% Empl. in Construction Ind.	7.7035	3.975	Elkhart-Goshen, IN	17.961	Naples-Marco Island, FL
Man	% Empl. in Manufacturing Ind.	12.5635	1.831	Anchorage, AK	40.949	Elkhart-Goshen, IN
Dur	% Empl. in Durable Man.	8.0786	0.804	Anchorage, AK	34.400	Elkhart-Goshen, IN
NonDur	% Empl. in NonDurable Man.	4.4849	0.871	Palm Bay-Melbourne-Titusville, FL	16.337	Danville, VA
Whole	% Empl. in Wholesale Ind.	3.2577	1.449	Blacksburg-Christiansburg-Radford, VA	7.228	Yakima, WA
Retail	% Empl. in Retail Ind.	12.0630	8.428	Durham, NC	18.256	Fayetteville-Springdale-Rogers, AR-MO
Trans	% Empl. in Transportation Ind.	4.7328	2.199	Santa Cruz-Watsonville, CA	11.745	Memphis, TN-MS-AR
Info	% Empl. in Information Ind.	2.1611	0.689	Decatur, AL	4.545	Denver-Aurora, CO
FinIn	% Empl. in Finance & Insurance Ind.	6.3152	3.100	Terre Haute, IN	19.664	Bloomington-Normal, IL
PrScTech	% Empl. in Professional, Scientific, and Technical Ind.	8.6424	4.002	Fond du Lac, WI	20.022	Washington-Arlington-Alexandria, DC-VA-MD-WV
EdHSA	% Empl. in Education, Health, and Social Assistance Ind.	22.2959	12.264	Las Vegas-Paradise, NV	40.054	Iowa City, IA
Ed	% Empl. in Education Ind.	9.4250	4.614	Naples-Marco Island, FL	28.263	State College, PA
HSAS	% Empl. in Health & Social Assistance	12.8709	7.107	Las Vegas-Paradise, NV	31.365	Rochester, MN
ArtsEntRec	% Empl. in Arts, Entertainment, and Recreation Ind.	8.7978	5.297	Cleveland, TN	30.166	Atlantic City, NJ
OthServ	% Empl. in Other Services Ind.	4.7308	2.983	Iowa City, IA	7.229	Midland, TX
PubAdm	% Empl. in Public Administration	4.7413	1.665	Sheboygan, WI	17.685	Olympia, WA
Occupation						
Oman	% Empl. in Management, Business, Science, and Arts Occ.	32.1901	20.794	Dalton, GA	50.712	Ithaca, NY
OServ	% Empl. in Service Occ.	17.0636	11.270	Dalton, GA	30.478	Atlantic City, NJ
OSales	% Empl. in Sales and Office Occ.	25.6987	19.441	Corvallis, OR	31.684	Monroe, LA
ONRCon	% Empl. in Natural Resource, Construction, and Maintenance Occ.	10.2194	5.540	Ann Arbor, MI	19.474	Farmington, NM
OProd	% Empl. in Production, Transportation, and Material Moving Occ.	13.8788	5.660	Washington-Arlington-Alexandria, DC-VA-MD-WV	35.230	Dalton, GA

VI. Analysis

Three separate models were examined in this research. A "Base" model was first examined which included many of the variables previously determined to affect poverty rates based on past literature. After this base model was established, industrial and occupational employment breakdowns were added to respective models. These models were developed to determine if occupational employment breakdowns are justified to be used in policy decisions in addition to the industrial employment breakdowns, which were traditionally researched.

A. Methodology

The cross-sectional data collected were analyzed using ordinary least squares regression. Testing and correction for econometric modeling issues such as multicollinearity and heteroskedasticity were used as appropriate and are discussed in the following models where they were used.

B. Base Models

The first model developed examined the traditional determinants of poverty as established through the literature review. This model includes the economic and demographic variables formerly discussed except for the theorized industrial and occupational employment breakdown variables. This model allows the standard variables to be tested alone and bring further support to the findings of the previous researchers. For the most part, the results agree with this past research.

Table 5 provides a summary of the variables, expected signs of the variables, estimated coefficients, and significance of the variables in the models. Those variables with yellow shaded results were significant in the models. The model was corrected for heteroskedasticity.

The employment rate, percent of the population that is African-American, percent of the population that was born in a foreign country, and the percent of the population in a metro area that migrated into the county within the past year were all significant and negatively associated with poverty. This means that if a metro area has a one percent increase in one of these variables, the poverty rate will decrease by the respective coefficients on each variable. For example, a 1 percent increase in the employment rate in a metro area will decrease the poverty rate by 0.256 percent.

Income inequality, the percent of the families led by single mothers, the percent of the population with less than a high school education, and the percent of the population that is 18 and under, aged 18 to 24, and aged 65 and above all increase poverty rates in metro areas. The percentage categories work the same as explained above except that a one percent increase in one of these categories increases the poverty rate by the respective coefficient. Income inequality as measured by the Gini Index increases poverty by 24.6 percent for every point increase in the index measure.

Table 5 – Base Model with Revised Models for Collinearity

Dependent Variable:				
Poverty Rate				
Independent Variables:				
(T Stats in Parentheses)	**Exp. Sign**	**Standard**	**Education**	**Employment**
Constant	+/-	-3.85 (-0.623)	-19.4 (-3.288)***	-2.94 (-0.529)
Employment Rate	-	-0.256 (-5.74)***		-0.255 (-6.898)***
Self-Employment Rate	-	-0.0299 (-0.398)		-0.0273 (-0.367)
Income Inequality	+	24.6 (3.886)***	28.2 (4.264)***	24.3 (3.919)***
Black	-	-0.0523 (-3.666)***	-0.0309 (-2.081)**	-0.0523 (-4.074)***
Non-Black Minority	+	-0.0186 (-1.20)	-0.00591 (-0.398)	-0.0182 (-1.176)
Foreign-Born	-	-0.0822 (-3.329)***	-0.0607 (-2.639)***	-0.0836 (-3.612)***
Female Head of Household	+	0.446 (7.626)***	0.481 (8.219)***	0.446 (8.221)***
Migration	-	-0.0964 (-2.436)**	-0.0342 (-0.868)	-0.0957 (-2.400)**
< High School Diploma	+	0.294 (5.86)***	0.260 (5.200)***	0.284 (10.720)***
High School Diploma	-	-0.0335 (-0.70)	-0.0757 (-1.582)	-0.0435 (-1.670)*
<Bachelor's Degree	-	0.0116 (0.252)	-0.00319 (-0.0682)	
Bachelor's Degree	-	0.0148 (0.186)	-0.192 (-2.621)***	
< 18	+	0.234 (3.206)***	0.376 (5.177)***	0.241 (3.693)***
18-24	+	0.174 (4.487)***	0.230 (5.975)***	0.172 (4.450)***
65+	+	0.0993 (1.667)*	0.250 (4.034)***	0.103 (1.856)*
N		360	360	360
R^2		0.829	0.808	.829
Adj. R^2		0.822	0.801	.823
F-Stat.		111.30	112.27	129.14
Prob. of F-Stat.		0.000	0.000	0.000

Significance: * = 10%, ** = 5%, & *** = 1%

The self-employment rate, percent of the metro population that is a non-black minority, and the percentages of the population with a high school diploma or equivalent, some college education, and a bachelor's degree were not found to be significant in this research. The self-employment rate and non-black minority variables were consistently insignificant across models and therefore can be concluded to not determine poverty rates based on these results. However, the education variables, in particular the bachelor's degree variable is highly correlated to the employment variable as can be seen in the correlation matrix in section B of the Appendix. This causes collinearity in the model and results in the education variables being insignificant in the first model. In order to show this, two additional models were run with the same variables except that in one the employment rates were dropped in order to see the effect on the education variables and in the other model the education variables were dropped to see the effect on the employment variables.

In the education model with the employment rates dropped, the bachelor's degree variable did become significant to the one percent level and with the expected negative sign. This indicates that multicollinearity is an issue in this model. In addition, in the employment model with the some college and full bachelor's degree variables dropped, did not change the significance or direction of effect for the employment rate variable. This further supports this collinearity issue.

Overall, the models were significant. The first full model had an adjusted R-squared value of .822 indicating that 82 percent of the variability in poverty rates across metro areas is explained by the significant variables. The education model has an adjusted R-squared of .801 and the employment model, .823. The F-statistics were also all above 110 further indicating the significance of the overall models.

C. Industry Breakdown Model

The next model examined considers the effect of including variables indicating the percentages of employment in different industry groups. This model was also tested and corrected for heteroskedasticity using a White test.

For the standard variables that were included in the previous model, all the significant variables display the same sign. However, some of the variables are no longer significant. The percent of the population that migrated into a metro area within the past year, the percent of the population of foreign birth, and the percent of the population that is aged 65 plus are no longer significant. The percent of the population with a high school degree and bachelor's degree are also not significant in this model, but this may be due to the collinearity between employment and the education variables as explained in the previous section. In addition, the less than bachelor's variable is significant in this model, but displays the opposite sign. This could again be a result of multicollinearity. According to theory, it does not make sense for a metro area with more of a population educated at least some beyond the high school level to experience more poverty.

Examining the industry breakdown variables reveals three significant variables. The percent of the population employed in agricultural, retail, and the finance and insurance industries are shown to partially determine poverty rates across metro areas. The retail and finance and insurance variables conform to what theory and common thought would suggest. The retail industry commonly pays lower salaries to workers, therefore if there is a larger portion of a population employed in this industry and receiving lower incomes, poverty rates would increase. Finance and insurance is the opposite. The finance and insurance industry generally requires more highly skilled workers. As such, these workers tend to earn more and if there are a higher proportion of these more highly paid workers, poverty rates should decrease. The agriculture industry variable, however, does not behave according to theory. Agriculture is generally a low paying industry and it would be thought at first glance that this industry should increase poverty rates. However, it needs to be remembered that this analysis only covers metro areas and therefore, the traditional rural setting may not apply. Although it does not follow traditional theory, the agriculture industry variable is significant to the one percent level. Through further research it would certainly be interesting to see if the agriculture industry remains a significant determinant and discover what specific factors of agricultural industry employment is involved in metro areas.

Overall this model has an adjusted R-squared of 0.839. This is better than the previous model which only had an R-squared value of 0.822. In addition, the F-statistic is 58.9 which is significant beyond the one percent level.

Table 6 – Industrial Breakdown Model

(T Stats in Parentheses)		Exp. Sign	Coefficients
Constant		+/-	-12.7 (-1.328)
IIneq	Income Inequality	+	25.1 (3.458)***
Black	Black or African American % of Total Population	-	-0.0581 (-3.761)***
NBMin	Other race besides white or black as percent of total population	+	-0.0265 (-1.536)
EmpR	Employment Rate	-	-0.266 (-5.116)***
SelfEm	Proprietor's Employment Rate	-	0.0235 (0.281)
LHS	Less than a High School Degree	+	0.382 (4.768)***
HS	High School Degree	-	0.0506 (0.752)
LBach	Some College	-	0.115 (1.732)*
Bach	Bachelor's Degree	-	0.140 (1.356)
FHoH	Female Head of Household % of Total Families	+	0.480 (6.611)***
MigPop	% Population Migrating	-	-0.0132 (-0.201)
For	% Foreign Born of Total Population	-	-0.0420 (-1.621)
Child	Under 18	+	0.231 (2.646)**
YAd	18-24	+	0.115 (1.990)**
Sen	Over 65	+	0.0489 (0.644)
Ag	% of Population in Agriculture	+	-0.201 (-2.743)***
Const	% of Population in Construction	-	-0.0265 (-0.324)
Man	% of Population in Manufacturing	+/-	-0.00991 (-0.284)
Whole	% of Population in Wholesale	+/-	0.146 (0.970)
Retail	% of Population in Retail	+	0.149 (1.669)*
Trans	% of Population in Transportation	+	-0.0786 (-0.886)
Info	% of Population in Information	+	-0.143 (-0.896)
FinIn	% of Population in Finance & Insurance	-	-0.128 (-2.466)**
PrScTech	% of Population in Professional, Scientific, and Technical	+/-	-0.00145 (-0.020)
EdHSA	% of Population in Education & Health & Social Assistance	+/-	0.0539 (1.213)
OthServ	% of Population in Other Services	+/-	-0.183 (-0.963)
PubAdm	% of Population in Public Administration	+/-	-0.0540 (-0.903)
N			301
R^2			0.854
Adj. R^2			0.839
F-Stat.			58.93
Prob. of F-Stat.			0.000

D. Occupational Breakdown Model

The last model examined includes the occupational breakdown variables instead of the industrial breakdown variables. As with the industrial breakdown model, the education, percent of people migrating within the past year, and percent of the population aged 65 and over are not significant as they were in the standard model after correcting for heteroskedasticity.

Out of the occupation variables, there were five that proved significant. These variables were the healthcare support, building and grounds cleaning and maintenance, sales and related, production, and transportation and material moving occupations. All of these occupations were positively related to the poverty rate indicating that a one percent increase in the employment in these occupations would increase the poverty rate by the corresponding coefficients.

The healthcare support occupation variable was significant to the ten percent level and was positive indicating that a one percent increase in the amount of workers in that occupation would increase the poverty rate in a metro area by 0.39 percent. Building and grounds cleaning and maintenance occupations, production occupations, and transportation and material moving occupations were significant to the five percent level. Sales and related occupations were significant to the one percent level. Building and grounds cleaning and maintenance occupations, sales and related occupations, and transportation and material moving occupations were all thought to increase poverty rates because of the lower income expected with these occupations. The impact of production and healthcare support occupations was uncertain before the model was run. In effect, these occupations may still be too aggregated in order to explain why poverty rates increase with higher percentages of the population in them. Future research could break down these occupations further.

Overall this model has an adjusted R-squared value of .837 and an F-stat of 66.2 indicating a good fit for the model. It is also comparable to the industry model indicating that an occupational breakdown is justified to be used instead of, or in conjunction with industrial breakdowns in determining poverty rates.

Table 7 – Occupational Breakdown Model

(T Stats in Parentheses)		Exp. Sign	Coefficients
Constant		+/-	-0.706 (-0.053)
IIneq	Income Inequality	+	19.4 (2.643)***
Black	Black or African American % of Total Population	-	-0.0490 (-3.595)***
NBMin	Other race besides white or black as percent of total population	+	-0.00349 (-0.262)
EmpR	Employment Rate	-	-0.278 (-5.971)***
SelfEm	Proprietor's Employment Rate	-	-0.0455 (-0.598)
LHS	Less than a High School Degree	+	0.217 (2.615)***
HS	High School Degree	-	-0.111 (-1.443)
LBach	Some College	-	-0.0634 (-0.859)
Bach	Bachelor's Degree	-	-0.0206 (-0.212)
FHoH	Female Head of Household % of Total Families	+	0.430 (6.421)***
MigPop	% Population Migrating	-	-0.0385 (-0.697)
For	% Foreign Born of Total Population	-	-0.0938 (-3.241)***
Child	Under 18	+	0.184 (2.550)**
YAd	18-24	+	0.113 (2.193)**
Sen	Over 65	+	-0.00363 (-0.054)
OManB	Management, Business, & Financial Occupations	-	-0.0636 (-0.537)
OProf	Professional & Related Occupations	-	0.0576 (0.603)
OSH	Healthcare Support Occupations	+/-	0.386 (1.707)*
OSPro	Protective Service Occupations	+/-	0.00352 (0.019)
OSFPrep	Food Prep & Serving Related Occupations	+	-0.0239 (-0.168)
OSBMain	Building & Grounds Cleaning & Maintenance Occupations	+	0.468 (2.35)**
OSPers	Personal Care & Service Occupations	+	0.134 (0.925)
OSales	Sales & Related Occupations	+	0.377 (3.450)***
OOffice	Office & Administrative Support Occupations	+/-	0.000699 (0.009)
OCons	Construction & Extraction Occupations	+/-	-0.0109 (-0.116)
OInst	Installation, Maintenance, and Repair Occupations	+/-	-0.147 (-0.857)
OProd	Production Occupations	+/-	0.131 (1.980)**
OTM	Transportation & Material Moving Occupations	+	0.227 (1.981)**
N			357
R^2			.850
Adj. R^2			.837
F-Stat.			66.21
Prob. of F-Stat.			0.000

E. Model Summary & "Best" Model

Table 8 provides a summary of the significant variables across the three main models examined. The self-employment rate, non-black minority, high school, and bachelor's degree variables are left out of this table in addition to the insignificant industrial and occupational breakdown variables.[8]

The "standard" model which only includes many of the established determinants found in the literature explains a large percentage of the poverty rates across metro areas. In itself, this is a good model with an adjusted R-squared value of .822.

Adding in the industrial and occupational employment breakdown variables only serves to strengthen the model. Using the industrial breakdown variables, three variables proved significant, although they did cause the variables that measured the percent of the population that migrated within the past year and the percent of the population that is over the age of 65 years to become insignificant. Even so, adding in these industry measures increased the fit of the model compared to the first by increasing the R-squared value to .839.

The occupational employment breakdown model reflected very similar results to the industrial breakdown model. The variables measuring the percent of the population migrating within the past year and the percent of the population aged 65 and over were also both insignificant. Specifically five occupations proved significant in this model and increased the R-squared value up to .837 from the standard or base model.

Deciding on the "best" model is difficult given just how close the results are. Strictly examining the R-squared values reveals that the model that includes the industrial employment breakdown variables is the best model since it has the highest R-squared value. However, the occupational breakdown model only has an R-squared value that is two-thousandths smaller. In addition, there are more occupations that proved significant versus the industry model. This could prove more useful from a policy standpoint, if one of these models were to be actually used in making decisions.

In final conclusion, both the industry and occupation models are better models over the base model. Strictly speaking from a statistical viewpoint, the industry model is the best model. However, depending on the application of the model results, the occupation model is practically just as good of an option.

[8] It should be remembered that although two of the education (percent of the metro area population with just a high school education and percent with a bachelor's degree) variables are insignificant across the models, this is most-likely caused by the collinearity that exists between the education variables and employment rate variables.

Table 8 – Model Summary

Model (T Stats in Parentheses)		**Exp. Sign**	**Standard**	**Industry**	**Occupation**
Constant		+/-	-3.85 (-0.623)	-12.7 (-1.328)	-0.706 (-0.053)
IIneq	Income Inequality	+	24.6 (3.886)***	25.1 (3.458)***	19.4 (2.643)***
Black	Black or African American % of Total Population	-	-0.0523 (-3.666)***	-0.0581 (-3.761)***	-0.0490 (-3.595)***
EmpR	Employment Rate	-	-0.256 (-5.74)***	-0.266 (-5.116)***	-0.278 (-5.971)***
LHS	Less than a High School Degree	+	0.294 (5.86)***	0.382 (4.768)***	0.217 (2.615)***
LBach	Some College	-	0.0116 (0.252)	0.115 (1.732)*	-0.0634 (-0.859)
FHoH	Female Head of Household % of Total Families	+	0.446 (7.626)***	0.480 (6.611)***	0.430 (6.421)***
MigPop	% Population Migrating	-	-0.0964 (-2.436)**	-0.0132 (-0.201)	-0.0385 (-0.697)
For	% Foreign Born of Total Population	-	-0.0822 (-3.329)***	-0.0420 (-1.621)	-0.0938 (-3.241)***
Child	Under 18	+	0.234 (3.206)***	0.231 (2.646)**	0.184 (2.550)**
YAd	18-24	+	0.174 (4.487)***	0.115 (1.990)**	0.113 (2.193)**
Sen	Over 65	+	0.0993 (1.667)*	0.0489 (0.644)	-0.00363 (-0.054)
Ag	% of Population in Agriculture Industry	+		-0.201 (-2.743)***	
Retail	% of Population in Retail Industry	+		0.149 (1.669)*	
FinIn	% of Population in Finance & Insurance Industry	-		-0.128 (-2.466)**	
OSH	Healthcare Support Occupations	+/-			0.386 (1.707)*
OSBMain	Building & Grounds Cleaning & Maintenance Occupations	+			0.468 (2.35)**
OSales	Sales & Related Occupations	+			0.377 (3.450)***
OProd	Production Occupations	+/-			0.131 (1.980)**
OTM	Transportation & Material Moving Occupations	+			0.227 (1.981)**
N			360	301	357
R^2			0.829	0.854	.850
Adj. R^2			0.822	0.839	.837
F-Stat.			111.30	58.93	66.21
Prob. of F-Stat.			0.000	0.000	0.000

VII. Conclusions & Policy Implications

Poverty is a complex issue that many people in the United States still live with on a daily basis. In addition, there are many programs in effect that try to alleviate poverty in the United States, but not all of these programs are ultimately successful. In fact, it has been proposed by some people that some of these policies actually exacerbate poverty.

In conclusion with this analysis, the models suggested that many of the determinants examined were significant and therefore they influence poverty rates across U.S. metro areas. These are the areas that programs could focus on in order to try to reduce poverty rates in the United States. In general many current programs aimed at alleviating poverty across the United States focus on education, economic opportunities, organizing communities, or other special initiatives ("Pathways out of Poverty"). These programs seem consistent with the results of this study.

Specifically and perhaps obviously, increasing the employment rate in metro areas is shown to decrease poverty rates.

Greater percentages of female led households and people with less than a high school degree are shown to increase poverty rates in U.S. metro areas. Programs that encourage teens to stay in school and wait to start families could reduce poverty rates.

The percent of the population with a bachelor's degree is also suggested to reduce poverty rates in one version of the model. This means that policies that promote the attainment of traditional four-year degree programs could reduce poverty rates in metro areas over time.

The percent of the population that is black or African American and the percent of the population that is foreign born in a metro area are shown to reduce poverty rates in this analysis. The inverse relationship between African American populations and poverty is not as intuitive as other variables and in future research it would be ideal to find a specific reason why this relationship exists, especially since the percent of the population that is of another minority group actually increases poverty rates in other research. This also suggests interesting policy implications especially with the current immigration debates. Policies that promote more diversity in these areas in U.S. metro areas could reduce poverty based on these results. More specifically, policies that promote the settlement of immigrants in metro areas could reduce poverty rates according to these models.

The percent of the population of another minority race besides black was also not shown to be a determinant of poverty rates. This indicates that while greater diversity of immigrants and African Americans reduce poverty rates, other races do not have either a positive nor negative impact.

Regarding the industrial and occupational mix models, the industry mix variables seem to behave according to theory and support the evidence of some past studies. Compared to the occupational breakdown model, the overall fit of the model is close to the industrial model. This suggests that future research and policy decisions are justified to use occupational breakdowns in combination or instead of industrial breakdowns. This may allow metro areas to eliminate

poverty to a greater extent than just examining industrial rates by themselves. Instead of just targeting a specific industry to come into a region, decision-makers can try to make sure that these specific industries also will bring in certain types of occupations that pay better. This method could better combat poverty rates in a region.

In the future, further research can be conducted based on this study. Data on other variables such as labor force participation, government expenditures through certain programs, and other demographic variables that explore diversity could be collected and tested. A trend variable could also be included in order to address any macroeconomic business cycle patterns. For example in this research, the data used were for a period during the latest recession. A trend variable could help with this issue.

In addition further breakdowns of industrial and occupational mixes could be examined. More minority groups could also be tested if data is available. The actual type of foreign-born population could also be examined. Is there a difference between naturalized foreign-born people and noncitizens? The effect of male headed households on poverty would also be interesting to examine. Different data sources could also be utilized or different years of data.

In addition to just manipulating the independent variables, the poverty rate could also be examined. With the limits of the actual measurement, it would be interesting to see if there is a way to manipulate the poverty rates to better reflect the actual hardships being faced in metro areas. For example, in metro areas with higher costs of living, the poverty rate may actually understate the total number of families experiencing real hardship. Factoring the cost of living in metro areas would be a logical extension of this research if it is possible.

Perhaps most importantly, the sample size of the study could be increased if micropolitan statistical areas were also included in the study. This would increase the sample size and also expand the body of poverty research into an area that few researchers have explored thus far. All this further research would bolster this analysis and provide further insight into the determinants of U.S. metro area poverty levels.

Appendix

A. List of Omitted Metro Areas

1. List of Metro Areas Omitted in all Models

FIPS Code	Metro Area Name	Population
16020	Cape Girardeau-Jackson, MO-IL Metro Area	95,701
18880	Crestview-Fort Walton Beach-Destin, FL Metro Area	181,211
31740	Manhattan, KS Metro Area	123,913
31860	Mankato-North Mankato, MN Metro Area	96,037
35840	North Port-Bradenton-Sarasota, FL Metro Area	699,076
44600	Steubenville-Weirton, OH-WV Metro Area	124,650
Total of 6 Metro Areas		1,320,588
Total Metro Area Population		256,432,923
Percentage of Total Metro Area Population of 6 Omitted Metro Areas		0.515%
Total U.S. Population		306,738,433
Percentage of Total U.S. Population of 6 Omitted Metro Areas		0.431%
Percentage of Total U.S. Population of Total Metro Area Population		83.6%

2. List of Metro Areas Additionally Omitted in Occupational Models

FIPS Code	Metro Area Name	Population
16180	Carson City, NV	55,393
25980	Hinesville-Fort Stewart, GA	77,897
37380	Palm Coast, FL	94,725
Total of **3** Metro Areas		228,015
Total of **3** Metro Areas plus 6 Original Omitted Metro Areas		1,548,603
Total Metro Area Population		256,432,923
Percentage of Total Metro Area Population of **9** Omitted Metro Areas		0.604%
Total U.S. Population		306,738,433
Percentage of Total U.S. Population of **9** Omitted Metro Areas		0.505%
Percentage of Total U.S. Population of Total Metro Area Population		83.6%

3. List of Metro Areas Additionally Omitted in Industrial Models

FIPS Code	Metro Area Name	Population
10180	Abilene, TX	164,016
11180	Ames, IA	88,897
11500	Anniston-Oxford, AL	118,049
15260	Brunswick, GA	111,148
16180	Carson City, NV	55,393
16220	Casper, WY	74,809
16940	Cheyenne, WY	90,545
18020	Columbus, IN	76,500
18700	Corvallis, OR	85,038
19060	Cumberland, MD-WV	102,961
19140	Dalton, GA	141,268
20940	El Centro, CA	171,720
21060	Elizabethtown, KY	116,856
21300	Elmira, NY	88,725
21820	Fairbanks, AK	96,035
22140	Farmington, NM	128,803
22380	Flagstaff, AZ	133,327
23460	Gadsden, AL	104,302
24500	Great Falls, MT	80,909
25260	Hanford-Corcoran, CA	152,493
25620	Hattiesburg, MS	141,332
25980	Hinesville-Fort Stewart, GA	77,897
26300	Hot Springs, AR	95,874
27060	Ithaca, NY	101,167
27180	Jackson, TN	114,679
27340	Jacksonville, NC	173,865
29020	Kokomo, IN	99,007
29420	Lake Havasu City-Kingman, AZ	199,985
29700	Laredo, TX	245,942
30020	Lawton, OK	121,107
30300	Lewiston, ID-WA	60,565
31020	Longview, WA	102,105
31460	Madera, CA	149,667
33540	Missoula, MT	108,653
34060	Morgantown, WV	127,684
34620	Muncie, IN	117,389
34900	Napa, CA	135,410
36140	Ocean City, NJ	97,347

36220	Odessa, TX	135,713
37380	Palm Coast, FL	94,725
37460	Panama City-Lynn Haven, FL	167,668
37700	Pascagoula, MS	161,274
38220	Pine Bluff, AR	100,660
38540	Pocatello, ID	89,757
39380	Pueblo, CO	158,024
39460	Punta Gorda, FL	160,029
40660	Rome, GA	96,193
41100	St. George, UT	137,030
41660	San Angelo, TX	110,781
41780	Sandusky, OH	77,243
42140	Santa Fe, NM	143,172
42680	Sebastian-Vero Beach, FL	137,187
44940	Sumter, SC	107,012
45500	Texarkana, TX-Texarkana, AR	135,388
47020	Victoria, TX	115,374
47580	Warner Robins, GA	137,684
48300	Wenatchee, WA	109,655
49700	Yuba City, CA	166,265
49740	Yuma, AZ	193,808
Total of **59** Metro Areas		7,186,111
Total of **59** Metro Areas plus 6 Original Omitted Metro Areas		8,506,699
Total Metro Area Population		256,432,923
Percentage of Total Metro Area Population of **65** Omitted Metro Areas		3.32%
Total U.S. Population		306,738,433
Percentage of Total U.S. Population of **65** Omitted Metro Areas		2.77%
Percentage of Total U.S. Population of Total Metro Area Population		83.6%

B. Correlation Table

	PovR	*Gini*	*Black*	*NBMin*	*EmpR*	*SelfEm*	*LHS*	*HS*	*LBach*	*Bach*	*>Bach*	*FHOH*	*MigPop*	*For*
PovR	1.0000													
Gini	0.4314	1.0000												
Black	0.3140	0.4144	1.0000											
NBMin	0.0646	0.0676	-0.2169	1.0000										
EmpR	-0.7537	-0.2748	-0.2992	-0.1336	1.0000									
SelfEm	0.0404	0.1372	-0.3436	0.2690	-0.0632	1.0000								
LHS	0.7583	0.3217	0.1946	0.2299	-0.6468	0.1119	1.0000							
HS	0.0747	-0.3363	0.0275	-0.4894	-0.2040	-0.3377	0.0817	1.0000						
LBach	-0.1393	-0.3255	-0.1811	0.1173	-0.0080	0.1752	-0.3595	-0.2600	1.0000					
Bach	-0.5612	0.1181	-0.0901	0.1701	0.6758	0.1237	-0.6067	-0.7018	0.0478	1.0000				
>Bach	-0.4249	0.2802	-0.0262	0.1142	0.4948	0.0371	-0.4963	-0.6067	-0.2084	0.7883	1.0000			
FHOH	0.5975	0.3993	0.6990	-0.0484	-0.4540	-0.2359	0.3438	0.0436	-0.0698	-0.2761	-0.1759	1.0000		
MigPop	-0.0886	0.1304	0.1089	-0.0123	0.1147	0.0486	-0.1816	-0.3485	0.0788	0.3150	0.3663	-0.0390	1.0000	
For	0.1315	0.2854	-0.1523	0.7454	-0.1238	0.2776	0.3533	-0.5824	-0.1009	0.2404	0.2375	-0.0640	-0.0683	1.0000
Child	0.4268	-0.0291	0.1279	0.3260	-0.3263	-0.0318	0.4385	-0.2094	0.1744	-0.1382	-0.3390	0.2872	-0.1401	0.3265
YAdult	0.0136	0.2335	-0.0412	0.0065	0.1522	-0.0456	-0.1513	-0.3126	-0.0813	0.2890	0.4697	-0.0139	0.6378	-0.0134
Adult	-0.4192	-0.2154	0.0617	-0.0356	0.3727	-0.0337	-0.2506	0.0569	-0.0256	0.1939	0.0797	-0.0703	-0.2901	-0.0737
Senior	-0.0589	-0.0498	-0.1347	-0.2990	-0.1936	0.1158	-0.0299	0.5237	-0.0544	-0.3788	-0.2878	-0.2050	-0.3468	-0.2416
OManBS&A	-0.4809	0.2021	0.0253	0.1266	0.5287	0.0134	-0.5493	-0.6094	-0.1137	0.8541	0.9025	-0.1296	0.2982	0.1839
OManB	-0.5390	0.0679	-0.0031	0.2193	0.5471	0.1044	-0.4621	-0.5624	0.0197	0.8039	0.6139	-0.1984	0.1120	0.3136
Oprof	-0.3466	0.2391	0.0368	0.0456	0.4078	-0.0430	-0.4864	-0.5103	-0.1687	0.7059	0.8849	-0.0621	0.3460	0.0691
OServ	0.2936	0.1619	-0.0206	0.1410	-0.4074	0.1473	0.1578	0.0949	0.1108	-0.2874	-0.1691	0.2175	-0.0132	0.1260
OSH	0.2412	-0.1432	-0.0458	-0.2255	-0.2687	-0.0698	0.0856	0.4453	0.0387	-0.4473	-0.3546	0.1592	-0.3660	-0.3012
OSPro	0.2843	0.0572	0.3303	0.1621	-0.4905	-0.0721	0.2735	0.0947	0.0063	-0.3097	-0.1983	0.4219	-0.0154	0.1291
OSFPrep	0.0092	0.1155	-0.1460	-0.0624	-0.0259	0.0250	-0.1723	0.0901	0.0600	-0.0299	0.0780	-0.0150	0.2570	-0.1300
OSBMain	0.3921	0.3546	0.0590	0.2717	-0.4641	0.2670	0.4086	-0.1001	-0.0319	-0.2248	-0.1437	0.1413	-0.0305	0.4470
OSPers	0.0146	0.0457	-0.1896	0.2787	-0.0432	0.2725	-0.0146	-0.2056	0.2390	0.0667	0.0091	0.0014	-0.0467	0.2530
OSal&O	-0.0227	0.0233	0.0923	-0.0900	0.0172	-0.0173	-0.1568	0.0426	0.2349	0.0979	-0.2071	0.0796	-0.1354	-0.0914
OSales	0.1089	0.2595	0.0863	-0.0273	-0.0896	0.2518	0.0128	-0.1459	0.1790	0.1201	-0.1214	0.0071	-0.0450	0.1167
Ooffice	-0.1231	-0.1885	0.0519	-0.0989	0.0993	-0.2370	-0.2235	0.1815	0.1668	0.0309	-0.1780	0.1019	-0.1456	-0.2229
Ofarm	0.2912	0.0037	-0.1719	0.3445	-0.2589	0.2088	0.4572	-0.1679	0.0314	-0.2198	-0.1821	0.0055	-0.0443	0.3745
Oag	0.2885	0.0020	-0.1709	0.3550	-0.2487	0.1879	0.4548	-0.1752	0.0237	-0.2081	-0.1721	0.0052	-0.0465	0.3877
Ofish	0.0564	0.0219	-0.0249	-0.1112	-0.1511	0.2874	0.0644	0.0834	0.1026	-0.1682	-0.1433	0.0035	0.0261	-0.1441
ONRCon	0.2281	0.0217	0.0677	0.0230	-0.3796	0.2774	0.3563	0.1351	0.1680	-0.3827	-0.4744	-0.0206	0.1072	0.0153
Ocons	0.1424	0.0926	-0.0162	0.0837	-0.2666	0.3793	0.2953	-0.0265	0.1370	-0.2064	-0.2997	-0.1276	0.1324	0.1563
Oinst	0.3056	-0.1546	0.2266	-0.1303	-0.4398	-0.1069	0.3082	0.4383	0.1507	-0.5882	-0.6275	0.2387	-0.0084	-0.3204
OPT&M	0.2258	-0.3312	-0.0267	-0.3087	-0.1706	-0.2739	0.3097	0.6459	-0.1040	-0.6513	-0.6078	0.0219	-0.3141	-0.3750
Oprod	0.1340	-0.3275	-0.0574	-0.3209	-0.0670	-0.2644	0.1970	0.5508	-0.0890	-0.5137	-0.4681	-0.0352	-0.2900	-0.3719
OT&M	0.3573	-0.2414	0.0475	-0.1912	-0.3439	-0.2134	0.4615	0.6604	-0.1054	-0.7559	-0.7298	0.1389	-0.2734	-0.2706
Ag	0.2489	0.0618	-0.1819	0.2357	-0.2072	0.2754	0.4447	-0.0797	0.0216	-0.2447	-0.2638	-0.0138	0.0135	0.2040
Const	0.0422	0.0569	-0.0162	0.1116	-0.1603	0.3789	0.1792	-0.1276	0.1821	-0.0627	-0.1855	-0.1727	0.1796	0.2157
Man	-0.0092	-0.3555	-0.0914	-0.2857	0.0564	-0.2821	0.0689	0.4612	-0.1031	-0.3489	-0.3145	-0.1286	-0.3237	-0.3055
Dur	-0.0864	-0.3494	-0.1542	-0.2383	0.0836	-0.2291	-0.0659	0.3599	-0.0076	-0.2304	-0.1985	-0.1563	-0.3225	-0.2575
Ndur	0.1279	-0.1928	0.0608	-0.2281	-0.0177	-0.2358	0.2665	0.4105	-0.2167	-0.3823	-0.3605	-0.0185	-0.1681	-0.2390
Whole	0.1195	-0.0355	-0.0361	0.0801	0.0332	-0.0232	0.2907	0.0948	-0.0874	-0.1270	-0.3320	-0.0019	-0.3733	0.1236
Retail	0.1623	-0.1343	-0.1493	-0.2185	-0.2146	0.2214	0.0837	0.3209	0.1721	-0.3352	-0.4298	-0.0947	-0.0321	-0.2406
Trans	0.1854	-0.0168	0.2273	-0.0187	-0.2128	-0.2118	0.2129	0.3258	-0.0025	-0.3376	-0.4332	0.2514	-0.2386	-0.0997
Info	-0.2954	0.1505	-0.0089	0.1850	0.3259	0.0295	-0.3167	-0.4013	-0.0366	0.5768	0.4706	-0.0692	0.1000	0.2337
FinIn	-0.3244	0.0837	0.0719	0.1012	0.3337	-0.0282	-0.2986	-0.3020	0.0649	0.5089	0.2549	-0.0273	-0.0052	0.1903
PrScTech	-0.2995	0.2323	0.0399	0.3512	0.2228	0.1573	-0.2525	-0.6281	0.0419	0.6558	0.5586	-0.1460	0.1057	0.4941
EdHSA	0.0852	0.2171	0.0097	-0.1868	0.0496	-0.0971	-0.1888	-0.0381	-0.1982	0.1131	0.4208	0.1358	0.2328	-0.2170
Ed	0.0693	0.2789	-0.0195	-0.0138	0.1059	-0.0765	-0.1348	-0.2844	-0.2565	0.2833	0.5983	0.0450	0.4964	0.0152
HSAS	0.0503	-0.0056	0.0417	-0.2917	-0.0565	-0.0606	-0.1363	0.3099	0.0076	-0.1840	-0.0869	0.1662	-0.2649	-0.3798
ArtsEnRec	-0.0539	0.1214	-0.0314	0.1461	0.0100	0.1054	-0.1135	-0.1118	0.1295	0.0890	0.0985	0.0131	0.1800	0.1351
OthServ	0.2595	0.3562	0.2034	0.0282	-0.3257	0.3216	0.2703	-0.0821	0.0176	-0.0859	-0.1845	0.1717	-0.0154	0.0608
PubAdm	0.0258	-0.0896	0.2407	0.1498	-0.1968	-0.0593	-0.0214	-0.0971	0.1374	0.0054	0.0287	0.2816	0.1665	0.0049

	Child	*YAdult*	*Adult*	*Senior*	*ManBS&*	*OManB*	*Oprof*	*OServ*	*OSH*	*OSPro*	*OSFPrep*	*OSBMain*	*OSPers*	*OSal&O*
Child	1.0000													
YAdult	-0.2174	1.0000												
Adult	-0.1988	-0.6216	1.0000											
Senior	-0.5572	-0.3944	0.0188	1.0000										
OManBS&A	-0.2313	0.3214	0.2321	-0.3591	1.0000									
OManB	-0.0282	-0.0768	0.4495	-0.2903	0.7712	1.0000								
Oprof	-0.3030	0.4894	0.0556	-0.3249	0.9268	0.4757	1.0000							
OServ	-0.1361	0.0983	-0.3208	0.3114	-0.2969	-0.3940	-0.1778	1.0000						
OSH	-0.0785	-0.1459	-0.1454	0.3816	-0.3133	-0.4679	-0.1569	0.3280	1.0000					
OSPro	0.1103	-0.1309	-0.0300	0.0716	-0.1753	-0.1752	-0.1389	0.5388	0.1122	1.0000				
OSFPrep	-0.3631	0.4062	-0.3445	0.1965	-0.0919	-0.2968	0.0482	0.6665	0.0495	0.0033	1.0000			
OSBMain	0.0811	-0.0511	-0.3107	0.2620	-0.3010	-0.2141	-0.2897	0.6533	0.0206	0.3214	0.2585	1.0000		
OSPers	-0.0191	0.0242	-0.0295	0.0173	-0.0405	-0.0009	-0.0554	0.6425	-0.0499	0.2520	0.3057	0.3029	1.0000	
OSal&O	0.0945	-0.2569	0.0633	0.1505	-0.0836	0.1837	-0.2239	-0.0356	-0.0590	0.0079	-0.0783	0.0458	0.0001	1.0000
OSales	0.0271	-0.2314	0.0329	0.2152	-0.1176	0.1378	-0.2438	0.1242	-0.1365	-0.0270	0.0643	0.3018	0.1290	0.6775
Ooffice	0.1053	-0.1521	0.0580	0.0215	-0.0137	0.1323	-0.0970	-0.1536	0.0359	0.0337	-0.1607	-0.1939	-0.1093	0.7816
Ofarm	0.3260	0.0444	-0.2787	-0.1226	-0.2656	-0.2098	-0.2432	0.1019	0.0087	0.0846	-0.0819	0.2097	0.1277	-0.3095
Oag	0.3401	0.0505	-0.2834	-0.1395	-0.2516	-0.1962	-0.2320	0.0873	0.0023	0.0781	-0.0895	0.2010	0.1146	-0.3114
Ofish	-0.1598	-0.0760	0.0404	0.2113	-0.2011	-0.1927	-0.1641	0.1982	0.0843	0.0917	0.0935	0.1286	0.1796	0.0020
ONRCon	0.1373	-0.2512	-0.0889	0.2398	-0.4911	-0.2732	-0.5174	0.1820	-0.0640	0.2427	-0.0240	0.3504	0.0614	0.1172
Ocons	0.0850	-0.2036	-0.0768	0.2248	-0.3385	-0.1225	-0.3955	0.1894	-0.1638	0.1814	0.0030	0.4070	0.1325	0.1014
Oinst	0.1856	-0.2279	-0.0696	0.1469	-0.5840	-0.4778	-0.5250	0.0678	0.2018	0.2557	-0.0738	0.0323	-0.1365	0.0917
OPT&M	0.1156	-0.2167	-0.0068	0.1461	-0.6758	-0.5928	-0.5841	-0.2261	0.2596	-0.1895	-0.1334	-0.2053	-0.3272	-0.2481
Oprod	0.0497	-0.1594	0.0229	0.1172	-0.5379	-0.4941	-0.4517	-0.2784	0.2191	-0.2671	-0.1239	-0.2607	-0.3359	-0.2991
OT&M	0.2239	-0.2765	-0.0688	0.1652	-0.7739	-0.6307	-0.6973	-0.0461	0.2702	0.0343	-0.1144	-0.0248	-0.2118	-0.0647
Ag	0.3060	0.0846	-0.3179	-0.1144	-0.3095	-0.2691	-0.2690	0.0801	0.0190	0.0124	-0.0424	0.1443	0.1304	-0.2594
Const	0.0502	-0.2155	-0.0116	0.2140	-0.2146	0.0508	-0.3265	0.1321	-0.2442	0.1554	-0.0209	0.3849	0.1079	0.1688
Man	0.0216	-0.1872	0.1366	0.0744	-0.3532	-0.3171	-0.3009	-0.3782	0.1472	-0.3480	-0.1916	-0.3259	-0.3401	-0.3295
Dur	-0.0210	-0.1747	0.1593	0.0813	-0.2252	-0.2137	-0.1851	-0.3184	0.1423	-0.3396	-0.1218	-0.3261	-0.2626	-0.2927
Ndur	0.0840	-0.1175	0.0312	0.0263	-0.4009	-0.3402	-0.3533	-0.2967	0.0840	-0.1930	-0.2182	-0.1670	-0.3076	-0.2322
Whole	0.3348	-0.3342	0.1340	-0.0616	-0.2873	-0.0144	-0.3884	-0.2975	0.0016	-0.2309	-0.3159	-0.0879	-0.1466	0.2791
Retail	-0.1027	-0.1324	-0.1742	0.4160	-0.4609	-0.3433	-0.4343	0.2075	0.2442	-0.0036	0.1566	0.1781	0.0296	0.4111
Trans	0.2409	-0.3566	0.1691	0.0262	-0.3433	-0.1389	-0.3925	-0.0382	0.0761	0.2079	-0.1870	-0.0280	-0.0872	0.2967
Info	-0.0243	0.0417	0.2362	-0.2397	0.5649	0.5655	0.4469	-0.2505	-0.2515	-0.1157	-0.1657	-0.1462	-0.0571	0.2504
FinIn	0.0150	-0.1375	0.2682	-0.0971	0.3759	0.6344	0.1452	-0.2245	-0.2854	-0.0764	-0.1949	-0.0519	-0.0389	0.5551
PrScTech	0.0403	-0.1020	0.3187	-0.2099	0.6458	0.7535	0.4479	-0.1820	-0.4676	-0.0245	-0.1836	0.0571	0.0696	0.1445
EdHSA	-0.2998	0.6241	-0.3950	-0.0766	0.3552	-0.2130	0.6164	0.1811	0.4040	-0.0385	0.2780	-0.1180	-0.0320	-0.2568
Ed	-0.2296	0.8719	-0.5141	-0.3294	0.4449	-0.0560	0.6478	0.1002	-0.0274	-0.0782	0.3211	-0.0336	-0.0173	-0.3368
HSAS	-0.1960	-0.1086	0.0191	0.3051	0.0055	-0.2798	0.1728	0.1688	0.7060	0.0388	0.0398	-0.1516	-0.0305	0.0159
ArtsEnRec	-0.1995	0.0997	-0.0358	0.1136	-0.0140	-0.0033	-0.0174	0.6928	-0.2091	0.2252	0.7080	0.4258	0.6326	0.0371
OthServ	0.1034	-0.1750	-0.0219	0.1228	-0.1430	-0.0103	-0.1915	0.0513	-0.1244	0.0969	-0.0790	0.2145	0.0676	0.2472
PubAdm	0.0803	-0.0191	0.0579	-0.1099	0.1418	0.1573	0.1030	0.1622	-0.0193	0.5976	-0.1254	0.0338	0.0757	0.1089

	OSales	*Ooffice*	*Ofarm*	*Oag*	*Ofish*	*ONRCon*	*Ocons*	*Oinst*	*OPT&M*	*Oprod*	*OT&M*	*Ag*	*Const*	*Man*
OSales	1.0000													
Ooffice	0.0707	1.0000												
Ofarm	-0.1385	-0.3023	1.0000											
Oag	-0.1520	-0.2934	0.9971	1.0000										
Ofish	0.1659	-0.1380	0.1110	0.0348	1.0000									
ONRCon	0.2879	-0.0852	0.0480	0.0257	0.2935	1.0000								
Ocons	0.3273	-0.1402	0.0780	0.0549	0.3061	0.9397	1.0000							
Oinst	0.0431	0.0878	-0.0472	-0.0558	0.1081	0.6074	0.2991	1.0000						
OPT&M	-0.2839	-0.0957	0.0117	0.0140	-0.0289	-0.0203	-0.1786	0.3580	1.0000					
Oprod	-0.3009	-0.1504	-0.0588	-0.0552	-0.0511	-0.1301	-0.2598	0.2405	0.9593	1.0000				
OT&M	-0.1632	0.0507	0.1604	0.1592	0.0275	0.2228	0.0497	0.5061	0.7922	0.5875	1.0000			
Ag	-0.1503	-0.2243	0.8202	0.8126	0.1585	0.2075	0.2165	0.0762	0.0463	-0.0471	0.2345	1.0000		
Const	0.4122	-0.1207	0.0720	0.0525	0.2581	0.8397	0.9227	0.1996	-0.2779	-0.3360	-0.0703	0.0727	1.0000	
Man	-0.3242	-0.1719	-0.1061	-0.0962	-0.1370	-0.2497	-0.3575	0.1337	0.8739	0.9438	0.4644	-0.1492	-0.3975	1.0000
Dur	-0.2561	-0.1797	-0.1652	-0.1569	-0.1198	-0.3022	-0.3829	0.0462	0.7259	0.8293	0.2876	-0.1977	-0.4097	0.9037
Ndur	-0.2831	-0.0748	0.0469	0.0548	-0.0999	-0.0380	-0.1399	0.2188	0.7024	0.6807	0.5416	0.0067	-0.1830	0.6785
Whole	0.2544	0.1627	0.2532	0.2641	-0.1234	0.0154	-0.0259	0.1031	0.2581	0.1515	0.4120	0.2378	-0.0248	0.1321
Retail	0.5112	0.1239	-0.0469	-0.0684	0.2771	0.4128	0.3498	0.3393	0.1002	0.0049	0.2765	0.0209	0.3207	-0.0919
Trans	0.1030	0.3150	-0.1059	-0.1047	-0.0227	0.2177	0.0661	0.4539	0.2339	0.0527	0.5561	-0.0503	0.0106	-0.0060
Info	0.1309	0.2286	-0.2361	-0.2220	-0.2000	-0.2635	-0.1916	-0.2901	-0.4436	-0.3882	-0.4321	-0.2622	-0.0903	-0.2796
FinIn	0.3480	0.4577	-0.2027	-0.1923	-0.1510	-0.1429	-0.0497	-0.2834	-0.4296	-0.4007	-0.3651	-0.2609	0.0714	-0.3439
PrScTech	0.2396	-0.0073	-0.1234	-0.1146	-0.1243	-0.0541	0.1020	-0.3879	-0.6572	-0.5835	-0.6222	-0.2183	0.2365	-0.4346
EdHSA	-0.3130	-0.0827	-0.1014	-0.0995	-0.0328	-0.3983	-0.3874	-0.2114	-0.1782	-0.1307	-0.2279	-0.0750	-0.4316	-0.1462
Ed	-0.3127	-0.1915	-0.0311	-0.0237	-0.0980	-0.3631	-0.3040	-0.3070	-0.2513	-0.1802	-0.3306	-0.0402	-0.3126	-0.1727
HSAS	-0.1090	0.1141	-0.1275	-0.1339	0.0742	-0.1844	-0.2440	0.0521	0.0341	0.0195	0.0556	-0.0717	-0.3057	-0.0159
ArtsEnRec	0.2377	-0.1513	-0.0572	-0.0694	0.1557	0.1402	0.2143	-0.1065	-0.3656	-0.3672	-0.2539	-0.0862	0.2391	-0.3902
OthServ	0.3183	0.0653	-0.0583	-0.0664	0.1015	0.3269	0.3033	0.2075	-0.0847	-0.1249	0.0270	0.1096	0.2340	-0.2071
PubAdm	-0.1598	0.2833	0.0188	0.0148	0.0538	0.0880	0.0532	0.1220	-0.3319	-0.3710	-0.1493	-0.0155	0.0696	-0.4281

	Dur	*Ndur*	*Whole*	*Retail*	*Trans*	*Info*	*FinIn*	*PrScTech*	*EdHSA*	*Ed*	*HSAS*	*ArtsEnRec*	*OthServ*	*PubAdm*
Dur	1.0000													
Ndur	0.2985	1.0000												
Whole	0.0491	0.2102	1.0000											
Retail	-0.1226	0.0056	0.0964	1.0000										
Trans	-0.0973	0.1534	0.3621	0.1356	1.0000									
Info	-0.2149	-0.2545	0.0096	-0.2325	-0.0458	1.0000								
FinIn	-0.2929	-0.2640	0.1380	-0.1414	0.0300	0.4030	1.0000							
PrScTech	-0.2995	-0.4549	-0.0706	-0.2877	-0.1537	0.5234	0.4320	1.0000						
EdHSA	-0.1189	-0.1218	-0.3236	-0.1051	-0.2776	0.0033	-0.2235	-0.2703	1.0000					
Ed	-0.1514	-0.1251	-0.3689	-0.2291	-0.3835	0.0873	-0.1590	-0.0674	0.7979	1.0000				
HSAS	0.0014	-0.0379	-0.0528	0.1262	0.0426	-0.1090	-0.1621	-0.3599	0.6121	0.0117	1.0000			
ArtsEnRec	-0.2983	-0.3579	-0.2703	0.0366	-0.1046	-0.0618	0.0079	0.1158	-0.0852	0.0311	-0.1821	1.0000		
OthServ	-0.2027	-0.1138	0.1359	0.0910	0.1600	0.0179	0.0401	0.1027	-0.2349	-0.2397	-0.0753	-0.0289	1.0000	
PubAdm	-0.3874	-0.2894	-0.3271	-0.0941	0.0456	0.0510	0.0197	0.1182	-0.0457	-0.0257	-0.0421	0.0120	0.0621	1.0000

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Education

Anticipated May 2012 **B.S., Business Economics**, Penn State Erie – The Behrend College
Schreyer Honors College
Thesis – "Determinants of Poverty: An Analysis Across U.S. Metro Areas"
Advisor: James A. Kurre, PhD
Reader: Kerry A. Adzima, PhD

Current Positions

2010 – Present **Research Assistant**, **E**conomic **R**esearch **I**nstitute of **E**rie (ERIE)
Penn State Erie – The Behrend College

- Gather and analyze data from the BEA, BLS, Census Bureau, and other government and private sources
- Compile results into reports including graphs and detailed explanations
- Coordinate with the graduate research assistant on projects to meet deadlines

2011 – Present **Tutor**, Learning Resource Center
Penn State Erie – The Behrend College

- Teach and review economic and business topics to fellow undergraduates
- Assist students with additional study practices

Research

Oct. 2011 – Present **"Determinants of Poverty: An Analysis Across U.S. Metro Areas"**

- Schreyer Honors College Thesis
- Focusing on exploring industry and occupational mixes, and additional diversity characteristics as determinants of poverty rates
- Expansion on previous summer fellowship poverty research

May 2011 – Oct. 2011 **"Causes of Poverty at the U.S. Metro Level"**

- $1,200 Penn State Behrend Undergraduate Student Summer Research Fellowship Award
- Explored economic, demographic, and geographic characteristics
- Found 10 significant causes of poverty based on 2 econometric models
- http://tinyurl.com/CausesofPovertyatUSMetroLevel

May 2010 – Nov. 2010 **"The Economic Cost of Pediatric Patients Traveling Outside Northwest Pennsylvania for Subspecialty Treatment"**

- $1,200 Penn State Behrend Undergraduate Student Summer Research Fellowship Award
- Collaborated with a local pediatric hospital to analyze the benefits of supplying local care
- Analyzed data from multiple sources in order to develop appropriate calculations
- Developed a full report on the findings and a summary report for the wider community
- http://tinyurl.com/CostofPedPatientsTraveling

Presentations

"Determinants of Poverty: An Analysis Across U.S. Metro Areas"

March 2012 — 26th Annual National Conference on Undergraduate Research
Weber State University – Ogden, Utah

April 2012 — 21st Annual Undergraduate Research and Creative Accomplishment Conference
Penn State Erie – The Behrend College – Erie, Pennsylvania

"The Economic Cost of Pediatric Patients Traveling Outside Northwest Pennsylvania for Subspecialty Treatment"

March 2011 — 25th Annual National Conference on Undergraduate Research
Ithaca College – Ithaca, New York

April 2011 — 20th Annual Undergraduate Research and Creative Accomplishment Conference
Penn State Erie – The Behrend College – Erie, Pennsylvania

Relevant Undergraduate Coursework

Regional Economics (Honors)	Intermediate Macroeconomics	Calculus 1 & 2
Econometrics	Managerial Economics (Honors)	Matrices
Intermediate Microeconomics	International Economics (Honors)	Statistics

Honors and Awards

Evan Pugh Scholar Award (Junior) –	Awarded to top 0.5 percent of respective class
Academic Achievement Award -	Awarded by Behrend Economics Faculty
Deans List –	Fall 2008 semester to Present
Beta Gamma Sigma –	Inducted into the International Business Honors Society
Behrend Honors Certificate –	Completed Behrend Honors Program

Scholarships

Lawrence and Elizabeth Held (2 yrs) –	Schreyer Honors College Scholars in the Black School of Business
Beta Gamma Sigma –	Jointly offered by Beta Gamma Sigma and Black School of Business

Academic Scholarships

Eleanor McGowan Smith & H.P. Smith Memorial (2)
Penn State Campus
John Danhouse Martz Jr.
Darrell E. Walker
J. Lupton and Eva Scott Mecartney
VFW Post 2006
The Bud Lutty Charitable Trust

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