Causes of Poverty
at the U.S. Metro Level

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I. Introduction

Poverty is a national issue that impacted 8 million of the 75.5 million families in the United States in 2009. More than 1 out of 10 families were in poverty (U.S. Census Bureau, 2009 ACS). Although this is a national concern and focused heavily on by the federal government and state governments, to really understand a complex issue such as poverty, it needs to be examined at a much more disaggregated level. This study examines poverty by breaking the United States down into smaller economic units—metropolitan statistical areas (MSAs or metro areas). Examining poverty at the metro level allows more of the causes of poverty to be untangled by looking at the detail behind the whole picture. Once the causes of poverty are determined at this smaller level policies can be suggested based on the results of this analysis.

Much research has already been conducted on this complex issue. This study built on previous research and used many of the "proven" causes at the metro level, but also explored some less studied causes. Almost 350 metro areas across the U.S. were examined for the year 2009. Specifically, the poverty rate in a metro area was theorized to be determined by economic, demographic, and geographic factors. Economic determinants included the employment rate, proprietor's employment rate, and a measure of the income inequality in the metro areas. Demographic determinants included the percentage of the population in certain age groups such as children and seniors, the percentage of families headed by single females, the education level obtained by the population, the number of families that recently relocated, the percentage of the population that were African American, another minority, or foreign-born. The location of the metro area in the country by Census Bureau Region was also included.

The end goal is to discover the causes of poverty at the disaggregated metro level in order to allow policy-makers to try better solutions designed to alleviate poverty across the entire United States.

II. Literature Review

> "Poverty is everyone's problem. It cuts across any line you can name: age, race, social, geographic or religious. Whether you are black or white; rich, middle-class or poor, we are ALL touched by poverty" — Kathleen Blanco

Poverty is truly a far-reaching and complex subject. The causes of poverty have been researched for a long time, but no one study has been able to specify all of the multitudinous determinants of poverty. Economic, demographic, social, political, and many other subject areas have all been examined. In addition, poverty is a concern from the smallest village to the entire world as a whole. No geographic area seems immune from poverty.

A. Poverty Measure

1. History of the U.S. Poverty Measure

An official measure of U.S. poverty was first established in the 1960s by Mollie Orshansky. This measure was based on a series of income thresholds that varied depending on family size and age. If a family's income was below the appropriate threshold, then that family was considered to be in poverty. The thresholds she used were determined by using food plans prepared by the U.S. Department of Agriculture. These plans specified the amount of food needed by people, but in order to determine the poverty income threshold levels they had to be expanded to include nonfood items. Orshansky found that approximately a third of income was spent on food at the time, so the food plan levels were multiplied by three and adjusted based on family size and age to determine the poverty thresholds (Fisher 1997).

The official Census Bureau definition of poverty still utilizes these thresholds:

> "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)" (U.S. Census Bureau, Poverty).

The thresholds that the Census Bureau uses to determine poverty rates depend on both the size of the family as well as the ages of the family members. It is an absolute poverty threshold, which means that it is simply updated by changes in price level as determined by the CPI-U and not by changes in consumption that occur over time (U.S. Census Bureau, Poverty). Table 8 in the Appendix contains the official 2009 poverty threshold levels from the Census Bureau.

There are considerable arguments against this measure of poverty. Some consider the poverty thresholds to be arbitrary, while others think that a measure based on expenditures would be better than income. There are also issues with the fact that the poverty rate does not take into account differences in the cost of living across the United States and does not take into account noncash benefits. 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. Most notably Citro and Michaels (1995) argue for the official poverty definition to be changed to include differences in 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.

These arguments for change are bolstered by the fact that the Census Bureau has other measures of poverty. The poverty rate is measured for individuals as well as across multiple age groups and other demographic groups. In addition there are completely alternative experimental measures of poverty available. Perhaps most notably, many government agencies do not even use the official poverty thresholds in their own decisions. There are poverty guidelines determined by the Department of Health and Human Services that are a somewhat simplified version of the thresholds and they are used for many governmental administrative purposes (U.S. Department of Health and Human Services).

2. Previously Used Poverty Measures

Even with the suggested faults of the official Census Bureau measure of poverty, most previous studies utilized the family poverty rates collected using the poverty thresholds. Levernier, Partridge, and Rickman (2000), Madden (1996), and Rupasingha and Goetz (2007) among many others used the family poverty rates available from the Census Bureau. The flaws in the measurement system are noted and in some cases processes are outlined for how to improve the measure or correct the data to reflect the problems associated with the measurement method. In even fewer cases, these processes are actually attempted.

B. Geography

This research on the causes of poverty focuses on the United States and as a beginning step the geographic level of the analysis had to be determined.

At the broadest level, the entire United States could be treated as one unit. Taken one step down, the U.S. could be broken down into Census divisions or other large multi-state regions such as New England, the South Atlantic, and the Pacific West Coast. Triest (1997) and

Powers and Dupuy (1994) examined poverty at the Census division level. States could also be used. Below states, both metropolitan statistical areas (MSAs or metro areas) and counties could be used and they both have strengths and weaknesses. Madden (1996) is one study that utilized metro areas. Research by Levernier, Partridge, and Rickman (2000) as well as Rupasingha and Goetz (2007) both used a county level analysis. Additionally some other research used even smaller geographic divisions such as Census Block Regions (Nizalov and Schmid (2004)). All these studies disaggregate the U.S. in order to determine the causes of poverty across the United States. But what level of geographic division is best for analysis?

The case can be made that Census divisions, states, counties, and even Census blocks are lines drawn onto a map typically for political reasons. They do not necessarily align with economic areas or with current factors impacting poverty. In the cases of states and counties, these lines may be up to hundreds of years old. Governmental actions such as taxes, zoning, and school districts are determined by these boundaries, but these arbitrary lines have few impacts on U.S. citizens beyond those. An individual is free to drive across state lines to work every day or to a neighboring county in order to shop. Metropolitan statistical areas are different by definition from all these other geographic breakdowns.

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" (Federal Register).

MSAs reflect labor markets: mini-economies. MSAs are built starting with a central county that fits the criteria and all the surrounding counties with which it has significant economic ties.

In order to find the determinants of poverty, the U.S. must be disaggregated geographically, but it makes sense to only go down as far as metro areas where the regions are still economically tied. At this level there will be a sense of a somewhat "closed system" where many of the causes of poverty will not be masked by averages across regions, and solutions to reduce poverty along with the resulting spill-over effects are contained to some extent. For these reasons, MSAs are used in this study rather than other geographic divisions.

C. Causes of Poverty

When it comes to the causes that are hypothesized to impact poverty rates, there is a strong background of previous work. Most studies agree that there are certain economic, demographic, and geographic causes that influence poverty rates. In addition some studies propose social and political causes. This study focuses on the economic, demographic, and

geographic components of poverty, but acknowledges that with such a complex topic there is significant overlap with other disciplines.

1. Economic Determinants

One economic variable related to poverty is the employment rate. In this context the employment rate is the percent of people actually working out of the total population. Rupasingah and Goetz (2007) found that as the employment rate increases poverty decreases. This stands to reason because as more people work, more income is captured, and there are fewer people in poverty.

Along with the employment rate, the growth of employment could also prove to be related to poverty rates. However, both studies by Levernier, Partridge, and Rickman (2000) and Rupasingah and Goetz (2007) found that their measures of employment growth were not significant in their results.

Closely related is the labor force participation rate. Levernier, Partridge, and Rickman (2000) found that both the female and male labor force participation rates were negatively related to poverty rates. Rupasingah and Goetz (2007) only tested female labor force participation because of a high correlation between male and female rates, but the female labor force participation rate did prove to be significant and indicated that higher female labor force participation rates lead to lower poverty rates.

Previous research not only looked into how many people were working, but also into what industries they worked in. 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 goods producing industry was negatively related to poverty, 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, found that there was a positive relationship between poverty and the percent employed in the agriculture industry at less than the .001 level, meaning that farming communities tended to be poorer. In summary most research shows a negative relationship between employment in most industries examined and poverty rates. Agriculture and the transportation and public utilities industries are the exceptions with some studies showing employment in these industries to increase poverty rates while others show decreasing poverty rates.

Madden (1996) found that there was a highly significant negative relationship between the change in mean income and the percentage change in the poverty rate between 1979 and

1989 among U.S. metro areas. This means that metro areas that experienced increases in average incomes also saw decreases in poverty rates as would be expected.

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.[1] If there were 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.

Some proprietorships are the result of entrepreneurs, and the number of proprietorships could signal the strength of an economy and the welfare of its citizens. Rupasingah and Goetz (2007) support this theory by finding that there is a negative relationship between number of proprietorships and poverty rates. Metro areas with more proprietorships tend to have lower poverty rates.

Income inequality is a subject closely related to poverty. Rupasingah and Goetz (2007) found that there is a strong relationship between income inequality and the rate of poverty. This means that areas that have more families close to the average income rather than at the polar extremes have less poverty. Madden (1996) used a similar variable and also found a significant positive relationship.

Nizalov and Schmid (2004) make a strong argument that there is a connection between increased rural poverty rates and poverty traps. They explain that one reason these rural poverty traps may exist is because of local education being funded by local finance rather than the state. This locally funded education from the poor citizens themselves is often-thought to be of lower standard than if the state were able to fund the education. Children from these areas have lower quality educations, which then lead to increased or maintained poverty rates in the region. Education is not an escape out of poverty if the actual quality of the education is low.

Related is a variable studied by Madden (1996). Madden looked at the relationship between the poverty rate in 1980 in the MSAs and the percent change in poverty rates in MSAs between 1979 and 1989. She found that there was a significant negative relationship between the rate in 1980 and the percent change in poverty rate. This means that those metro areas that had higher poverty rates to start with experienced slower poverty growth over the time period. These studies indicate that the duration a metro area has experienced increased poverty as well as the magnitude of that poverty affect the current and future poverty trends in metro areas.

Government programs can also impact poverty. Rupasingah and Goetz (2007) found that federal grants were actually positively related to poverty rates although it was a small coefficient and it was noted that there may be reverse causality with more grants being specifically targeted towards poorer segments.

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[1] 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 have also been some more unique variables tested as determinants of poverty. Rupasingah and Goetz (2007) for example, tested a variable that measured the number of big box retailers per capita, but theory does not provide a clear-cut expectation here. This is because the inclusion of big box retailers could provide local people jobs which could reduce poverty rates, but at the same time these jobs may be low paying and investment could be placed elsewhere which could increase poverty rates. Unfortunately, they were unable to determine that there was any significant relationship between per-capita big box retailers and poverty rates.

2. Demographic Determinants

The demographic determinants used in many studies include those that might generally be thought of as being associated with higher rates of poverty.

One such factor is population. Rupasingah and Goetz (2007) found that those counties that are fringe counties of metro areas of one million people or more and counties in metro areas of 250,000 to one million people have lower poverty rates than other counties. Madden (1996) found a negative relationship between the change in population across metro areas from 1979 to 1989 and the change in metro poverty rates, but it was significant in only one model. Controlling for additional local labor market variables such as the change in wage and salary Gini index and the change in employment-to-population ratio made the population variable insignificant.

Poverty varies across age groups. Rupasingah and Goetz (2007) tried to capture this difference in their analysis by looking at three different age breakdowns; those under 18, those aged 18-24, and those aged 65 and over. They concluded that children (those under 18) as well as the 18-24 age group were associated with higher metro poverty rates. Levernier, Partridge, and Rickman (2000) were unable to reach a consistent result across their models. They used breakdowns of 18 to 24, 60 to 64, and 65 and over and found a negative relationship in some models, while in others the variables were insignificant or significant and positive. Madden (1996) only examined the change in the percent of the population over 65, but found that it had the strongest relationship among the demographic variables examined in explaining poverty differences among metro areas. In all there has not been a consistent answer among studies as to what, if any, age groups determine poverty rates in regions, but both young and old age groups have been found to be significant in some models.

Female-headed families were found to be very significant in the research on the determinants of poverty performed by Levernier, Partridge, and Rickman (2000). Female-headed families were shown to increase the poverty rates across counties. In contrast, Madden (1996) found that there was a positive relationship in one model, but that when other controls were added to the model the percentage of female-headed families variable was insignificant. In all, female-headed families may increase poverty rates in metro areas.

Educational attainment is tied to lower poverty rates. Rupasingah and Goetz (2007) 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 both were related to lower county poverty rates. Levernier, Partridge, and Rickman (2000) also found that a high school education with some college as well as a full college graduate was linked to lower poverty rates. Slack et al. (2009) found that the percent of population with less than a high school education was positively related to poverty among married couple-headed families in the Texas borderland and Mississippi delta. The more educated a population is, the less poverty is observed.

Migration rates have also been tied to poverty. There are alternative theories though as to how migration impacts poverty. One theory concludes that increased migration leads to increased poverty. When people move they lose some of their social ties and have to start over. This sometimes includes job seniority. This lack of a safety net could increase poverty rates if unfortunate events occur. The alternative theory believes that through migration, people will find the best job match for their skills and this will lead to greater efficiency and rising incomes. This would decrease poverty rates. Research by Rupasingah and Goetz (2007) and Madden (1996) support this second theory. They found that those areas that had more long-term residents had increased poverty. Levenier, Partridge, and Rickman (2000), however, did not arrive at a consistent answer. Testing with all their determinants, they also found that there was a positive relationship between long-term residents and poverty rates. In a model that left out some of the economic variables including industry mix though, the relationship switched although it was not as significant of a relationship. Migration may increase or decrease poverty rates.

Minorities experience higher levels of poverty in some areas and so Rupasingah and Goetz (2007) used a factor that measured the percentage of non-African American minorities of the total population across counties. Their study found that higher percentages of non-African American minorities were determinants of higher poverty rates when examining all counties, but that the variable had a negative relationship with poverty rates when examining only counties that are parts of metro areas. This means that minorities in MSAs tend to be richer, but outside MSAs they tend to be poorer. Levernier, Partridge, and Rickman (2000) also found that the percentage of non-African American minorities was positively related to poverty rates across counties. Levernier, Partridge, and Rickman (2000) also examined the percentage of African Americans and found that there was a negative relationship between the percentage of African Americans and poverty rates across most of the models examined. Madden (1996) also used the percentage of African-Americans and found that at first there was a negative relationship across metro areas, but this result proved insignificant as further variables were added into the model. In summary, previous research has found that across all U.S. counties non-African American minorities are associated with higher poverty rates, but that there is a negative relationship when examining only those counties that are part of metro areas. In addition, the percent of the population that are African American is surprisingly associated with lower poverty rates across counties and metro areas.

Oftentimes foreign-born residents are assumed to face challenges from living in a different culture. Some of these challenges are similar to minority challenges such as discrimination. These challenges could increase poverty rates among foreign-born residents.

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Rupasingah and Goetz (2007) tested this factor and found alternating results. When examining all U.S. counties, the percentage of foreign-born residents was negatively related to poverty rates, while when examining only those counties that are part of metro areas they found a positive relationship. Slack et al. (2009) also examined the percent of foreign-born residents in relation to poverty rates in their examination of poverty along the Texas Borderland and Lower Mississippi Delta. They found a significant positive relationship between the percentage of foreign-born residents and poverty rates among married couple-headed families. These studies show that there could be some relationship between foreign-born residents and poverty rates across metro areas, but the results are unclear.

Related to minorities and foreign-born residents, Rupasingah and Goetz (2007) found that ethnic diversity is positively related to poverty rates. This means that metro areas with greater ethnic diversity have more poverty.

3. Other Determinants

There are other determinants in previous research that have been theorized to impact poverty rates. Rupasingah and Goetz (2007) theorized and supported the idea that areas that are more politically competitive will have higher poverty rates because the politicians will focus more heavily on short-term economic goals that may get them reelected rather than long-term developmental goals.

The amount of social capital in a region could also impact poverty rates. Social capital in this context is a measure of connectedness between people. Rupasingah and Goetz (2007) found by using proxies that social capital is negatively related to poverty rates across all U.S. counties but the variable was insignificant, but positively related to poverty when only examined across metro area counties. Across U.S. counties the more connected people are, the less poverty observed.

4. Conclusions

There are many different economic and demographic causes that have been previously examined and oftentimes shown to increase or decrease poverty rates among varying geographical areas. In the Theory section, some of these causes will be selected and considered for use in discovering what determinants impact poverty rates across U.S. metro areas.

III. Theory

It is theorized that family poverty rates across metro regions are a function of economic, demographic, and geographic determinants:

Equation 1: Theoretical Model

Family Poverty Rate$_i$ = f(Economic Causes$_i$, Demographic Causes$_i$, Geographic Causes$_i$)

where $_i$ = metro area

These determinants are broken down into variables and explained in the following sections.

A. The Dependent Variable: Family Poverty Rates

The official family poverty rate as measured by the United States Census Bureau was used in this study. There are other measures available including individual poverty rates that are broken down by age group and other demographics, but like much previous research family rates were used. Families work together and care for each other. At a basic level families are the fundamental economic units. 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 be in poverty while the other 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

This project will examine the following selected determinants of family poverty rates across metro regions divided by type: economic, demographic, and other.

1. Economic Determinants

a) Employment

The percentage of the population employed must be examined. Metro areas with lower employment rates would likely have higher poverty rates because earned income is the majority

of income people receive on average[2]. If people are not earning wages, then they are more likely to be in poverty. Rupasingah and Goetz (2007) reached this same conclusion.

b) Proprietorships

The per capita percentage of proprietorships should also be examined across metro areas as a determinant of poverty rates. 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.

c) 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 people wealthy 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. 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.

2. Demographic Determinants

There are many demographic categories of people that are shown through some analyses to have a higher incidence of poverty than other categories. These categories such as age, gender, and ethnicity will be examined along with others in order to determine if they are significant in determining poverty rates among U.S. metro areas.

a) Age

The young and old are often thought to have higher poverty rates than those of their middle-aged peers. Because of this theory, it follows those 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

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[2] 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 (BEA, National Economics Accounts, Table 2.1).

to obtain consistent results. Because the theory has strong backing yet the results from previous studies are inconsistent, all three age categories will be theorized to cause higher poverty rates. A higher percentage of people that fall into the three age groups of 18 and under, 18 to 24 years, and 65 plus are theorized to be a determinant of poverty in a metro area.

b) Female Heads of Household

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.

c) Education

Education is widely viewed as a key to success and it 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 will decrease poverty rates.

d) Migration

There are two separate theories regarding migration rates observed in metro areas and their effects on poverty rates. One theory argues that less migration leads to greater social safety for individuals through job security and other social safety nets. An opposing theory states that higher migration rates will lead to a better alignment between people's skills and occupations. The theory that higher migration rates will lead to a better match between people and jobs seems as though it would have a greater impact on poverty rates than the theory of social safety regardless and it is this theory that will be tested.

e) Minorities and Foreign-Born Residents

Minorities and foreign-born residents are often thought to experience higher poverty rates and much research has been conducted to determine whether it 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 overall it appears 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.

3. Geographic Determinants

It is impossible to examine every single determinant that affects poverty across U.S. metro regions. In addition, there are some cultural or regional characteristics that are impossible to measure. Because of these reasons, an additional factor that classifies what Census region of the U.S. that a metro area falls in will be included in the model. There are nine Census regions (U.S. Census Bureau, Geography Division). This additional factor will capture some of these immeasurable or missed determinants and allow additional theories to be explored after this analysis.

The variables to be examined as well as their expected signs are summarized in Table 1.

Table 1 – 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 population employed	-
Proprietorships	Proprietorships per capita	-
Income Inequality	Index stating how unequally distributed income is	+
Under 18	Percent of population 18 and under	+
18 to 24	Percent of population 18 to 24 years old	+
65+	Percent of population over 65 years old	+
Female Head	Percent of families headed by females	+
Less than High School	Percent of population with less than a high school diploma	+
Some College	Percent of the population with some college education	-
Bachelor's Degree	Percent of population with a bachelor's degree	-
Greater than Bach. Degree	Percent of population with greater than a bachelor's degree	-
Migration	Percent of population that moved into the metro area from another county within the previous year	-
African-American	Percent of population that is African American	-
Non-African American Minorities	Percent of population that are of a non-African American minority	+
Foreign-Born	Percent of population that is foreign-born	+
Regional Variables	Variables for all but the base region for cultural/other impacts	+/-

IV. Data

A. Poverty Measure

Family Poverty Rates are available from the Census Bureau. There are the decennial census files, which are a true count of the people in the United States, and there are also estimates available through the American Community Survey (ACS). At the time of this study, the latest decennial census data were for 2000—about 11 years old. In addition, many other studies have already used these data. In comparison, the latest ACS data were from 2009, but there is an issue with 2009 because it is during a recession. Considering the benefits of both data sources, the recent ACS estimate was more beneficial than the older census data and was therefore used in this study.

The 2009 ACS 1-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 under 18 years of age. The ACS data are available from the Census Bureau website using the American FactFinder.

One slight weakness with this database is that there are 20 out of the 366 metro areas that do not have poverty rates reported. Many of these same metro areas also have missing data on the variables tested as determinants of poverty, so it would have been necessary to exclude them from the study anyway. As a result, this study will use a set of 346 metro areas for the empirical work.

Although these 20 metro areas are 5.46 percent of the 366 total, they contain much less of the total metro area population. Only 1.0 percent of the total population of the 366 metro areas is in the missing 20 metro areas. This means that by using the 346 metro areas with poverty rates, 99 percent of the total population of all metro areas is captured. The metro area populations can also be compared to the entire U.S. population. In 2009, metro areas accounted for 83.8 percent of the entire U.S. population and the omitted metro areas in this study only made up 0.85 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 20 omitted metro areas along with the population in each and the percentage breakdowns is included in Table 7 in the Appendix.

B. Determinant Variables

1. Economic Determinants

a) Employment

Employment data were obtained from the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce under the Regional Economic Accounts' Local Area Personal Income section. Table CA04 provides data on population and employment numbers by metro area that allowed the employment rate for each MSA to be calculated. 2009 data were used for this study.

b) Proprietorship Employment

Proprietorship employment rates were calculated from the same data as the overall employment rates. These data are included in table CA04 from the Local Area Personal Income section of the BEA. Proprietorship employment includes "sole proprietorships and the number of individual business partners not assumed to be limited partners" and also self-employed farmers (BEA, Proprietorship Employment). Proprietorship employment rates were available for every metro area with a reported family poverty rate.

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) Income Inequality

Income inequality data for each MSA was obtained from the same source as the family poverty rate data; the ACS 2009 1-Year Estimates. Income inequality is expressed in the Gini Index. Figure 1 graphs income inequality and poverty rates.

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.

Figure 1. – Income Inequality and Poverty Rate Across Metro Areas
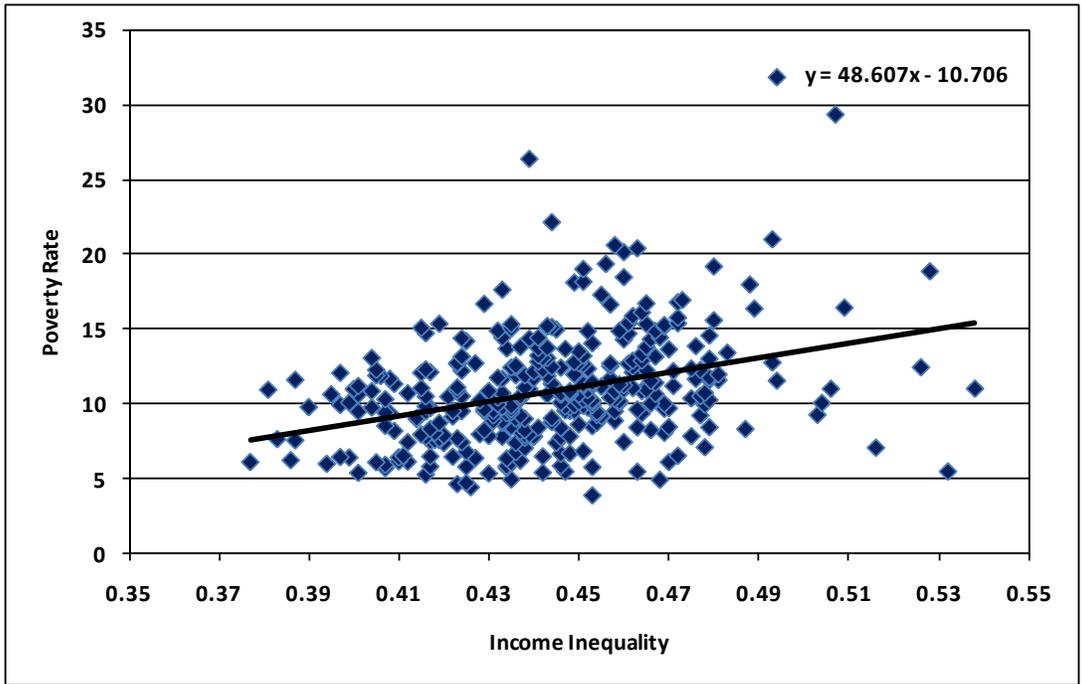
Figure 1 displays that there is a positive relationship between income inequality and the poverty rate across the 346 metro areas examined as hypothesized. Fitting a trendline produces an equation with a positive slope.

2. Demographic Determinants

The following demographic determinant data are all from the 2009 ACS 1-Year Estimates from the U.S. Census Bureau.

a) Age

Table B01001 provides data on the sex by age of the total population. Age breakdowns are reported in five year breaks with special breaks for ages such as 21. These breakdowns allow the percentages of the population in each MSA to be calculated for the 18 and below, 18 to 24, and 65 plus age groups.

These specific age groups are the only ones used in the following models because these groups are those that are thought to generally experience lower incomes and therefore higher rates of poverty. Those people under the age of 18 are not yet considered to be adults and don't have the ability or opportunity to bring in enough income in most situations to avoid poverty.

The 18 to 24 age group is different in that this is the age group in which most young adults enter into their first careers or obtain additional education such as college. In both of these

cases, income in general is limited. Those just starting off their careers will most often earn less and have a greater tendency to fall into poverty. Those in college or other education settings will either not be working, or at least not be working as much as they would be otherwise, because of the burden of classes. In addition, there may not be job opportunities available around the region in which these students attend school that match their abilities. All of these factors could lead to young adults having less income and a greater likelihood of being in poverty.

The 65 plus age group contains some people that work and in some cases these people are at their peak and making the most money of their lives, but there are also the retired, the elderly and those that may be sick or disabled. This limits the income that some in this age group are able to obtain and increases the chance that they may be in poverty.

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 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.

Figure 2 displays the relationship between the percent of the population with a bachelor's degree and the poverty rate across metro areas. Fitting a trendline on the 346 metro area points provides an equation with a negative slope indicating that there is a negative relationship between the percentage of the population with a bachelor's degree and the poverty rate across U.S. metro areas.

Figure 2. - Percent of Population with a Bachelor's Degree and Poverty Rates

$y = -0.4761x + 18.503$
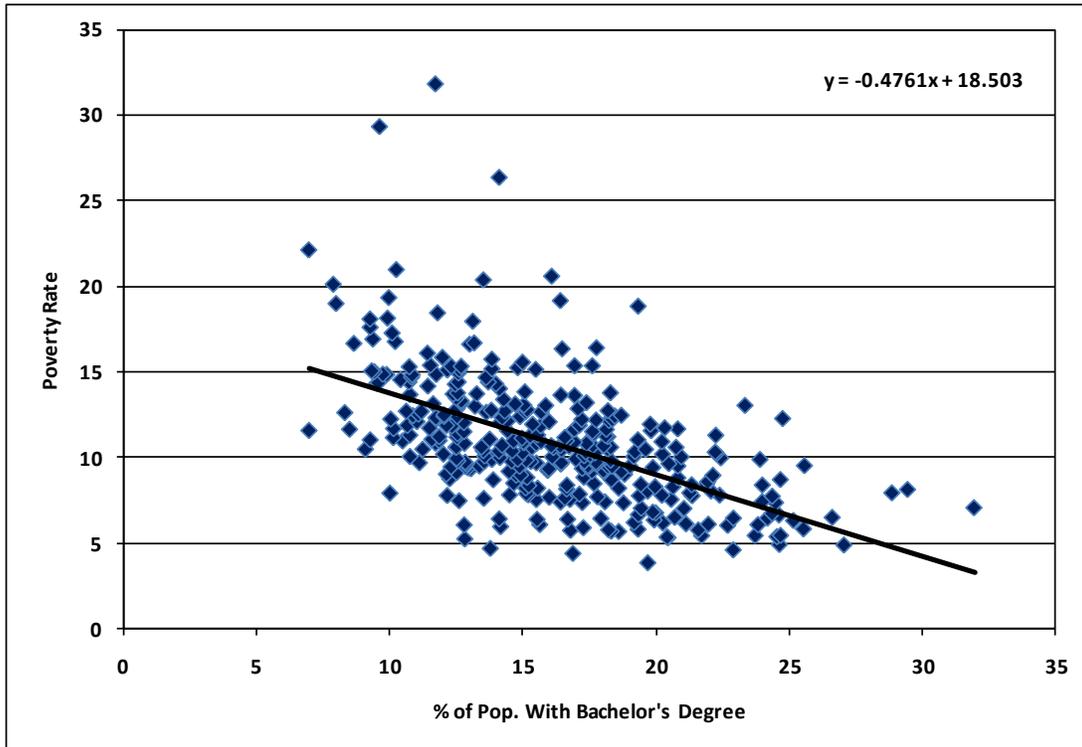
d) Migration

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 sum is divided by the total population of the metro area aged one and over to convert to a percentage.

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 category 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.

3. Geographic Determinants

Each metro area was categorized by both the Census division and region in which it falls. The Census divisions are the Northeast, South, Midwest, and West. The Census regions are New England, Middle Atlantic, South Atlantic, East South Central, East North Central, West North Central, West South Central, Mountain, and Pacific. For this project the more disaggregated Census regions are more appropriate than the divisions because they will be able to provide more detail in the end models developed. Figure 3 displays the U.S. Census Regions and Divisions.

Figure 3 – U.S. Census Regions and Divisions
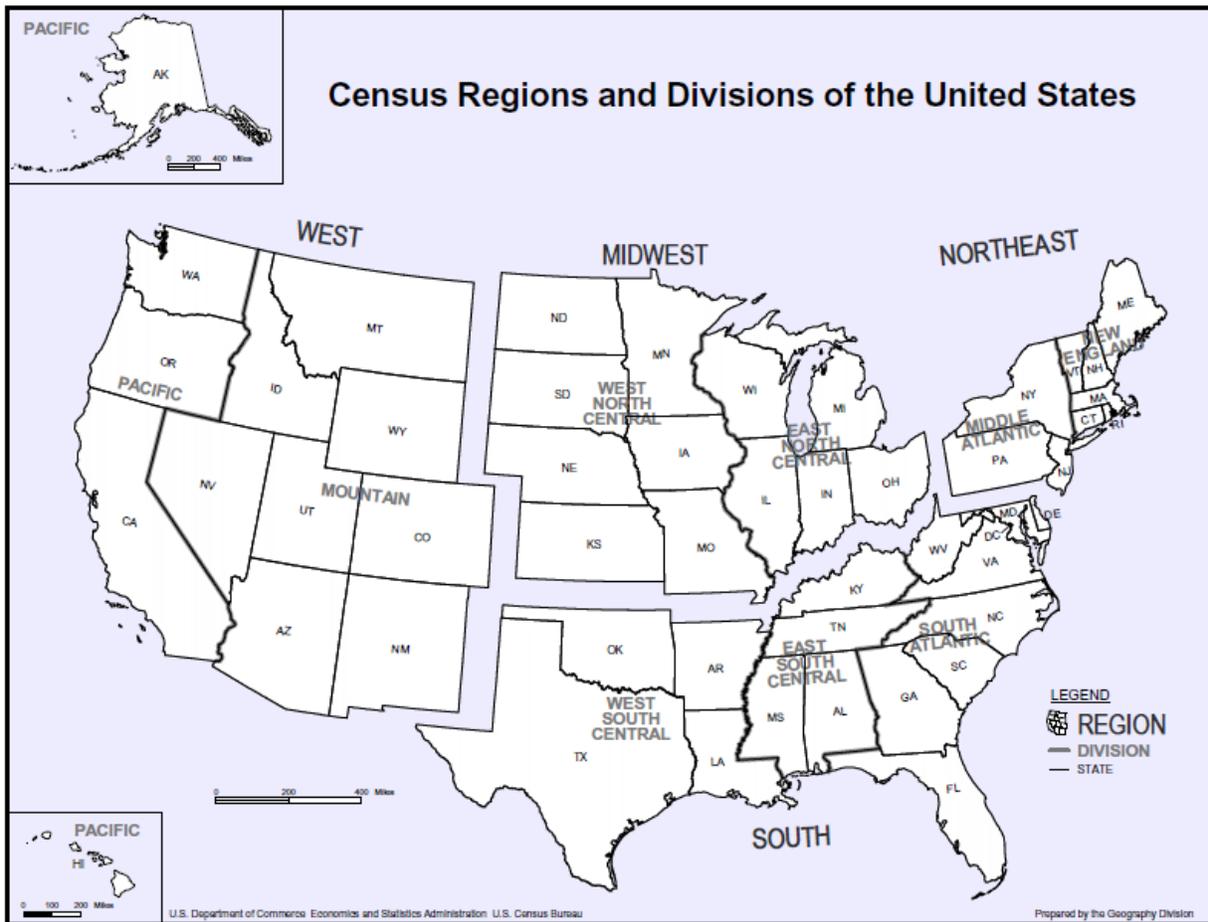
Source: U.S. Census Bureau, Geography Division

Census divisions and regions are based on state boundaries and this creates an issue because metro areas can cross state lines. For those metro areas that straddle a census division or region, the metro area was assigned into the region or division based on the central city location.

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 2.

Table 2 – Variable Names with Shortened Equation Names

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

Using the shortened names of the variables listed above, the empirical model can be developed below.

Equation 2: Empirical Model

$$PovR_i = \beta_0 - \beta_1 EmpR_i - \beta_2 PempR_i + \beta_3 IIneq_i + \beta_4 Child_i + \beta_5 YAd_i + \beta_6 Sen_i + \beta_7 FHoH_i$$
$$+ \beta_8 LHSD_i - \beta_9 SColl_i - \beta_{10} BachD_i - \beta_{11} GBachD_i - \beta_{12} Mig_i - \beta_{13} Black_i + \beta_{14} ORace_i$$
$$+ \beta_{15} For_i +/- \beta_{16} Regional\ Dummies$$

where $_i$ = metro area, β_0 = constant

V. Descriptive Statistics

The dependent variable is the poverty rate across metro areas. For the 346 metro areas used, the average poverty rate was 10.8 percent. Across all these metro areas, 1 in 10 people was in poverty in 2009. The minimum poverty rate was in the Napa, California metro area with only 3.81 percent of the population in poverty. The highest poverty rate was in the McAllen-Edinburg-Mission, Texas metro area with 31.8 percent of the population in poverty.

As for the independent variables, the employment rate ranged from only 24.28 to 80.53 percent with an average of 56.53 percent. The highest employment rate was in the Midland, Texas metro area, while the lowest employment rate was in Palm Coast, Florida.

Proprietor employment ranged from as low as 3.22 to 28.4 percent in the 346 metro areas. The highest and lowest proprietor employment rates were in the same metro areas as the highest and lowest employment areas. Midland, Texas had the highest proprietor employment rate, while Palm Coast, Florida had the lowest.

The highest income inequality was in Morgantown, West Virginia with a Gini Index of 0.54. The lowest Gini Index of 0.38 was in Sheboygan, Wisconsin meaning that out of the 346 metro areas examined, it has the most equal income among residents. The average Gini Index for all metro areas was 0.44.

The next category of determinants is the age groups. The under 18 years of age group had the highest percentage of the population in Laredo, Texas with 37.7 percent. Almost 2 out of five people living in this metro area are under the age of 18. The metro area with the lowest percentage of the population below 18 years of age was Punta Gorda, Florida with only 14.6 percent.

Punta Gorda, Florida also had the lowest number of 18 to 24 years olds with only 5.8 percent. State College, Pennsylvania had the highest percentage of 18 to 24 year olds with 30.7 percent. This is unsurprising since State College is home to the University Park campus of Pennsylvania State University.

With the smallest shares of children and college aged young adults out of all metro areas, it is predictable that Punta Gorda, Florida actually has the highest percentage of those over 65 years old with 34.6 percent. The Provo-Orem, Utah metro area has the smallest percentage of people aged 65 and over with only 6.5 percent of the population.

For the female head of household data, Wausau, Wisconsin had the smallest percentage of female headed households with only 7.4 percent in 2009. Meanwhile the Columbus, Georgia-Alabama metro area had over four times as many female headed households with 32.6 percent.

Starting the education categories with those with less than a high school degree, Manhattan, Kansas had the lowest percentage of people aged 25 and over with less than a high school degree with 5.3 percent. This is logical because Manhattan, Kansas is home to Kansas State University. On the other extreme, McAllen-Edinburg-Mission, Texas had the highest percentage of the population with less than a high school degree with 39.3 percent. Nearly 2 out of 5 people in this metro area do not have a high school diploma or an equivalent. The average

percent of the population over 25 years with less than a high school diploma across all the metro areas examined was 14.2 percent.

On average 30.6 percent of those aged 25 and over had some college education. The lowest percentage was in Houma-Bayou Cane-Thibodaux, Lousiana with only 19.4 percent, while the highest percentage was in Bend, Oregon with 43.2 percent.

For the percent of the population with a bachelor's degree, Dalton, Georgia had the lowest percentage with only 7.0 percent. Boulder, Colorado had the highest percentage with 32.0. On average across all metro areas examined, only 16.1 percent of the population aged 25 and over had a bachelor's degree. This is only a little greater than the percent of the population with less than a high school diploma.

Boulder, Colorado also had the greatest percentage of the population with a degree higher than a bachelor's with 26.0 percent. The Hanford-Corcoran, California metro area had the smallest percentage with only 2.9 percent. The average percent of the population over 25 years old with a degree greater than a bachelor's was 9.1 percent.

Considering migration during the previous year, the highest rate of migration was in Jacksonville, North Carolina with 24.4 percent of the population living outside of the county in the previous year. The lowest rate of migration was in Niles-Benton Harbor, Michigan with only 2.5 percent. 6.8 percent of the population on average moved into the metro areas examined from an outside county in 2009.

The race and ethnicity categories provide wide ranges. Examining the percent of the population that is black or African American, Albany, Georgia had the highest percentage of the population with 53.1 percent. Wenatchee-East Wenatchee, Washington had none of the population estimated as African American in 2009. 10.7 percent of the population was Black or African American in 2009 on average across the 346 metro areas.

The percent of population of another minority race besides black was lowest in Altoona, Pennsylvania with only 1.6 percent. Honolulu, Hawaii had the largest percentage with 73.9 percent. 9.1 percent of the population on average across the metro areas were of another minority race besides black.

Across the 346 metro areas, 7.7 percent of the population was foreign-born. The lowest percent was in Parkersburg-Marietta-Vienna, West Virginia-Ohio with only 0.7 percent. The highest percentage of foreign-born residents was in the Miami-Fort Lauderdale-Pompano Beach, Florida metro area with 37.1 percent of the population.

Table 3 provides a summary of the descriptive statistics on the data used.

Table 3. - Variable Descriptive Statistics

		Mean	Minimum	Maximum
Dependent Variable:				
PovR	**Poverty Rate**	10.84	3.81	31.80
Independent Variables:				
EmpR	Employment Rate	56.53	24.28	80.53
PEmpR	Proprietor's Employment Rate	11.35	3.22	28.40
IIneq	Income Inequality	0.44	0.38	0.54
Age				
Child	Under 18	24.03	14.60	37.69
YAd	18-24	11.24	5.75	30.69
Sen	Over 65	13.29	6.51	34.60
FHoH	Female Head of Household % of Total Families	18.79	7.43	32.64
Education				
LHSD	Less than a High School Diploma	14.21	5.27	39.31
SColl	Some College	30.58	19.41	43.16
BachD	Bachelor's Degree	16.10	6.95	31.98
GBachD	Greater than a Bachelor's Degree	9.11	2.91	25.96
Mig	% Population Migrating	6.84	2.45	24.43
Race or Ethnicity				
Black	Black or African American % of Total Population	10.71	0.00	53.06
ORace	Other race besides white or black as percent of total population	9.13	1.58	73.93
For	% Foreign Born of Total Population	7.66	0.68	37.12

VI. Analysis

A. Methodology

The cross-sectional data collected were analyzed using least squares regression. Two different models with revised versions were examined taking into account different sets of variables. A summary of these models and versions is included in Tables 5 and 6.

B. Model 1 – Economic and Demographic Variables without Regional Variables

The first model examined used all the economic and demographic variables but did not include the regional dummy variables. A correlation analysis of the variables was conducted and is included as Table 4 on the next page. There were two sets of variables that were somewhat highly correlated and can be seen in the matrix. These variables are the percent of the population with less than a high school diploma and the poverty rate and also the percent of the population with a bachelor's degree and the percent of the population with greater than a bachelor's degree. The correlation of the poverty rate and less than high school diploma variables is 0.735 and the correlation of the bachelor's degree and greater than bachelor's degree variables is 0.748. These correlations are not extremely high, but should be noted. The correlations among the other independent variables are not high, so it suggests that collinearity is not an issue.

After the correlation analysis, regressions were run on model 1. The results are included below in Table 5 under version A. This model supports many of the theorized results, but there were a few unexpected, although insignificant variables.

Employment rate, proprietor's employment rate, income inequality, under 18 years , 18 to 24 years, over 65 years, female head of household, less than a high school diploma, percent of the population black, and the percent of the population that are foreign-born are all significant variables and exhibit the predicted sign. In addition, overall the model has an adjusted R-squared value of about .81 and an F-statistic of 98.78.

Even with these good results, there were five variables that were insignificant. The percent of the population with some college education, a bachelor's degree, or even more than a bachelor's degree were all insignificant. Also the sign on the some college education and more than a bachelor's degree variables were positive in this model indicating that metro areas with higher proportions of more educated people have higher poverty rates, which does not fit theory. The percent of the population that migrated as well as the percent of the population that is of another minority race besides black were also insignificant in this model.

An interesting note is the difference between the correlation and regression results for the race and ethnicity variables. The correlation results indicate a positive relationship between the variables and the poverty rates in metro areas. The regression results display the opposite, meaning that greater percentages of these populations actually reduce poverty rates. This difference indicates that the factors that may make these populations experience more poverty are actually taken into account by other variables such as education status or employment rate, rather than race.

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Table 4. - Variable Correlation Matrix

	Poverty Rate	Emp. Rate	Prop's Emp. Rate	Income Ineq.	Under 18	18-24	>65	Female HOH	< HS	Some College	Bach.	> Bach.	Non-Movers	Black	Other race	Foreign Born
Poverty rate	1.000															
Employment Rate	-0.431	1.000														
Proprietor's Employment Rate	-0.354	0.539	1.000													
Income Inequality	0.351	0.129	0.202	1.000												
Under 18	0.471	-0.208	-0.114	-0.107	1.000											
18-24	0.038	0.269	0.027	0.199	-0.208	1.000										
>65	-0.140	-0.294	-0.015	-0.022	-0.550	-0.406	1.000									
Female Head of Household % of Total Families	0.625	-0.123	-0.247	0.363	0.281	-0.042	-0.186	1.000								
< HS Diploma	0.735	-0.470	-0.251	0.231	0.555	-0.142	-0.130	0.432	1.000							
Some College	-0.140	-0.152	0.070	-0.374	0.117	-0.054	0.039	-0.179	-0.277	1.000						
Bachelor's Degree	-0.548	0.590	0.471	0.149	-0.186	0.227	-0.285	-0.288	-0.548	-0.103	1.000					
> Bachelor's Degree	-0.422	0.484	0.365	0.304	-0.354	0.376	-0.192	-0.193	-0.447	-0.279	0.748	1.000				
% Non-Movers	-0.048	0.254	0.068	0.001	-0.133	0.682	-0.284	-0.054	-0.180	0.165	0.168	0.217	1.000			
Black or African American % of Total Population	0.253	0.020	-0.129	0.292	0.070	-0.005	-0.130	0.700	0.101	-0.141	-0.055	-0.017	0.080	1.000		
Other Race besides white or black as % of Total Pop.	0.026	-0.074	0.074	-0.012	0.335	-0.021	-0.286	-0.036	0.284	0.088	0.117	0.111	-0.025	-0.238	1.000	
% Foreign Born of Total Population	0.126	-0.163	0.057	0.224	0.374	-0.072	-0.205	0.022	0.481	-0.152	0.177	0.202	-0.122	-0.173	0.687	1.000

Table 5 – Model 1 Regression Results

Dependent Variable:				
PovR	**Poverty Rate**			
Independent Variables:				
(T Stats in Parentheses)		**Expected Sign**	**Version A**	**Version B**
Constant		+/-	-25.4 (-7.95)	-25.1 (-8.91)
EmpR	Employment Rate	-	-0.0625 (-3.50)	-0.0687 (-4.23)
PEmpR	Proprietor's Employment Rate	-	-0.152 (-3.05)	-0.149 (-3.30)
IIneq	Income Inequality	+	41.5 (8.84)	39.7 (9.14)
Child	Under 18	+	0.438 (7.55)	0.456 (8.55)
YAd	18-24	+	0.168 (4.44)	0.195 (6.73)
Sen	Over 65	+	0.151 (2.83)	0.177 (3.58)
FHoH	Female Head of Household % of Total Families	+	0.343 (9.16)	0.347 (9.56)
LHSD	Less than a High School Diploma	+	0.266 (6.31)	0.272 (10.50)
SColl	Some College	-	0.0205 (0.67)	
BachD	Bachelor's Degree	-	-0.0402 (-0.92)	
GBachD	Greater than a Bachelor's Degree	-	0.0140 (0.30)	
Mig	% Population Migrating	-	0.0403 (0.82)	
Black	Black or African American % of Total Population	-	-0.0723 (-5.57)	-0.0714 (-5.81)
ORace	Other race besides white or black as percent of total population	+	-0.00925 (-0.54)	
For	% Foreign Born of Total Population	+	-0.146 (-5.41)	-0.162 (-9.64)
N			346	346
R^2			0.818	.816
Adj. R^2			0.810	.811
F-Stat.			98.78	148.81
Prob. of F-Stat.			0.00	0.00

The model was run again without these insignificant variables and the results are in Table 5 under version B. Eliminating these five variables from the model did not make a huge difference with the overall fit of the model. The adjusted R-squared value only increased by a little over a thousandth. The F-statistic increased to 148.8 and the remaining variables were still significant and displayed the same theorized signs as in the last model.

B. Model 2 – Economic and Demographic Variables with Regional Variables

After analyzing the model without the regional variables, a second model was created that included these regional geographic variables to see if the location of a metro area itself had any effect on poverty rates in that metro area. The first test of this model included all the economic, demographic, and geographic variables and is listed under version A of Model 2.

As with the previous model, the same five economic and demographic variables were insignificant. These were the percent of the population with some college education, a bachelor's degree, or more than a bachelor's degree, the percent of the population that migrated, and the percent of the population that was of a different minority race than African American. In addition, the Middle Atlantic and Pacific variables were insignificant indicating that they are not statistically different than the New England region of the U.S., which was the reference region.

Overall this second model had an adjusted R-squared value of 0.816, which is just slightly higher than the revised first model. The F-statistic is lower at 67.6 than the previous model, but is still significant.

Revising this second model by eliminating the insignificant variables provides the following changes under version B of Model 2.

All the remaining variables remain significant and display the theorized sign. The adjusted R-squared term only increases slightly once again to 0.818 and the F-statistic increases to 97.86, which is significant.

Overall, these models reinforce expectations about the main determinants of poverty being tested. The employment rate in a metro area is negatively related to the poverty rate, meaning that as employment increases, poverty decreases. The same relationship exists with proprietorship employment specifically. Income inequality is strongly positively related to poverty rates across U.S. metro areas. The higher the percentage of people that fall into the under 18, 18 to 24, and over 65 age groups, the higher the poverty rate. Female heads of household are also positively related to poverty rates as is the percentage of the population with less than a high school diploma. This means that metro areas with higher proportions of these population groups experience higher poverty rates. The percent of the population that is African American or foreign-born are also found to be negatively related to poverty rates as with some of the previous research. This result is not as obvious or expected as other variables, but is backed up by the previous research. The inclusion of the regional variables also indicates that when compared to metro areas in New England, metro areas in the South Atlantic, East South Central, East North Central, and Mountain regions all experience higher rates of poverty.

Education is one of the key theorized ways to move a population out of poverty. It is very strange then, that the education variables tested were insignificant in the previous models. Going back to the correlations in Table 4, the bachelor's degree variable which measures the percent of the population aged 25 and over with a bachelor's degree is fairly highly correlated with the employment variable data. Because of this unsuspected insignificance and the correlation, collinearity may be an issue with the model. In order to test for this, a third version of Model 2 was run and the results are included in Table 6 under version C.

Table 6 – Model 2 Regression Results

Dependent Variable:						
PovR	**Poverty Rate**					
Independent Variables:						
(T Stats in Parentheses)		Expected Sign	Version A	Version B	Version C	Version D
Constant		+/-	-23.4 (-6.58)	-23.3 (-7.65)	-27.9 (-8.09)	-27.9 -9.87
EmpR	Employment Rate	-	-0.0609 (-3.20)	-0.0691 (-4.01)		
PEmpR	Proprietor's Employment Rate	-	-0.140 (-2.58)	-0.142 (-2.93)		
IIneq	Income Inequality	+	37.9 (7.84)	36.5 (8.29)	33.6 (6.71)	33.5 7.47
Child	Under 18	+	0.404 (6.35)	0.408 (6.88)	0.435 (6.54)	0.466 8.07
YAd	18-24	+	0.171 (4.51)	0.182 (6.18)	0.203 (5.14)	0.208 6.86
Sen	Over 65	+	0.137 (2.49)	0.150 (2.97)	0.186 (3.39)	0.196 3.81
FHoH	Female Head of Household % of Total Families	+	0.380 (9.59)	0.379 (10.10)	0.402 (9.87)	0.387 9.88
LHSD	Less than a High School Diploma	+	0.238 (5.05)	0.267 (9.42)	0.251 (5.22)	0.256 7.18
SColl	Some College	-	-0.00362 (-.10)		0.000398 (0.01)	
BachD	Bachelor's Degree	-	-0.0583 (-1.28)		-.117 (-2.51)	-0.125 -3.23
GBachD	Greater than a Bachelor's Degree	-	0.0150 (0.30)		-0.0192 (-0.38)	
Mig	% Population Migrating	-	0.00734 (0.14)		-0.00558 (-0.10)	
Black	Black or African American % of Total Population	-	-0.0893 (-5.82)	-0.0899 (-6.03)	-0.0861 (-5.35)	-0.0841 -5.41
ORace	Other race besides white or black as percent of total population	+	-0.00348 (-0.19)		-0.0107 (-0.55)	
For	% Foreign Born of Total Population	+	-0.121 (-4.33)	-0.132 (-6.97)	-0.0950 (-3.29)	-0.106 -5.01
MAT	Middle Atlantic Region	+/-	0.368 (0.68)		0.699 (1.25)	
SAT	South Atlantic Region	+/-	1.57 (2.88)	1.10 (3.40)	1.78 (3.14)	1.00 3.37
ESC	East South Central Region	+/-	1.79 (3.03)	1.32 (3.19)	1.88 (3.04)	1.10 2.88
ENC	East North Central Region	+/-	1.39 (2.76)	0.953 (3.11)	1.77 (3.40)	0.998 3.63
WNC	West North Central Region	+/-	1.23 (2.13)	0.719 (1.80)	1.07 (1.82)	
WSC	West South Central Region	+/-	1.19 (2.04)	0.684 (1.81)	.819 (1.34)	
MOU	Mountain Region	+/-	1.56 (2.64)	1.00 (2.63)	1.70 (2.75)	0.780 2.19
PAC	Pacific Region	+/-	0.774 (1.23)		1.00 (1.53)	
N			346	346	346	346
R^2			0.828	0.826	0.810	0.807
Adj. R^2			0.816	0.818	0.797	0.799
F-Stat.			67.62	97.86	65.61	106.63
Prob. of F-Stat.			0.00	0.00	0.00	0.00

Leaving out the employment variables in Version C makes the bachelor degree variable significant and it had the expected negative sign. This means that metro areas with higher percentages of people with a bachelor's degree experience lower poverty rates. The variables measuring the percent of people with some college education and those with greater than a bachelor's degree, however, are still insignificant in this version. The percent of the population that migrated as well as the percent of the population of another minority race besides black also remained insignificant. The only other variable to change sign or significance in Version C is the west south central region variable. The west south central region variable is insignificant in this version and the west north central region variable is close to being insignificant. In this model, it means that there is no significant difference in poverty rates holding all else constant between the west south central region and the New England region, which was the reference region.

As with Version A, a second regression was completed using the variables in Version C, except that the insignificant variables were dropped from the regression. The results of this regression are listed under Version D in Table 6. The bachelor's degree variable remains negative and significant in this model. The west north central region variable also becomes insignificant after the other variables are dropped from the equation and therefore it was dropped from version D as well. Version D, which does not contain the employment variables has an adjusted R^2 value of 0.799. This is only slightly less than the adjusted R^2 value of Version A of 0.818 which does not contain the education variables. This indicates that the bachelor's degree and employment variables are highly correlated and there is a collinearity issue within the model.

Even with this collinearity issue, these models display a good estimate of the determinants of poverty across metro areas in the U.S. In the future though, more testing and correction for multicollinearity should be conducted. In addition other variables such as industry mix should be tested to see if they impact poverty rates.

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 should focus on in order to try to reduce poverty rates in the United States. In general many current programs aimed to alleviate poverty across the United States focus on education, economic opportunities, organizing communities, or other special initiatives (Charles Stewart Mott Foundation). These programs seem consistent with the results of this study.

Specifically, programs that promote overall employment as well as new proprietorship employment should be enacted. Four versions of the models suggest that greater employment and proprietorship employment reduce poverty rates among metro areas.

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 by 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. This 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.

Examining the model results from the other side, policies that promote the migration of people and the attainment of only some college education or of education beyond a bachelor's degree are suggested by this model to be inefficient.

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.

In the future, further research can be conducted based on this study. Data on other variables such as industry mix, labor force participation, government expenditures through certain programs, and other demographic variables that explore diversity could be collected and tested. Different data sources could also be utilized or different years of data. This further research would bolster this analysis and provide further insight into the determinants of U.S. metro area poverty levels.

Appendices

Appendix A. 20 MSAs not Included in Analysis

During this project a few U.S. metro areas were left out of the analysis because of missing data. For most of these metro areas, the variable with missing data was the poverty rate. A few of these twenty were missing employment, race, and ethnicity data. Table 7 provides a summary of these metro areas including the 2009 population in each. Omitting these metro areas only missed 1.01 percent of the total population of all metro areas, or 0.85 percent of the total U.S. population. In addition, the total metro area population comprised 83.8 percent of the total U.S. population. Overall this analysis covered the majority of the population of the entire United States.

Table 7 – 20 Metro Areas not Included in Analysis with 2009 Population Data

FIPS Code	Metro Area Name	Population
16180	Carson City, NV	55,176
25980	Hinesville-Fort Stewart, GA	74,420
16220	Casper, WY	74,508
18020	Columbus, IN	76,063
41780	Sandusky, OH	76,963
24500	Great Falls, MT	82,178
18700	Corvallis, OR	82,605
11180	Ames, IA	87,214
20220	Dubuque, IA	93,072
36140	Ocean City, NJ	96,091
21820	Fairbanks, AK	98,660
27060	Ithaca, NY	101,779
19260	Danville, VA	105,814
33540	Missoula, MT	108,623
29940	Lawrence, KS	116,383
44600	Steubenville-Weirton, OH-WV	120,929
34100	Morristown, TN	137,612
44220	Springfield, OH	139,671
18880	Crestview-Fort Walton Beach-Destin, FL	178,473
35840	North Port-Bradenton-Sarasota, FL	688,126
Total of 20 Metro Areas		2,594,360
Total Metro Area Population		257,355,190
Percentage of Total Metro Area Population of 20 Omitted Metro Areas		1.01%
Total U.S. Population		307,006,550
Percentage of Total U.S. Population of 20 Omitted Metro Areas		0.85%
Percentage of Total U.S. Population of Total Metro Area Population		83.83%

Appendix B. 2009 Poverty Threshold Levels

Table 8 provides the 2009 poverty thresholds that determined the poverty rates used in this analysis. The poverty threshold for each family is dependent on the size of the family unit and the number of related children under 18 years in that family unit. To read this table, the number in the family unit is found in the first column and then the poverty threshold is found by going across that row to the appropriate column that describes how many children are in the family unit. For example if there are five people in a family of which 3 of those people are under 18 years old, then the poverty threshold in 2009 for that family is $25,603. Any family of that composition that made below $25,603 in 2009 was officially in poverty.

Table 8 – Poverty Thresholds for 2009 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)....	10,956									
Under 65 years........................	11,161	11,161								
65 years and over....................	10,289	10,289								
Two people............................	13,991									
Householder under 65 years...........	14,439	14,366	14,787							
Householder 65 years and over......	12,982	12,968	14,731							
Three people..........................	17,098	16,781	17,268	17,285						
Four people...........................	21,954	22,128	22,490	21,756	21,832					
Five people...........................	25,991	26,686	27,074	26,245	25,603	25,211				
Six people............................	29,405	30,693	30,815	30,180	29,571	28,666	28,130			
Seven people..........................	33,372	35,316	35,537	34,777	34,247	33,260	32,108	30,845		
Eight people..........................	37,252	39,498	39,847	39,130	38,501	37,610	36,478	35,300	35,000	
Nine people or more...................	44,366	47,514	47,744	47,109	46,576	45,701	44,497	43,408	43,138	41,476

Note: The poverty thresholds are updated each year using the change in the average annual Consumer Price Index for All Urban Consumers (CPI-U). Since the average annual CPI-U for 2009 was lower than the average annual CPI-U for 2008, poverty thresholds for 2009 are slightly lower than the corresponding thresholds for 2008.

Source: U.S. Census Bureau, Poverty Definitions

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