Methodology: Identifying Specific Candidate Variables and Building Distress Indexes

In this technical section, we describe the methodology used to select the candidate distress indicator variables and to build the distress indices presented in Section 4. To improve readability, the longer statistical tables can be accessed in the Appendix. For those with less interest in the technical details of our work, we invite you to skip directly to Section 4 where we present our results.

In deriving our candidate distress indexes, we generally follow the process described during the February and June 2009 webinars organized at the ARC headquarters and in the April 2008 report we submitted to the ARC. Our methodology involves (1) identifying individual "Candidate Variables" that are associated with contemporaneous and future distress as described in Section 2 above, and (2) using the Candidate Variables to construct six top "Candidate Distress Indexes" presented to ARC for further examination. The six top Candidate Distress Indexes are constructed using a variety of combinations of the Candidate Variables.

As described in Section 2, we consider 40 Candidate Variables that are linked to future distress and local economic growth. These measures are associated with labor market conditions, income, poverty, housing and self employment, among other factors. *A priori,* these 40 Candidate Variables are perceived as good measures of contemporaneous distress. To assess whether they are also suitable forward-looking variables for determining future distress, we collect data on the same variables dating back to the mid-1990s.

Selecting Specific Candidate Distress Indicator Variables

We considered a variety of methodologies to select our distress indicators. Sophisticated regression strategies were initially considered which have the advantage of being considerably less data intensive than the approach we eventually selected. Yet, we decided to forego this methodology for two reasons. First, there is no clear, single dependent variable for distress—so pursuing statistical analysis without a clear dependent variable is problematic. Second, ARC stakeholders desire an end-product that is transparent to non-statisticians. As a result, we employ a multiple-step approach that selects the variables associated with both current and future distress in a clear and straightforward manner. The desired outcome is to develop Candidate Distress Indexes that could help target funding to counties that are *currently* in distress and at the greatest risk of experiencing *future* distress. Because ARC policy intervention is usually aimed at reducing future distress, our empirical goals seem particularly appealing.

Our methodology for selecting Candidate Variables is explained in the following steps. The first step is to consider whether our Candidate Variables are strongly associated with future distress. As noted previously, our interest is to address future distress in a manner that is consistent with the ARC tradition of addressing long periods of persistent distress—rather than short-term cyclical downturns such as a plant closing. As such, we consider whether the Candidate Variables are associated with future distress (or economic outcomes) about ten years in the

future. Thus, we take the Candidate Variables measured in circa 1996/1997 (or as close as possible due to data availability) and examine their correlation with key economic outcomes around the current or 2006/2007 time period.

While numerous economic outcomes in 2006/2007are considered in this analysis, we focus on key recognizable outcomes. Specifically, Table 3.1 outlines the five measures of "contemporaneous" distress that we believe are the most important and most easily defensible to ARC stakeholders and external observers. These five key indicators provide a general picture of overall economic prosperity and help capture the broad dimensions of community distress, without examining so many outcomes as to become too unwieldy. We view high correlations with these five contemporaneous economic measures as a good reflection that a Candidate Variable measured in the mid 1990s would be closely associated with future distress.

Table 3.1: Five Key Indicators of Current Distress

1	2007 poverty rate
2	2006 per-capita market income
3	1996-2006 total job growth (including proprietors)
4	1996-2006 population growth
5	2007 employment/population ratio

As noted in the previous section, the ten-year measures of employment and population growth reflect the persistent nature of the distress that we are trying to capture here. This persistence would not be well-represented in measures calculated over shorter periods of time, such as two or five years.

The predictive performance of these Candidate Variables for the ARC counties is demonstrated in Appendix Table A.1. This table shows the correlations for Candidate Variables measured in the mid-1990s (down the rows) with outcomes measured around 2006/2007 (columns across the top). For comparison, the very top row shows the 1997 ARC distress index measured on a 1 to 5 scale with one being categorized as in attainment and five being classified as distressed. The correlation of the percent change in population between 1986 and 1996 with the 2007 poverty rate is -0.41, which is of moderate predictive power.

The predictive performance of the same Candidate Variables for all U.S. counties is demonstrated by the correlations shown in Appendix Table A.2. U.S. aggregate correlations are used as a way to appraise the reliability of the ARC county results. For example, for all U.S. counties, the correlation of the 1986-1996 percent change in population with the 2007 poverty rate is only -0.22. In other words, population growth is related to a much lesser degree to poverty in the overall U.S. than in the ARC region.

We provide many of the correlations for the 2006/2007 variables shown in Tables A.1 and A.2 for comparison purposes. Evaluating the size of all these correlations, the five variables identified in Table 3.1 are the most informative variables in terms of whether a Candidate Variable measured in 1996/1997 also is associated with distress in 2006/2007.

Based on discussions with ARC stakeholders, and after reviewing the distress indicator literature, we view the correlations with the 2007 poverty rate as particularly important in indicating distress. Thus, we require some Candidate Variables (measured in the 1996/1997 period) to be highly correlated with the 2007 poverty rate. Not surprising, the 1997 poverty rate is highly correlated with the 2007 rate (0.92), while the 2000 employment/population ratio and the 1996 per-capita income also have correlations in the -0.74 or -0.77 range. Given the persistence of the poverty rate, we include the poverty rate as a good Candidate Variable in further assessment. For illustration purposes, Figures 3.1 to 3.3 report scatter plots of the 1996 poverty rate with the 2007 poverty rate, 2006 per capita market income, and the 2007 employment/population rate. These figures show the strong association between the 1997 poverty rate and future economic outcomes.

Next, we examine several groupings of variables to select additional Candidate Variables to be used in constructing Candidate Distress Indexes. First, the 1986-1996 population growth variable consistently dominates the 1986-1996 job growth variable across the board—even being more highly associated with 1996-2006 job growth. Second, 1996 per-capita market income is also highly associated with most of the key variables, though it is only moderately associated with 1996-2006 population and job growth. Third, the 2000 employment/population rate is more strongly correlated with the five key 2006/2007 measures than the labor-force participation rate. Conversely, the 1996 unemployment rate is much less strongly related to 2006/2007 outcomes than either the employment population ratio or the labor force participation rate. The weak performance of the unemployment rate is consistent with the general limitations of the unemployment rate recognized by ARC stakeholders and within the academic literature (Partridge et al., 2008).

Among the education variables, we focus on measures that reflect at least some college attainment. This follows from the February 2009 ARC webinar in which stakeholders strongly voiced this preference. College-educated workers better reflect the shift to the knowledge economy. (We report the correlations for high school dropouts and high school graduates for comparison.) The percent of the adult population with at least one year of college education generally outperforms the percent of the adult population with at least an associate degree and the percent of the adult population with at least a bachelor's degree. Yet, given the focus on the knowledge economy in the literature and among ARC stakeholders, we retain the bachelors degree for subsequent analysis because the differences in correlations among the educational attainment groups are not that sizable. Overall, the five (six including the bachelor's degree variable) Candidate Variables selected for further analysis are shown in Table 3.2.

***Table 3.2**:* Candidate Indicator Variables Selected for Further Analysis for Inclusion into Distress Indexes

1	Employment/population ratio
2	Poverty rate
3	Per-capita market income
4	Percent of the adult population with at least one year of college education (also at least a four-year Bachelors degree)
5	10 -year percent change in population

It should be noted that other variables are not as highly associated with the five key 2006/2007 economic outcomes. For example, the 1986-1996 percent change in per-capita income, the 1996 self employment share of total employment, and 1996 building permits per capita are not as highly correlated with these five key outcomes.

The results of our selection of the candidate indicator variables are also supported by the correlation analysis for all U.S. counties. As noted previously, Table A.2 shows the corresponding correlations with 2006/2007 outcomes for all U.S. counties. Comparisons to the entire U.S. represent a valuable way to examine the validity of the results. One of the key patterns is that the ARC regional correlations for the key economic outcome variables are greater than the corresponding correlations for all U.S. counties. However, our basic conclusions remain unchanged in that the best Candidate Distress Variables shown in Table 3.2 for the ARC region appear to be the same for the U.S. as a whole. This correspondence with the U.S. adds credibility to our findings, which would help make a compelling argument when proposing a new economic distress index to OMB and Congress.

The five Candidate Variables displayed in Table 3.2 appear to be solid forward-looking indicators associated with economic outcomes 10 years in the future (six when including the four-year college graduate share). Of course, these Candidates are selected on the basis of their characteristics in 1996/1997. Thus, one outstanding question is whether the Candidate Variables listed in Table 3.2 are linked to contemporaneous outcomes measured in 2006/2007. In this fashion, Table 3.3 presents the correlations of the six Candidate Variables (including the four-year college graduate share) measured in (or as close as possible to) 2006/2007 with the five key economic outcomes measured in 2006/2007. We also show the respective correlations for the 2007 unemployment rate because it is currently being used by ARC in its distress index.

Table 3.2: Correlations between 2006/2007 Candidate Variables, the Unemployment Rate and 2006/2007 Economic Outcomes, ARC Counties

	Poverty Rate 2007	**Per-capita Market Income 2006**	**% Job Growth 1996-06**	**% Population Growth 1996-06**	**Employment-Population Ratio 2007**
Employment-population ratio 2007	-0.72	0.71	0.45	0.42	1.00
Unemployment rate 2007	0.61	-0.61	-0.37	-0.29	-0.62
Poverty Rate 2007	1.00	-0.74	-0.32	-0.33	-0.72
Per-capita market income 2006	-0.74	1.00	0.36	0.32	0.71
Percent share of adult population with a 4-yr college degree or more (BA+MA+professional+PhD), 2000	-0.37	0.72	0.26	0.26	0.47
Percent share of adult population with more than one year of college (more than one year at some college+associates+BA+MA+professional +PhD), 2000	-0.47	0.77	0.26	0.28	0.53
Population percent change 1996-06	-0.33	0.32	0.73	1.00	0.42

The unemployment rate consistently underperforms relative to the employment-population ratio as shown by the size of correlations for both variables. The results clearly demonstrate that not only are the six Candidate Variables (including the four-year bachelors degree share) strong forward-looking indicators of future distress, but they also capture contemporaneous distress as well.

Methodology to Construct the Distress Indexes Using the Candidate Variables

The first step in the process of building actual Candidate Distress Indexes is to create Z-scores for each of the five Candidate Variables described above. Z-scores are commonly used by social scientists to compare variables that are measured using different metrics (such as income in dollar figures and poverty in percentages) and having different distributions. In effect, Z-scores allow for comparisons between variables and without it, one would be attempting to compare "apples" and "oranges." For example, by using Z-scores, we can directly compare unemployment rates, which may nationally vary from 4% to 18%, to poverty rates that may vary from 5% to 50%.

A Z-score is created through a statistical transformation of a variable that sets its mean equal to zero and its standard deviation equal to 1. Thus, for each of the 5 Candidate Variables, we create a transformed variable that reflects whether a county's value for the variable is (say) 0.5 standard deviations above the mean. For example, if the mean 1986-1996 population growth rate for all counties is 12% and the standard deviation is 10%, then a county that experienced a 17% population growth rate would be 0.5 standard deviations above the mean and be given a population-change Z-score of 0.5. Likewise, a county that experienced a population growth rate of only 2% over the period would be given a Z-score of -1.0 to correspond to its falling 1.0 standard deviation below the mean population growth rate of 12%.

For every Candidate Variable except the poverty rate, a *positive* Z-score is associated with a more favorable outcome. In order to convert the poverty rate Z-score into the same basis, we take the negative of the poverty rate Z-score-- i.e., – $\text{Z-score}_{\text{povrt}}$. Thus, if the mean poverty rate is 15% with a standard deviation of 10%, a county with a poverty rate of 20% would be assigned a Z-score of -0.5 -- i.e., negative Z-scores would then reflect outcomes *below* the national mean for all of the Candidate Variables.

As we noted above, converting the variables into Z-scores is important in constructing a distress index because it places all of the Candidate Variables on an even basis regardless of their variability. For example, the

Side Box 3.1:

The sensitivity of changing to an index based on Z-scores can be examined using the current ARC Distress Index. Using the process described in this section, we calculated the FY2007 ARC Distress Index based on Z-scores rather than the current procedure.

Figures 3.1a and 3.1b show how the ARC distress categorization would change if it were based on Z-scores.

Red indicates counties that would be categorized as distressed under both indexes—or there would be no change.

Blue indicates counties that would be categorized as distressed with the ARC Index, but would not be categorized as distressed using the Z-score index.

Green indicates counties that would be categorized as distressed using the Z-score index, but not under the current ARC Index.

White indicates counties that would not be categorized as distressed using either index.

The results show that 33 counties would change position, mostly in Central and Southern Appalachia. Sixteen counties not categorized by the current ARC method as distress would now fall into the distressed category when using the Z-score method (mostly in Ohio and Mississippi). On the other hand, 17 counties classified as distressed using the current method would no longer fall into the distress category with the Z-score method, with a large number of these being located in West Virginia. Thus, there is very little net change in the number of distressed counties using z-scores.

current ARC Distress Index gives a greater weight to the poverty rate by default--simply because the poverty rate has greater variability than the unemployment rate or the per-capita market income, as we demonstrated in our 2008 report (Partridge et al., 2008). Giving the poverty rate a higher weight may be appropriate, but this characteristic is an artifact of the poverty rate having a larger standard deviation, not because of a formal process of selecting weights by the ARC staff and stakeholders. With the Z-score transformation, this problem of different weighting among the variables comprising a distress index is avoided.

The current ARC Distress Index is composed of three variables. One potential shortcoming of this index is that three variables may be inadequate to capture all the dimensions of distress. Another shortcoming is that a distress index composed of only three variables may be prone to large year-to-year fluctuations when one variable changes, which may create transitional funding issues. Thus, considering up to five Candidate Variables mitigates these concerns without creating an index that is too unwieldy because it contains too many variables.

Using the five Candidate Distress Variables, we create 24 different permutations (combinations of different Candidate Variables) that are used to identify potential Candidate Distress Indexes. The basic strategy is to construct several permutations composed of 3 of the 5 Candidate variables, then several permutations composed of 4 of the 5 Candidate Variables, and finally one composed of all five Candidate Variables. Based on these permutations, once we identify the top potential Candidate Distress Indexes, we create additional Candidate Distress Indexes by substituting the percent of the population with at least one-year of college education with the percent with at least a bachelor's degree. We substituted different variables for education because the ARC States and staff suggested that differing measures of years of college completion might have varying effects in the region. Thus, our substitution considers whether using fewer years of college attainment (one year) has different effects than using a four-year college degree.

Then, for each of the two dozen permutations of Candidate Distress Indexes, the respective Z-scores for the corresponding Candidate Variables (including the negative of the poverty rate Z-score) are summed to obtain an overall measure of relative distress. For a given year, equation 3.1 illustrates a Candidate Distress Index (D) based on using population growth, the percent of the adult population with at least one-year of college education, and the poverty rate:

(3.1) $D_{pop_col_pov} = Z_{pop} + Z_{col} + Z_{pov.}$

Given our construction of the Z-scores, more *positive* values of the Candidate Distress Index indicate a more vibrant environment, while a more negative value indicates a county that is falling more into distress. We repeat this calculation for each of the 25 permutations and combinations to obtain the various Z-score based Candidate Distress Indexes.

The current ARC ranking procedure is then used to categorize each county into the five classifications running from distressed to attainment. Specifically, for each of the two dozen Candidate Distress Indexes measured in 1996/1997, we rank all of the approximately 3,100 U.S. counties into the five ARC attainment categories: the lowest 10% Z-scores are considered

*Distressed***;** 10%-25% Z-scores are categorized as *At-Risk*; 25%-75% of Z-scores are classified as *Transitional*; 75%-90% of Z-scores are denoted as *Competitive***;** 90%-100% of Z-scores are considered in *Attainment*. Each ARC region county is then assigned to the category into which they fall for the entire nation.

Ranking the Candidate Distress Indexes

To assess whether the two dozen 1996/1997 Candidate Distress Indexes are forward-looking measures of distress, we calculate their correlation with the five key contemporaneous (2006/2007) measures of economic outcomes shown in Table 3.1, as well as the other ancillary measures used in Tables A.1 and A.2.[2] The resulting correlations for the ARC region are shown in Appendix Table A.3 and the corresponding correlations across all U.S. counties are reported in Appendix Table A.4. The last column of these two tables shows the average correlations for the five key economic outcome variables. We rank the top Candidate Distress Indexes based on this average, which implicitly gives each of the five key outcomes an equal weight in appraising the overall economic outcomes. In cases in which there are ties in the average correlation, Candidate Distress Indexes that use more Candidate Variables are ranked higher because that would better reflect broader dimensions of economic distress. Indexes based on more indicators would also have the advantage of experiencing less-year-to-year fluctuation. We also rank more highly the Candidate Distress Indexes that include the poverty rate due to poverty's long-standing significance as an economic benchmark in the ARC region.

Based on the criteria above, we report the top six-ranked indexes in upper six rows of Table A.3. The highest-ranked Candidate Distress Index has an average correlation of 0.71. It is composed of the ten-year population growth, employment/population rate, percent of the population with at least one-year of college education, and the poverty rate. The second ranked index—also with an average correlation of 0.71—includes the same set of Candidate Variables but does not include the percentage of the population with at least one-year of college education. Finally, the sixth highest ranked Candidate Distress Index includes the percent of the population with at least one-year of college education, per-capita market income, ten-year population growth, and the poverty rate (with an average correlation of 0.70).

For the top-six ranked (circa) 1996/1997 indexes, there is relatively little difference in terms of their average correlation with 2006/2007 economic outcomes. As one moves further down the list, the forward-looking correlations tend to decline more rapidly. Thus, at the very top, there is less to differentiate the indexes from one another, which would suggest that the Commission would not be making a major mistake were it to choose one index over another—at least on an *a priori* basis. However, different sets of counties would be affected by the choice of a specific index.

As explained earlier, the percent of the population with a four-year college degree will be given further attention since it is perceived as more strongly linked to a county's potential to participate

[2]The values assigned to the Distress Indexes are a value of 5 for a distressed county, a value of 4 for a county classified as at-risk, and so forth, to a value of 1 when the county is classified as in attainment.

in the emerging knowledge economy. Of the top-six Candidate Distress Indexes presented in the top tier of Table A.3, four include the percent of the population with at least one year of college education. For these four Candidate Distress Indexes, we replace the percent of the adult population with at least one year of college education with the percent with at least a bachelor's degree. We then create four additional Candidate Distress Indexes. These four alternative distress indexes are reported in the bottom rows of Table A.3 (see rows 1b-4b).

The average correlations in the final column of Table A.3 illustrates that using the college graduate share results in no measurable change in the predictive capacity of the indexes. Moreover, the highest-ranked Candidate Distress Index using four-year college graduate includes the same variables as the highest-rated Candidate using the percent with at least one-year of college education (with the only difference being the college attainment variable). Likewise, the second-highest Candidate Distress Index using the bachelor's degree is the one that includes all 5 Candidate Variables—which is also the second-highest Candidate Distress Index when using the one-year college attainment share. The overall conclusion is that replacing the one-year college attainment share with the bachelor's attainment share does not make a perceptible difference as a forward-looking indicator of economic distress. Given that having at least a bachelor's degree is more closely linked to the emerging knowledge economy, we have a slight preference for Candidate Distress Indexes that include the bachelor's degree share, which is in line with the preferences of ARC stakeholders.

Table A.4 reports the corresponding Candidate Distress Index correlations using all 3,100 U.S. counties rather than the group of ARC counties. The table is ordered in the same manner as Table A.3 with the top indicators using the one-year college attainment share in the upper portion of the table and four corresponding measures using bachelor's degree attainment in the bottom tier. Among the ones using bachelor's degree attainment, the Candidate Index with the highest correlation (0.63) is the one that uses ten-year population growth, employment/population rate, percent of the adult population with at least a bachelor's degree, and the poverty rate. The second highest-ranked index includes all five Candidate Variables, while the one ranking third-highest includes all the variables with the exception of the poverty rate.

For the Candidate Distress Indexes using at least one-year college attainment, the top-three ranked indexes use the same variables as the top-three ranked Candidate Distress Indexes using bachelor's degree attainment. The only difference is that a modest change occurs in the ordering of the indexes. In addition, the rankings using all U.S. counties tend to be aligned with the results of the rankings of the ARC counties.

A general finding is that the top-ranked choices in terms of average correlation are very closely clustered—with a more rapid decline when moving further down the list. But, in order to winnow the list to a more manageable size, we decide to move forward with Candidate Distress Indexes that include at least four Candidate Variables. We do so for at least three reasons: (1) indexes that include at least four Candidate Variables represent the largest change from past ARC practice; (2) there is less year-to-year variability when including a greater number of variables; and (3) they capture more dimensions of distress. Thus, we no longer consider the Candidate Distress Index composed only of ten-year population growth, employment/population

ratio, and per-capita income, nor the Candidate Distress Index composed of ten-year population growth, the employment/population ratio, and the poverty rate.

This leaves six Candidate Distress Indexes for further consideration, three that include at least one-year college attainment variable and the other substituting this measure with the bachelor's degree attainment share. In Table 3.4, we report the six indexes we recommend for further consideration by the ARC: section 3.4a lists the variables and section 3.4b presents them in chart form. Appendix Table A5 presents descriptive statistics for each of the six Candidate Distress Indexes for (1) the ARC region and (2) for the remaining U.S. counties. Appendix Table A6 presents the underlying Z-score values for the six Candidates for each ARC county, as well as comparisons to the FY2007 ARC Distress Index.

Our recommendation is to rank more highly the Candidate Distress Indexes that include the bachelor's attainment share rather than one-year college attainment. Among those, our two highest-ranked Candidate Distress Indexes use all five Candidate Variables (with bachelor's degree attainment) or uses population growth, employment/population rate, bachelor's degree share; and poverty rate. Though we are not strongly recommending Candidate Distress Indexes that use the one-year college attainment share, they do provide an excellent comparison to examine the sensitivity of the precise counties that fall into the distress category (see Section 4).

The correlations of these Candidate Distress Indexes with 2006/2007 outcomes are reported in Table 3.5. In addition, the last two columns of Table 3.5 include the ARC Distress Index measured in 2007 and 2009.

Table 3.4: *The Six Indexes Recommended for Further Consideration to the ARC*

Panel a. The Six Indexes

1	Population growth, Employment/population ratio, Percent of adults with a four-year college degree, Poverty Rate
2	Population growth, Employment/population ratio, Percent of adults with a four-year college degree, Per-capita market income, Poverty Rate
3	Population growth, Employment/population ratio, Percent of adults with a four-year college degree, Per-capita market income
4	Population growth, Employment/population ratio, Percent of adults with at least one year of college education, Poverty Rate
5	Population growth, Employment/population ratio, Percent of adults with at least one year of college education, Per-capita market income, Poverty Rate
6	Population growth, employment/population ratio, Percent of adults with at least one year of college education, Per-capita market income

Panel b. Specific Candidate Variables Comprising Each Index

	Poverty Rate 2007	Population growth 1996-2006	Employment/ population ratio 2007	% of adults with a four-year college degree 2000	% of adults with at least one year of college education 2000	Per-capita market income 2006
Index 1	**X**	**X**	**X**	**X**		
Index 2	**X**	**X**	**X**	**X**		**X**
Index 3		**X**	**X**	**X**		**X**
Index 4	**X**	**X**	**X**		**X**	**X**
Index 5	**X**	**X**	**X**		**X**	
Index 6		**X**	**X**		**X**	**X**

Table 3.5*:* Correlations between the Lagged Candidate Distress Indexes and 2006/2007 Key Economic Outcomes, ARC Counties

Lagged Candidate Distress Indexes	**%Pop. Growth 1996-06**	**Poverty Rate 2007**	**Per-capita Market Income 2006**	**%Job Growth 1996-06**	**Employment/ Population ratio 2007**	**ARC Distress Index 2007**	**ARC Distress Index 2009**
Population growth 86-96, Employment /population ratio 00, Percent of adults with a four-year college degree 00, Poverty Rate 97	0.65	-0.78	0.80	0.52	0.80	-0.83	-0.79
Population growth 86-96, Employment /population ratio 00, Percent of adults with a four-year college degree 00, Poverty Rate 97, Per-capita market income 96	0.62	-0.79	0.85	0.49	0.80	-0.85	-0.82
Population growth 86-96, Employment /population ratio 00, Percent of adults with a four-year college degree 00, Per-capita market income 96	0.67	-0.70	0.83	0.53	0.78	-0.80	-0.77
Population growth 86-96, Employment /population ratio 00, Percent of adults with at least one year of college 00, Poverty Rate 97, Per-capita market income 96	0.55	-0.86	0.85	0.45	0.80	-0.87	-0.84
Population growth 86-96, Employment /population ratio 00, Percent of adults with at least one year of college 00, Poverty Rate 97	0.64	-0.79	0.81	0.51	0.80	-0.83	-0.80
Population growth 86-96, Employment /population ratio 00, Percent of adults with at least one year of college 00, Per-capita market income 96	0.67	-0.72	0.83	0.52	0.78	-0.81	-0.78

Evaluating How the Top Candidate Distress Indexes Correlate with Contemporaneous Distress

The top-six Candidate Distress Indexes reported in Table 3.4 appear to do an admirable job as forward-looking indicators of future distress. Next, we briefly confirm that they are also highly linked to contemporaneous measures of economic outcomes. To do this, for the top-six Candidate Distress Indexes shown in Table 3.4, we now derive their values based on circa 2006/2007 data (rather than circa 1996/1997 data used in the previous sub-section). The correlations of these circa 2006/2007 Candidate Distress Indexes with the five key 2006/2007 economic outcomes (listed in Table 3.1) are reported in Table 3.6. The results indicate that there is a very high correlation with contemporaneous measures of economic distress, often in the 0.8 range. Thus, we conclude that the top-six Candidate Distress Indexes are strong indicators of both current and future economic distress.

The last two columns of Table 3.6 show that the correlations of the top-six 2006/2007 Candidate Distress Indexes with the current 2007/2009 ARC Distress Index are also in the range of 0.77~ 0.84. Thus, because the correlations are not near 1.0, the Candidate Indexes do not merely represent incremental change from the current ARC Index. Yet, the relatively high correlation also means that they would not constitute a radical change. The question of which particular counties are affected when using these Candidate Distress Indexes versus the current ARC Index is discussed next in Section 4.

Table 3.6: Correlations between the Candidate Distress Indexes and 2006/2007 Key Economic Outcomes

Candidate Distress Indexes	**Population growth 96-06**	**Poverty Rate 07**	**Per-capita market income 2006**	**Job growth 1996-06**	**Employment /population ratio 2007**	**ARC Distress Index 2007**	**ARC Distress Index 2009**
1) Population growth 96-06, Employment/population ratio 07, Percent of adults with a four-year college degree 00, Poverty Rate 07	0.70	-0.81	0.81	0.60	0.84	-0.83	-0.81
2) Population growth 96-06, Employment/population ratio 07, Percent of adults with a four-year college degree 00, Per-capita market income 06, Poverty Rate 07	0.64	-0.82	0.87	0.57	0.83	-0.86	-0.84
3) Population growth 96-06, Employment/population ratio 07, Percent of adults with a four-year college degree 00, Per-capita market income 06	0.70	-0.66	0.84	0.62	0.80	-0.78	-0.76
4) Population growth 96-06, Employment/population ratio 07, Percent of adults with at least one year of college education 00, Per-capita market income 06, Poverty Rate 07	0.64	-0.83	0.87	0.56	0.83	-0.86	-0.84
5) Population growth 96-06, Employment/population ratio 07, Percent of adults with at least one year of college education 00, Poverty Rate 07	0.69	-0.82	0.81	0.59	0.84	-0.84	-0.81
6) Population growth 96-06, employment/population ratio 07, Percent of adults with at least one year of college education 00, Per-capita market income 06	0.70	-0.68	0.84	0.61	0.81	-0.80	-0.77

Figure 3.1a: Index constructed using proposed equal-weight Z-score method--using current ARC variables (Unemployment Rate, Poverty Rate, Per-Capita Market Income)

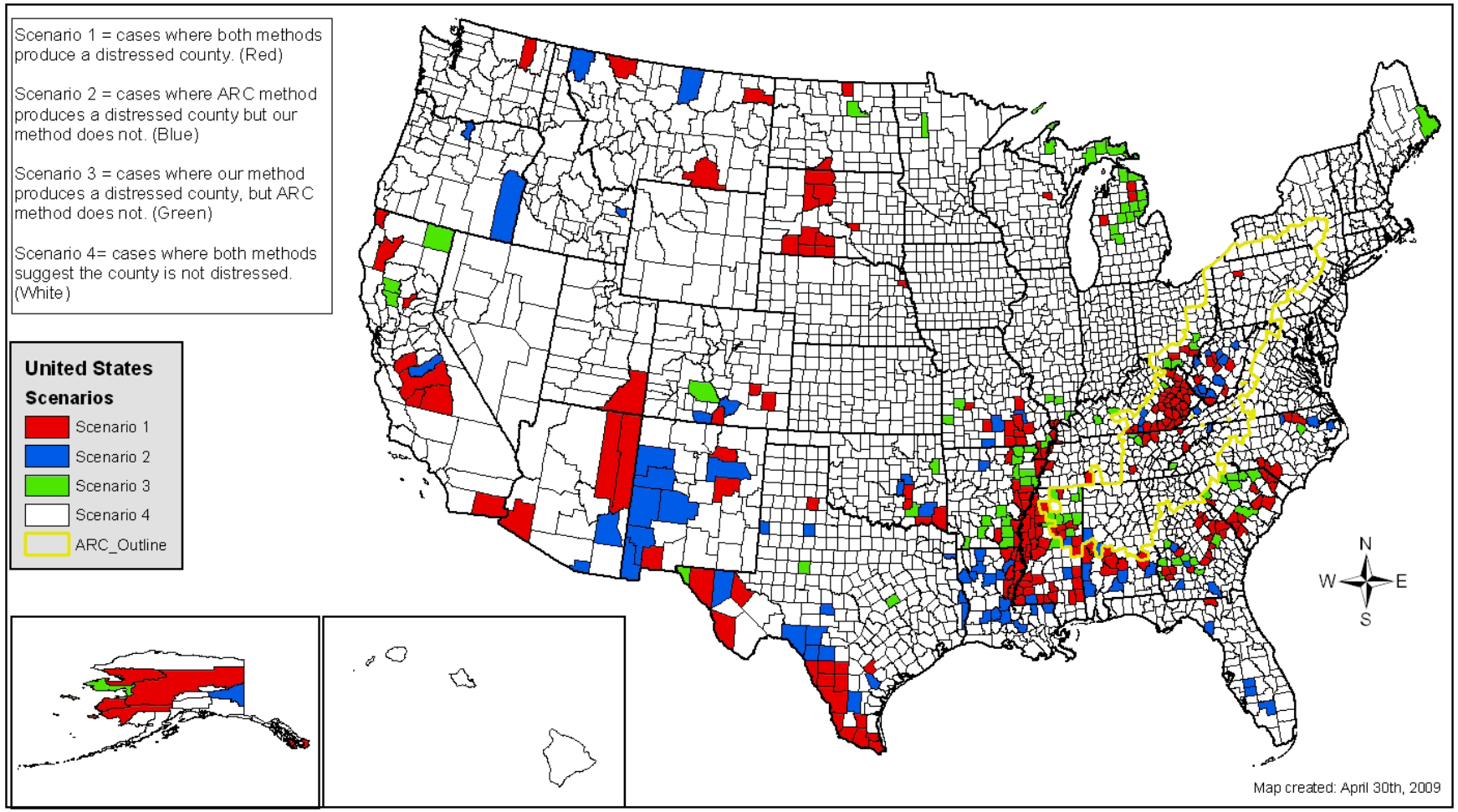

Figure 3.1b: Index constructed using proposed equal-weight Z-score method--using current ARC variables (Unemployment Rate, Poverty Rate, Per-Capita Market Income), ARC Counties

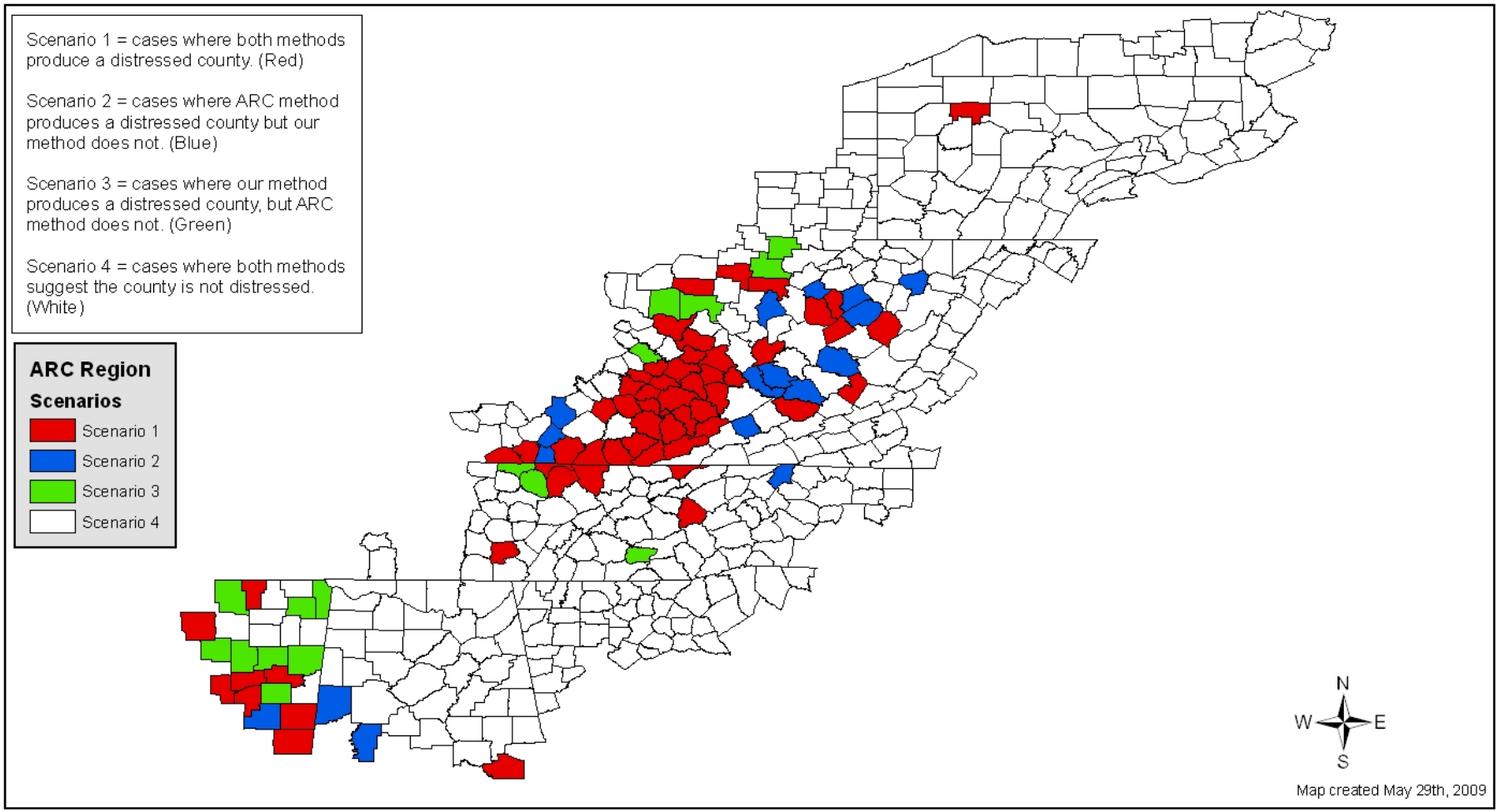

Figure 3.2: Correlation between 2007 Poverty Rate and 1997 Poverty Rate, ARC Counties

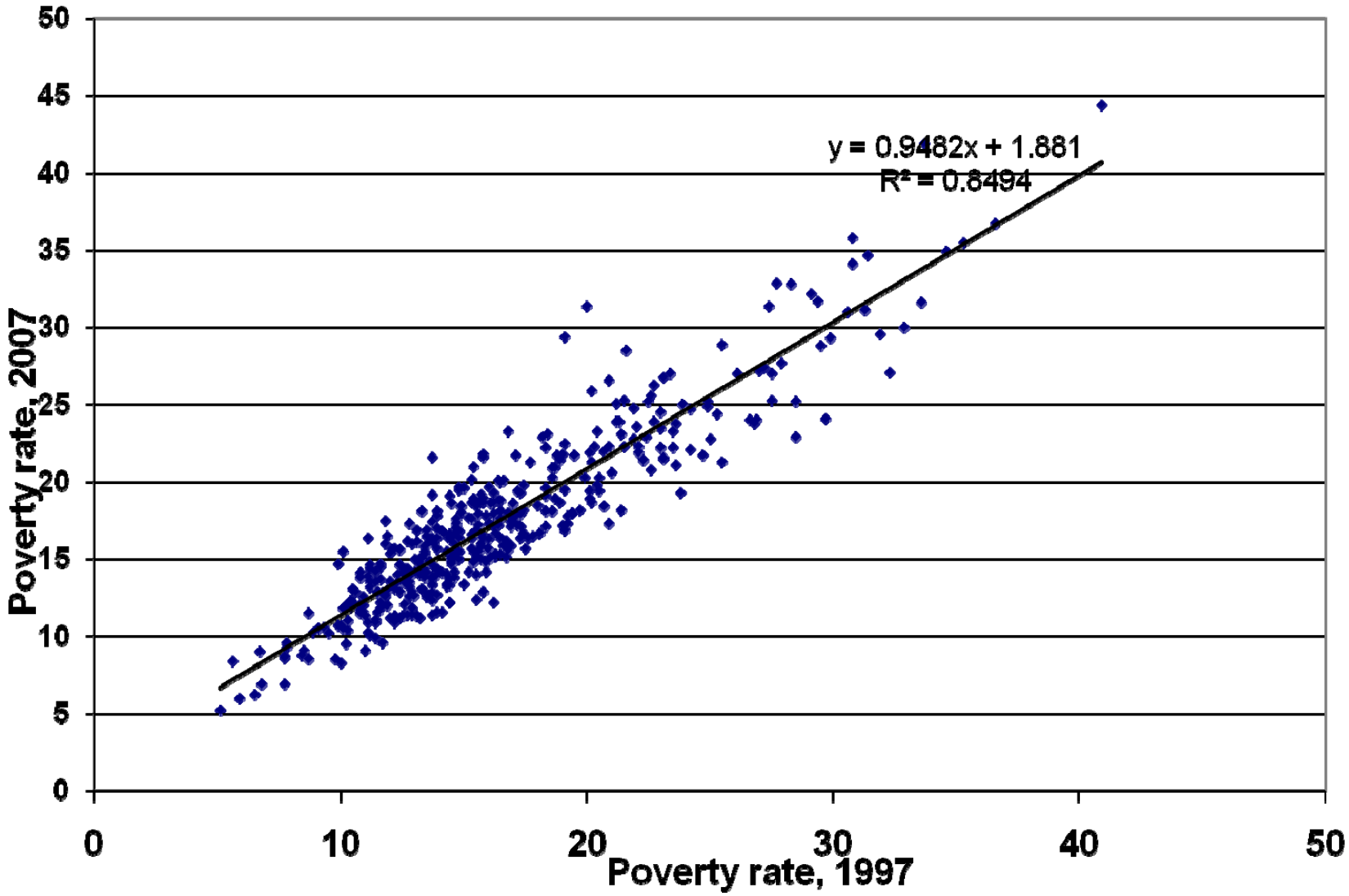

***Figure 3.3*:** Correlation between 2006 Per-Capita Market Income and 1997 Poverty Rate, ARC Counties

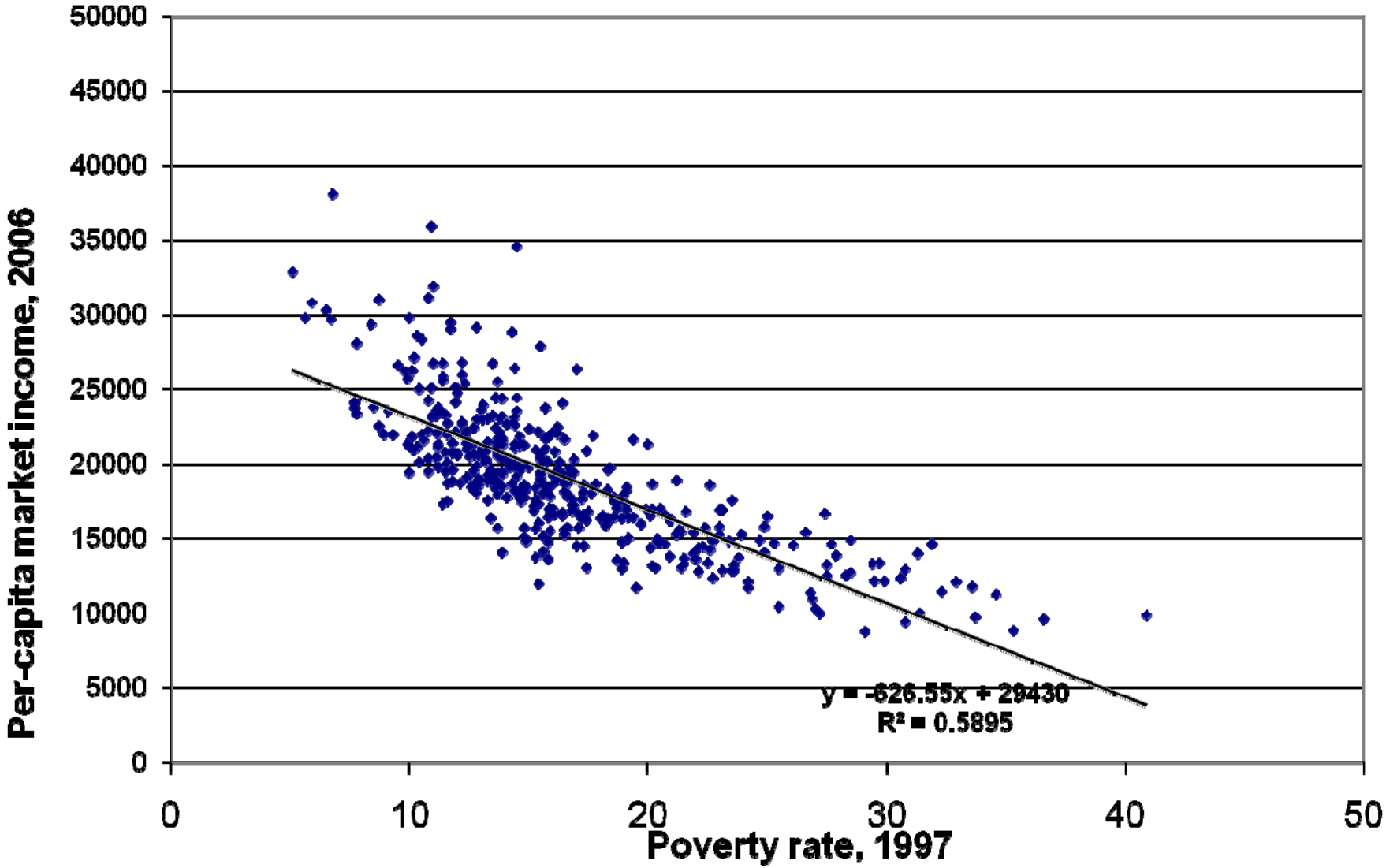
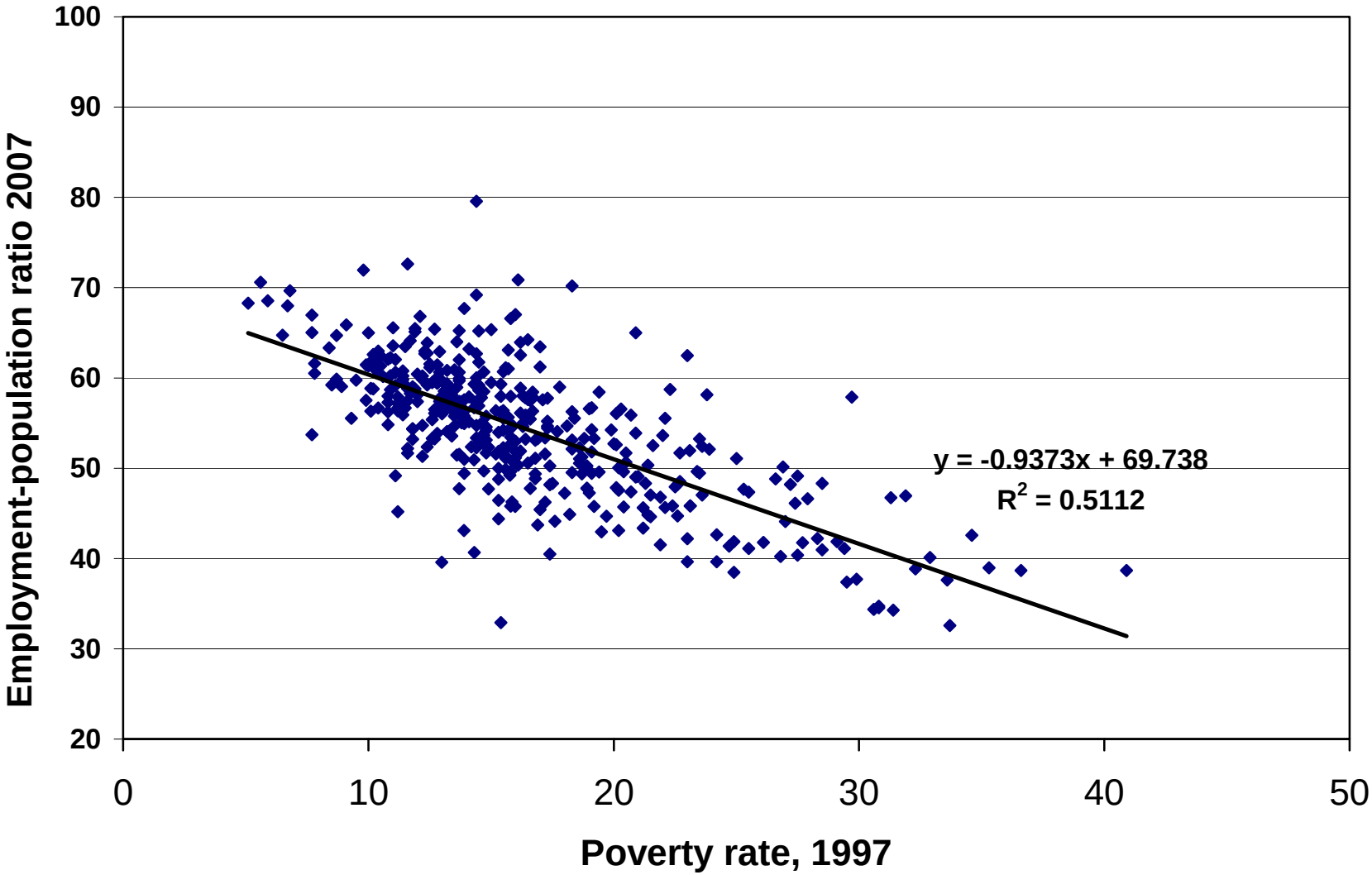
Figure 3.4: Correlation between 2007 Employment/Population Ratio and 1997 Poverty Rate, ARC Counties