

The Appalachian Regional Development Act and Economic Change

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Abstract: The Appalachian Regional Development Act of 1965 is one of the longest serving place-based regional development programs in the U.S., and is the largest in terms of geographic scope. I use county-level data from the 1960 and 2000 Decennial Censuses to evaluate the effect of ARDA on poverty rates and real per capita incomes in Appalachia. The intent to treat parameter is identified in a difference-in-difference framework by comparing outcomes in Appalachia to alternative comparison groups. Additional knowledge of which counties were solely eligible for highway development funds under ARDA from those counties eligible for both highway as well as human development programs helps isolate the average treatment effect on the treated. The results suggest that the ARDA reduced Appalachian poverty between 1960 and 2000 by 7.6 percentage points relative to the rest of the U.S., and 4 percentage points relative to border counties, with half to two-thirds of the effect realized within the first five years of the Act's passage. These anti-poverty gains were most pronounced in the Central Appalachian region, where poverty rates fell by 5 to 16 percentage points depending on comparison group. Comparing grant eligible to grant ineligible counties suggests a modest additional anti-poverty boost from human development programs.

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Forty-five years ago on March 9, 1965 President Johnson signed the Appalachian Regional Development Act (ARDA), solidifying Appalachia's place as a galvanizing force in the nation's *War on Poverty*. The ARDA created a unique federal and state partnership known as the Appalachian Regional Commission (ARC) whose mission was to expand the economic opportunities of the residents by increasing job opportunities, human capital, and transportation. Through fiscal year 2009 about \$23.5 billion has been spent on ARDA programs, around \$12.7 billion coming from federal funds and \$10.8 billion in state and local funds (ARC 2009). Of the total, roughly half has been spent on highways and the other half on human services. This has been the longest serving place-based regional development program in the U.S. after the Tennessee Valley Authority, which was established by President Roosevelt during the Great Depression, and to this day remains the largest in terms of geographic scope. In this chapter I evaluate the effect of ARDA on economic progress in Appalachia since 1960.

The case for federal intervention into local and regional economic development along the lines of ARDA has generally been met with skepticism by economists (Schultze 1983; Glaeser and Gottlieb 2008; Kahn, this book). Proponents of place-based policy typically make an appeal either on redistributive grounds or because of the need to redress a negative externality (or subsidize a positive externality such as agglomeration economies). The case against such intervention follows from the belief that helping poor places is not the same thing as helping poor people—business subsidies may just induce new firms to bring new migrants to the area and not hire locals, leading to upward pressure on local house prices and rents, and while such price pressure benefits current owners it harms current renters who are more likely to be poor. And these place-based interventions, while possibly making the area more attractive, reduce the incentive for the poor to migrate away to areas with greater economic opportunities. Schultze

(1983, p. 9) went straight to the heart of the matter when he argued that “There are many important tasks that only governments can do....But the one thing that most democratic political systems—and especially the American one—cannot do well at all is make critical choices among particular firms, municipalities, or regions, determining cold-bloodedly which shall prosper and which shall not.” And yet this is exactly what the ARDA set out to accomplish—to direct resources to the Appalachian region in hopes of lifting its economic status.

There have been scores of papers and books written on the history of ARDA¹, but perhaps surprising there have been few attempts to test empirically the effect of the Act on economic outcomes in the region. Ralph Widner (1990), who was the first director of the Appalachian Regional Commission, on the 25th anniversary of passage of ARDA provided a basic overview of economic progress by comparing mean outcomes in Appalachia and its subregions to the rest of the U.S. from 1970 to the mid 1980s. He found that incomes and employment improved, but education lagged sorely behind and the promise of development flowing from improved transportation access was only partially met.

Isserman and Rephann (1995) conducted a more formal analysis by comparing the economic growth of Appalachian counties to their matched “twins” located outside of Appalachia between 1969 and 1991. The idea for the matched twin is to serve as the counterfactual for the Appalachian county. Using a set of variables characterizing population and economic status in 1959, along with a distance metric to combine the set of variables into a single index², each Appalachian county was matched with a county (or group of counties in the

¹ See, for example, Widner (1990), Bradshaw (1992), Glen (1995), Eller (2008), and the references therein.

² The distance metric they used is the Mahalanobis distance, or quadratic distance. It differs from its Euclidean counterpart in that Mahalanobis distance weights the squared deviation of a random variable about its mean by the covariance matrix of the random variables. It also differs from the more commonly used “propensity score” of Rosenbaum and Rubin (1983) that uses regression methods to create the index, or propensity score, to match across treatment and comparison groups.

case of ties) located at least 60 miles outside the region. So, for example, Wayne County, West Virginia, which is part of the Huntington MSA, was matched to Hamilton County, Indiana, a part of the Indianapolis MSA. Isserman and Rephann found that earnings grew 48 percent faster in Appalachia than the control counties, per capita incomes grew 17 percent faster, and population grew 5 percent faster. They infer that these income growth differences imply an additional \$8.4 billion in income for Appalachia in 1991, a huge return on the \$13 billion spent as of that year.

Glaeser and Gottlieb (2008) adopt a more standard multivariate regression model to evaluate the effect of ARC on per capita income growth and population growth. Instead of matching to counties around the nation, their sample is all counties in states that contain parts of Appalachia, excluding those counties within 90 kilometers of the coast. The sample is intended to compare counties in Appalachia to “similar” neighboring counties in the region. Between 1970 and 1980 they find that population growth was 3.4 log points faster, but there was no difference between 1970 and 2000. They find no evidence that income grew faster between 1970 and 80, and actually fell by 2000. In light of the conflicting estimates, Glaeser and Gottlieb (p. 200) sum up with the rather pessimistic view that “The ARC may or may not be cost effective, but there is little chance that its effectiveness will ever be evident in the data.”

In this paper I provide improved estimates of the effect of ARDA on poverty and real per capita incomes in Appalachia. First, my evaluation spans the 1960 to 2000 Decennial Censuses, which begins five years prior to passage of the Act, and thus placing the Appalachian and comparison counties on a “pre-treatment” baseline instead of post-treatment as in the previous papers. Second, my regression framework controls for county changes in demographics and the labor force, whereas the prior papers did not control for confounding factors even though there were substantial difference in human capital, urban density, and labor force growth at the

baseline period of 1960, as well as over the past four decades. Third, I provide a more refined characterization of the treatment and comparison groups, and the robustness of the ARDA to these alternative assignments. Like the previous papers, I only observe whether counties were included within the coverage area of the Act, and not specific policy interventions; thus, the parameter identified in the difference-in-differences model is known in the treatment effects literature as the *intent to treat on the treated* (Heckman, et al. 1999; Blundell and Costa-Dias 2009). However, some counties within the ARDA jurisdiction were never eligible for financial grants, and some border counties may have benefitted indirectly from the ARDA programs, and thus I separate grant-eligible from grant-ineligible counties from border counties to identify the parameter more closely aligned to average treatment effect on the treated, i.e. those counties directly affected by the ARDA. Finally, I also allow heterogeneity of treatment effects by disaggregating the Appalachian region into the major subregions of Northern, Central, and Southern.

The results suggest that the ARDA reduced Appalachian poverty between 1960 and 2000 by 7.6 percentage points relative to the rest of the U.S., and 4 percentage points relative to border counties, with half to two-thirds of the effect realized within the first five years of the Act's passage. These anti-poverty gains were most pronounced in the Central Appalachian region, where poverty rates fell by 5 to 16 percentage points depending on comparison group. Comparing grant eligible to grant ineligible counties suggests a modest additional boost to human development programs. Although there is some evidence that levels of real per capita income diverged after passage of ARDA, there was strong evidence of convergence in growth rates, resulting in 14 percent faster growth overall and about 25 percent faster growth in Central and Southern Appalachia compared to the rest of the country, whether restricted to rural regions

or not. Together the results suggest that the ARDA was a positive intervention in Appalachia in terms of lifting the incomes among the lower half of the income distribution.

Poverty and the Appalachian Regional Development Act

The 1960 Presidential campaign set the stage for the ARDA when then Senator John F. Kennedy toured West Virginia and was moved by the widespread poverty in the state, and for good reason. Figure 1 depicts 1960 county level poverty rates in the United States, where nearly every other person was living in poverty in a typical West Virginia county. Extreme poverty was not unique to West Virginia—rates in excess of 50 percent were the norm from West Virginia to Texas—but aided by the popular works of Harrington (1962) and Caudill (1963) it was imminently clear that poverty in this part of the country was distinct from most of the Northeast, Midwest, and West. Prompted by the urging of several proactive governors in the region, in 1963 President Kennedy formed the President’s Appalachian Regional Commission (PARC) “to prepare a comprehensive action program for the economic development of the Appalachian Region.” (PARC 1964, p. II). The work of the Commission was continued by President Johnson after the assassination of President Kennedy, and in 1964 PARC issued their final report where they recommended an ambitious program of investment in transportation, water and natural resources, and human capital via education, training, health, and nutrition programs.

PARC opened their report by noting that “Appalachia is a region apart—both geographically and statistically....The average Appalachian, whether he lives in a metropolis, in town, on the farm, or in a mountain cabin, has not matched his counterpart in the rest of the United States as a participant in the Nation’s economic growth.” (PARC, p. xv) To make such a statement required a definition of precisely what part of the U.S. comprised the Appalachian region that was to benefit from the “comprehensive action program” suggested in President

Kennedy's charge. This was complicated both by economic and political considerations. The 1960 poverty rates in Figure 1 suggest that the region in need of assistance was the 16 states in the South, but this would preclude inclusion of Pennsylvania, whose governor served on the PARC. Moreover, in order to secure passage of the ARDA legislation it was necessary to first add counties in Ohio, and then later from New York and South Carolina, to the original nine states recommended by PARC (Bradshaw 1992).

Figure 2 depicts the Appalachian region as of the 1967 amendments, the latter of which added yet a thirteenth state (Mississippi). By 1967 the ARDA region spanned parts of 12 states and all of West Virginia, 397 counties in total or 12.6 percent of all U.S. counties. The PARC report made clear that certain parts of the region were worse off economically, and in particular the central part of the region encompassing eastern Kentucky, central Tennessee, southern West Virginia, and western Virginia; thus, for reporting purposes the Appalachian Regional Commission historically separated Northern Appalachia, Central Appalachia, and Southern Appalachia as shown in Figure 2.

The ambition of the ARDA was also spelled out in the PARC report in its goal to bring Appalachia up to the rest of the United States. From an evaluation perspective this suggests that PARC viewed the "treatment" group as counties included in ARDA and the "comparison" group the rest of the U.S. A cursory look at Figure 3, which depicts county poverty rates in 2000, suggests much lower levels *and* greater homogeneity of poverty rates across the nation relative to 1960, and with the possible exception of parts of Central Appalachia, a key benchmark of ARDA was attained in the 35 years since passage. Whether or not ARDA had a causal role in effecting that change is of course not possible to deduce from a comparison of Figures 1 and 3, and is the focus of subsequent sections below.

Leading up to the creation of PARC, the Area Redevelopment Act of 1961 (ARA) made limited funds available to upwards of one-third of needy counties across the nation. However, about 20 percent of counties contained within the new Appalachian region either were never eligible for ARA grants, or were initially eligible but removed from ARDA grant eligibility by 1965 primarily because these counties were deemed “too rich” for federal intervention along the lines proposed in the Act (Bradshaw 1992). In Figure 4 I present the map of Appalachia that delineates ARA grant eligible from ARA grant ineligible counties (see also Map 2 in Bradshaw 1992). Some of these counties were not included in PARC’s original conception of Appalachia (e.g. New York and South Carolina), but most others were included. This suggests that in evaluating the effects of ARDA on the region it is important to differentiate economic change in those counties that were grant eligible from those grant ineligible. That is, while PARC viewed the rest of the U.S. as the comparison group for Appalachia, a more appropriate reference group might in fact be those counties within the region but not eligible for ARA grants. But this is probably too conservative because it suggests that only ARA grant eligible counties were the focus of policymakers. Indeed in their report, PARC stated:

“In some of these urban complexes, income and living standards far exceed the regional norm and in some cases surpass the national average.....But these cities, standing with one foot in Appalachia and one foot in industrial America, prosperous as they are, fall far short of the performance of urban areas in the rest of the country....At the onset of its work the Commission was confronted by a major problem of strategy: whether to concentrate its efforts on the hard core of Appalachian distress—the largely rural interior country of marginal farms, coal, and timber—or devote its attention to the entire region.....Solutions must be devised to assist both.” (pp. XV and XVIII)

The quote suggests that the actual intent to treat, at least by PARC, was the entire region, and indeed, it is important to note that the grant ineligible counties received assistance for highway funds from other federal, state, and local sources, but they were not eligible for human

development grants.³ Exploiting these programmatic differences should isolate the intent to treat effects of ARDA more precisely, and indeed yield a parameter more closely aligned to the average treatment effect on the treated.

At the time the PARC report was submitted, President Johnson expressed concern that other poor regions of the country might also claim need for redevelopment funds, thus leading to federal budgetary pressures.⁴ This concern was prescient, for later in 1965 the President signed the Public Works and Economic Development Act (PWEDA), which established multicounty economic development districts through the auspices of a new Economic Development Administration.⁵ This suggests that identifying any causal impact of ARDA might be confounded with the PWEDA, especially if PWEDA funds were directed to areas near the Appalachian region. As a consequence Figure 4 also highlights border counties to Appalachia that will serve as an additional comparison group for the grant eligible ARDA counties. Moreover, at the same time that ARDA and PWEDA were being enacted, the broader set of *Great Society* programs (e.g. Aid to Families with Dependent Children, Food Stamp Program, Head Start, Medicaid, and Medicare) were also being created with separate legislation. Although these programs were nationwide, they were often rolled out across the nation at different times. For example, Food Stamp Programs were introduced sooner in Central and Northern Appalachia compared to the South and West as a whole, while Head Start was introduced first in the 300 poorest counties in the U.S. (Ludwig and Miller 2007; Hoynes and Schanzenbach 2009).⁶ This

³ I thank Ronald Eller for clarifying this distinction.

⁴ Indeed, Charles Schultze was the Director of the Budget for President Johnson and was not sympathetic to the creation of ARC, as made obvious in the quote in the Introduction (Schultze 1983, and personal correspondence).

⁵ The EDA continues to this day, and a major growth policy of President Obama is the creation and/or expansion of RICs, or Regional Innovation Clusters that “are geographic concentrations of firms and industries that do business with each other and have common needs for talent, technology, and infrastructure.”

(<http://www.eda.gov/AboutEDA/RIC/>)

⁶ Observe, however, that with the exception of AFDC none of the Great Society programs have a mechanical effect on county poverty rates or per capita income used in the evaluation because in-kind transfers are not included in the

suggests that an additional advantage of these alternative comparison groups is to control for regional spillover effects of concurrent legislative changes.

Appalachia and Economic Change, 1960-2000

I begin with a general overview of economic change in Appalachia in the four decades from 1960 to 2000. The outcomes I focus on are a subset of those that PARC used as background justification for intervention in the region. Because PARC believed that the goal was to raise the well being of Appalachia's residents to the rest of the country, I initially compare the 1967 set of Appalachian counties to the rest of the U.S. However, because Appalachia is largely rural, a more appropriate comparison group to identify the intent to treat might in fact be other parts of rural America. Likewise, as indicated in the prior section, to examine the possible role of policy spillovers, I also consider two variants of border counties as comparisons groups—those counties immediately adjacent to Appalachia and those counties surrounding the adjacent counties, which in most cases is the first two or three counties beyond the Appalachian border. Thus there are four comparison groups—the rest of the country, rural regions of the country, adjacent border counties, and surrounding border counties. The latter is akin to the comparison group adopted by Glaeser and Gottlieb (2008).

The county-level data utilized in the analysis come from the 1960-2000 Decennial Censuses. Information on 1960 income, population, civilian labor force, number of high-school degree holders, number of African-Americans, and number of urban residents was obtained from the 1962 County and City Data Book. These data are available on the University of Michigan's Inter-University Consortium for Political and Social Research website at the URL:

<http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/2896/system>. The United States did not

Census definition of income in general, and for poverty measurement specifically. However, it is possible that the programs have behavioral effects via altered labor supply, thus affecting poverty and per capita income via that channel.

produce its first estimates of poverty until the 1960s, but in the special tabulation the Economic Research Service of the USDA produced estimates for the 1960 Census.⁷ The data for the 2000 Census was obtained from the *USA Counties Basic Information Database* hosted by the U.S. Census Bureau at the URL: <http://censtats.census.gov/usa/usa.shtml>.

The variables of interest include real per capita income earned by county residents and its log, the poverty rate defined as the ratio of the number of persons living below the family-size specific poverty threshold to the total population of the county, the proportion of residents residing in the county who are over the age of 25 and have at least a high school degree, the labor force growth rate defined as the percentage change in the civilian labor force residing in the county from one decade to the next, the share of residents residing in an urban area, and the proportion of residents who are African American.^{8,9} The income data in 1960 were converted to real 2000 dollars using the personal consumption expenditure deflator from the Bureau of Economic Analysis (BEA). It is important to note that the income data in the Census is money income, which differs from personal income reported in the BEA's Regional Economic Information System that among other things includes in-kind transfers.

Table 1 presents 1960 mean outcomes in Appalachia and the four comparison groups, along with the differences between Appalachia and the four groups. The first row of each variable presents the mean, or difference in means, while the second row contains the standard deviation in parentheses or the standard error in square brackets from testing the difference in means. The first three columns present mean outcomes for 1960. In real terms Appalachian per

⁷ We thank Robert Gibbs of ERS for providing these data.

⁸ To construct labor force growth in 1960 we obtained the corresponding labor force data from 1950 to calculate the 1950-1960 growth.

⁹ The definition of what constitutes as an urban area has changed over time. For the years 1960-1990; any area that was one of the Census designated places with more than 2500 people, or was incorporated in an urban area was considered to be an urban area. In 2000, the definition of urban areas was a core census block groups or census block that had at least 1000 persons per square mile and the surrounding census blocks that have a population density of at least 500 persons per square mile (http://www.census.gov/geo/www/ua/ua_2k.html).

capita income fell significantly below the counties outside Appalachia. Moreover, in 1960 county poverty rates in Appalachia were about 10 percentage points higher than outside the region, and labor force growth over 7 percentage points lower. Counties in Appalachia were much less likely to have citizens who matriculated from high school by age 25, were much less likely to live in an urban area, and less likely to have African Americans residing in its borders. Residents of Appalachia were indeed a “people apart” at the dawn of the 1960s.

In the remaining columns of Table 1 I present the same set of calculations for Appalachia against the other three comparison groups. The most widely applied definition of rural is based on the Economic Research Service’s rural-urban continuum code.¹⁰ This code takes a value between 1 and 9, with larger numbers reflecting more rural locations. The earliest categorization by ERS of rurality was conducted in 1974, and while there were likely some implicit changes in designation between 1960 and 1974, the 1974 data are clearly preferred to the more recent 2003 codes. I define rural America as any county outside of Appalachia with the rural-urban code of 6 or higher. About 70 percent of Appalachian counties fall under this category in 1960, and thus counties with rural-urban codes greater than 5 will serve as a useful comparison.

Table 1 shows that the differences in income, poverty, and education between Appalachia and rural America in 1960 are narrower relative to those with the rest of the country, and in fact labor force growth was even more sluggish in rural parts of the country in the 1950s compared to Appalachia. Table 1 also presents comparisons with the two border county designations. Here we see that in 1960 Appalachia was less similar to her immediate neighbors than rural U.S. overall, except for high school completion. The other difference with the border counties is that

¹⁰ This is sometimes referred to as the Beale Code, after Calvin Beale who while at ERS was instrumental in the development of the index <http://www.ers.usda.gov/Briefing/Rurality/ruralurbcon/>.

they are more urban than the rest of the U.S. in general, and have higher shares of African Americans.

Table 2 presents a similar set of calculations for each of the three subregions of Appalachia in comparison to the rest of the country. We see that in the baseline year of 1960 the deficit between Appalachia and the rest of the nation was greatest in the Central region, followed by the Southern region. Real per capita income was \$2,752 lower in Central Appalachia, county poverty rates were an astonishing 26 percentage points higher in Central Appalachia relative to the rest of the U.S., and labor force growth 20 percentage points lower owing to the negative 15 percent labor force growth in Central Appalachia between 1950 and 1960. On the other hand, across many major economic indicators Northern Appalachian counties in 1960 were either no different or actually better off than those outside Appalachia. For example, poverty rates were lower in Northern Appalachia and incomes were no different.

In Tables 3 and 4 I present a parallel set of calculations for Census year 2000. In absolute value terms, and relative to the rest of the country, the real difference in per capita income actually widened over the forty years for Appalachia overall (Table 3) and both the Central and Northern regions, but narrowed for the Southern region (Table 4). At the same time, the absolute differences in poverty rates, high school completion, and labor force growth compared to the U.S. in general fell in all regions of Appalachia (except for poverty in the Northern Appalachian region). In short, there is *prima facie* evidence that the complex story of convergence and divergence in the earnings of men across major Appalachian regions in Black and Sanders (this book) appears to carry over to a host of other economic outcomes as demonstrated in Tables 1-4.

ARDA and Economic Well Being in Appalachia

In this section I consider a multivariate regression model to more precisely estimate the effect of ARDA on economic well being in Appalachia. I focus attention on three outcomes: poverty rates, real per capita incomes, and log real per capita incomes. Poverty rates provide a summary of the economic status of individuals in the lower tail of the income distribution, and while a major focus of PARC, have not been used in the previous evaluations of ARDA by Isserman and Rephann (1995) and Glaeser and Gottlieb (2008).

The baseline regression model I estimate for county i , $i = 1, \dots, N$, in time period t , $t = 1960$ or 2000 , is given as

$$y_{it} = \alpha + \beta App_i + \delta_{2000} + \gamma(App_i * \delta_{2000}) + x_{i1960}\varphi + u_{it}, \quad (1)$$

where y_{it} is the outcome (poverty rate, real per capita income, or log per capita income), App_i takes a value of 1 if the county is located in ARDA designated Appalachia as of 1967 and 0 otherwise, δ_{2000} is an indicator variable that equals 1 in the year 2000 and 0 in 1960, $App_i * \delta_{2000}$ is an interaction term that equals 0 for all counties in 1960 and 1 for Appalachian counties in 2000, and x_{i1960} is a vector of observable factors at the county level that have been shown to affect poverty rates and average incomes at the individual and state level such as high school completion rates, labor force growth, urbanicity, and race (Gundersen and Ziliak 2004).

The parameter of interest in equation (1) is γ , the coefficient on the interaction term that yields the intent to treat. With the model assumptions above, least squares estimation of equation (1) gives the regression-adjusted difference-in-difference estimate of the effect of ARDA on y_{it} . Indeed, with two years of data, 1960 and 2000, and dropping the control variables x_{i1960} , equation (1) yields the unadjusted difference-in-difference estimates that can be computed comparing Tables 1 and 3, and 2 and 4. However, the simple difference-in-difference estimates

ignore that that there were significant “pre-treatment” differences in the confounding factors like education and labor force growth in Table 1, and thus may not reflect causal effects of the role that ARDA had in accounting for convergence in poverty on the one hand, or divergence in per capita incomes on the other. Controlling for observed heterogeneity will provide more accurate estimates of ARDA than the simple difference-in-difference estimates.

The baseline model in equation (1) identifies the effect of ARDA by comparing Appalachian counties to the balance of counties in the U.S. As noted earlier, this is a useful exercise because the PARC believed that the goal of ARDA was to lift the region up to the rest of the country, and as such γ in equation (1) represents the intent to treat. However, because the ARDA county designation is somewhat arbitrary (inclusion in the original counties was determined by the governor of each state, and subject to Senate approval), and the possibility of spillover of programs into neighboring counties, I also estimate the model using the three alternative comparison groups of rural America, adjacent border counties, and surrounding border counties.

Table 5 reports the results of the four comparison groups described above where the dependent variable is the county poverty rate in the Census years of 1960 and 2000. For ease of presentation I only provide estimates of the intent to treat parameter, though in all cases the initial period demographic controls are quantitatively and statistically significant, and have the expected signs. That is, higher high school completion, faster labor force growth, higher urban shares, and lower shares of black residents are each associated with lower poverty rates. The high R-square of 0.75 or greater indicates that the model does a good job explaining the variation in county poverty rates.

The first row and column tabulates the baseline specification in equation (1), suggesting that after passage of ARDA, poverty rates in Appalachia fell 7.6 percentage points relative to the rest of the United States in the ensuing thirty five years. On an initial baseline poverty rate of 42.5 percent, this is an impressive 18 percent reduction. If we restrict attention to the narrower comparison group of rural America, the table suggests that ARDA reduced poverty in Appalachia by 4.5 points relative to rural America, which is about 60 percent of the total effect against the rest of the country. Moreover, in the next two columns where we compare Appalachia to the two border county designations, we also find smaller anti-poverty gains—4 percent and 3.2 percent, respectively.

The next three rows of Table 5 separates App_i into its Central, Northern, and Southern Appalachian subregions in order to admit heterogeneity of treatment effects within Appalachia. Each row represents a separate regression model, and while the comparison groups in each of the first two columns are identical, in the latter two comparisons I only use the border counties in the respective regions, i.e. for Central Appalachia I use border counties in Kentucky and Tennessee; for Northern Appalachia I use border counties in Ohio, New York, Pennsylvania, Maryland, New Jersey, and Delaware; and for Southern Appalachia I use Tennessee, Mississippi, Alabama, Georgia, North Carolina, South Carolina, and Virginia. In these three rows we find astounding heterogeneity in the effect of ARDA on poverty both across subregions, as well as within subregions but across comparison groups. Compared to the rest of the U.S., poverty in Central Appalachia fell 16.3 percentage points, and 13.3 percentage points in Southern Appalachia, or 28 percent on the respective 1960 baseline rates of 58.4 and 46.1 percent. On the other hand, poverty in Northern Appalachia actually diverged from the rest of the country by 4.4 percentage points. As we move across columns, Central Appalachia consistently outperformed rural

America, as well as her border counties in terms of poverty reduction. Southern Appalachia likewise outperformed rural parts of the country in general, but did no better than the border counties, perhaps because the border regions span fast-growing metro areas such as Atlanta and Charlotte. Northern Appalachia, on the other hand, diverged in terms of poverty again rural America, but made substantive gains against border counties, highlighting the particular challenges facing counties in Rust Belt states.

The Area Redevelopment Act of 1961 excluded many counties in Appalachia from funding eligibility, and ARDA expanded upon that set of counties so that by 1965 there were 72 ARDA grant ineligible counties (Bradshaw 1992). This suggests that the intent to treat was not necessarily the full set of Appalachian counties, rather the grant eligible counties. Thus in the last four rows of Table 5 I consider an alternative definition of App_i where it equals 1 if the county was ARA eligible and 0 for the comparison group, excluding ARA-ineligible counties. This is perhaps the most conservative approach to identifying the effect of ARDA as it assumes that the only true treatment effect occurs in human-development grant eligible counties. In fact, an alternative approach is to view the highway development funds and human development funds as multiple treatments, and thus comparing the models with ARA grant eligible only counties with the full set in the baseline will yield the extra impact from human development programs. Overall we see that the human development programs boosted the anti-poverty effectiveness of ARDA by about 0.8 percentage points (8.4 versus 7.6), or about 11 percent on the baseline effect of 7.6 points. The Southern Appalachian region particularly benefited from these programs with an additional poverty reduction of 19 percent from 13.3 to 16.6. Even still, the results suggest that the major incremental gains against poverty in the region were from improvements in transportation and infrastructure.

Of note in passing is that all the estimates in Table 5 are identical to the difference-in-difference estimates one obtains without demographic controls in Tables 1-4. For example, we can construct the unadjusted effect of ARDA on poverty relative to the rest of the country by noting that 0.024 in Table 3 less 0.100 in Table 1 yields -0.076, which is exactly the same as reported in Table 5. The only difference is that the estimates in Table 5 are more precise. This is a remarkable outcome. In the standard random assignment treatment-control experiment, controlling for demographics should have no effect on the treatment parameter if random assignment was carried out correctly. Controlling for demographics could improve the efficiency of the estimated treatment effect if those demographics help explain variation in the outcome variable, but they will not affect the parameter itself. This is exactly what we find here, suggesting that pre-treatment differences in high school completion rates, black share, urban share, and labor force growth had no effect on the estimated treatment provided by ARDA other than the variance of the estimate. Or in other words, assignment into Appalachia was random with respect to initial demographics. If we modify the specification and instead allow the demographics to change over time then the effect of ARDA on poverty rates falls by about one-third to 5.1 percentage points, which suggests that ARDA likely improved some of the demographic outcomes observed in 2000 over and above the direct effect on poverty.

Tables 6 and 7 present a parallel set of estimates but instead of poverty rates the dependent variables are the level of real income per capita (Table 6) and natural log of real income per capita (Table 7). The main difference in interpretation across these models is that in the difference-in-difference specification the log income per capita approximates a percent change and thus in Table 6 we identify the effect of ARDA on income levels while in Table 7 we identify the effect of ARDA on income growth.

The tables reveal a complex story of the effect of ARDA on the level and growth of real incomes. Relative to the rest of the country, Appalachia showed no progress as a result of ARDA on income levels, but income growth converged by 14 percent. This growth convergence is consistent with the much lower income at baseline. Compared to rural America, though, Appalachia converged in both levels and growth. At the same time, it diverged in levels compared to her border counties, and did no better in terms of growth. This analysis helps reconcile the diverging conclusions of Isserman and Rephann (1995) and Glaeser and Gottlieb (2008). The comparison group used in the former was based on a matching algorithm, which in practice likely approximates my use of rural America, while Glaeser and Gottlieb used a comparison group akin to the surrounding border counties. When compared to her neighbors, Appalachia did not fare so well in terms of income convergence, but they showed substantive gains against a more general rural counterpart. Across the subregions, income levels in the Central region diverged, but growth rates converged, whereas both levels and growth diverged in Northern Appalachia (or stayed the same in terms of growth compared to border counties). Southern Appalachia actually converged in income levels and growth in relation to the nation and rural America, but showed no relative improvement in light of ARDA relative to her border counties.

In Table 8 I re-estimate the baseline models of the effect of ARDA on Appalachia from Tables 5-7, but now restrict attention to 1960-1970. These models will capture the immediate effects of ARDA five years after passage, and thus abstract from any intervening social and economic developments in the decades after 1970 that are not controlled for in Table 5 and yet may confound the estimate of the program. Each row pertains to dependent variable from each of the respective tables. Thus, the baseline estimate of a 5 percentage point reduction in column

and row (1) of Table 8 indicates that in comparing this to column (1) of Table 5 nearly two-thirds of the anti-poverty effectiveness of ARDA relative to the country occurred in the first five years of the program. This is perhaps not surprising given that the major influx of resources into the region occurred in the initial years of the program. This increases to three-fourths of the total impact in comparison to rural America, but only about one-half the total gain relative to the border counties. On the other hand, only about 20 to 40 percent of the effect of income levels and income growth was realized by 1970. This suggests that Appalachian counties benefitted with continued investments after 1970.

Conclusion

The passage of the Appalachian Regional Development Act was a major legislative achievement given the historic federal-state partnership that it envisioned and the formalization of local development districts, the efficacy of which was often met with considerable skepticism by economists and politicians wary of too much government intervention into economic life. It faced many critics at its origin, and at subsequent Congressional reauthorizations, and has had its share of operational and funding challenges over the years (Bradshaw 1992; Eller 2008). Yet despite this criticism the evidence presented here suggests that ARDA, or more specifically the *intent* of the Act, has delivered at least partially on two key goals of alleviating extreme poverty and improving income growth among the typical county in Appalachia.

As elucidated in the chapter by Kahn, the economic case for federal investment in local areas and regions is often difficult to make—one must justify the investment on equity grounds that it will reduce inequality, or on efficiency grounds that it reduce negative externalities and/or enhance positive externalities such as agglomeration economies. The case made by PARC (1964) focused on both—extreme poverty was a blight that at once violated American’s sense of

fairness and inhibited the nation's economic growth potential. The results here suggest that the ARDA investment did succeed in reducing hardship and brought Appalachian incomes closer to the national average.

However, even with ARDA, other forces at work caused the region to diverge from the country in terms of incomes per capita among Central and Northern Appalachians. The results of Bollinger, et al. (2011), Black and Sanders (this book), and Kahn (this book) each point to skill deficits, both a shortage of highly educated workers and employers demanding such workers, as a leading factor for divergence in income levels. Twenty years ago at the 25th anniversary of ARDA, Widner (1990, p. 310) reached a similar conclusion: "Yet in the years immediately ahead, the quality of labor will be the most powerful determinant of local economic development and, in this respect, Appalachia shares a major problem with America's inner cities and other distressed parts of nonmetropolitan America: its education gap." The positive treatment effect attributed to infrastructure and human development programs in this chapter suggests continued investments in this area are needed, and probably more intensively than in the past. Additional empirical work on ARDA is called for in order to ascertain more clearly which specific programs paid off for Appalachia in the hopes of guiding future investments in the people in this and other disadvantaged regions of the country.

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Figure 1: County Poverty Rates in 1960

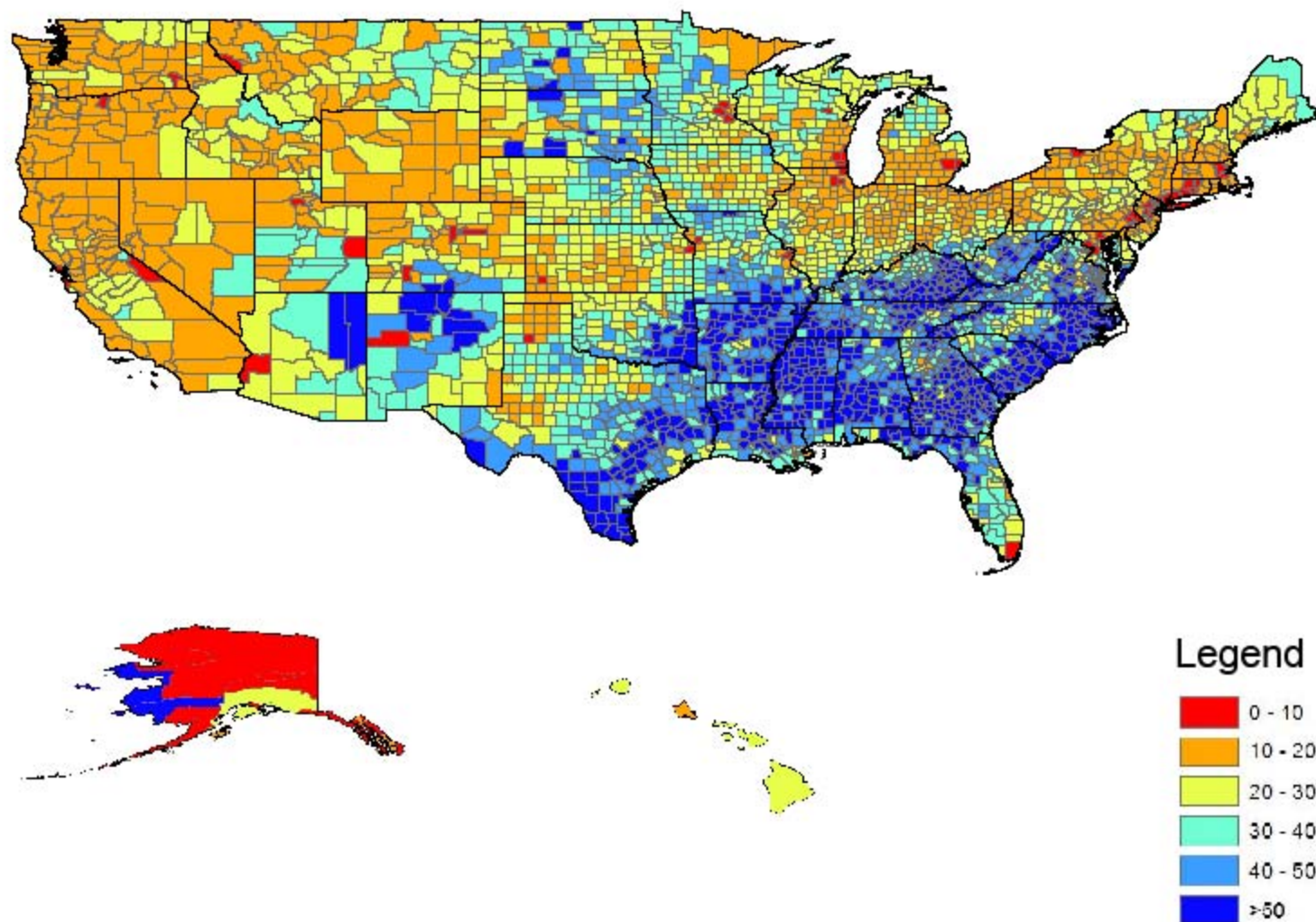


Figure 2: Appalachian Counties as of 1967 by Major Subregion

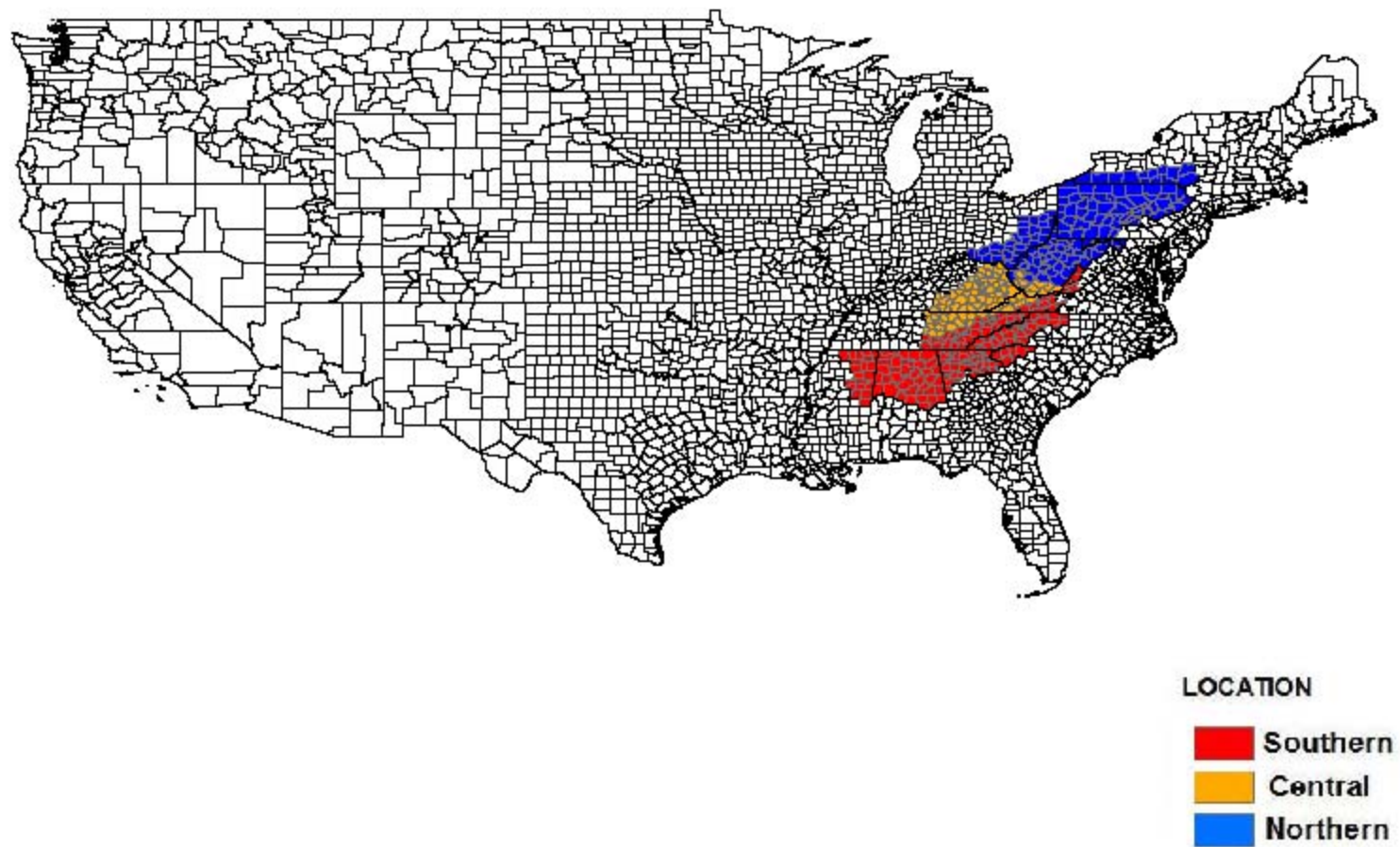


Figure 3: County Poverty Rates in 2000

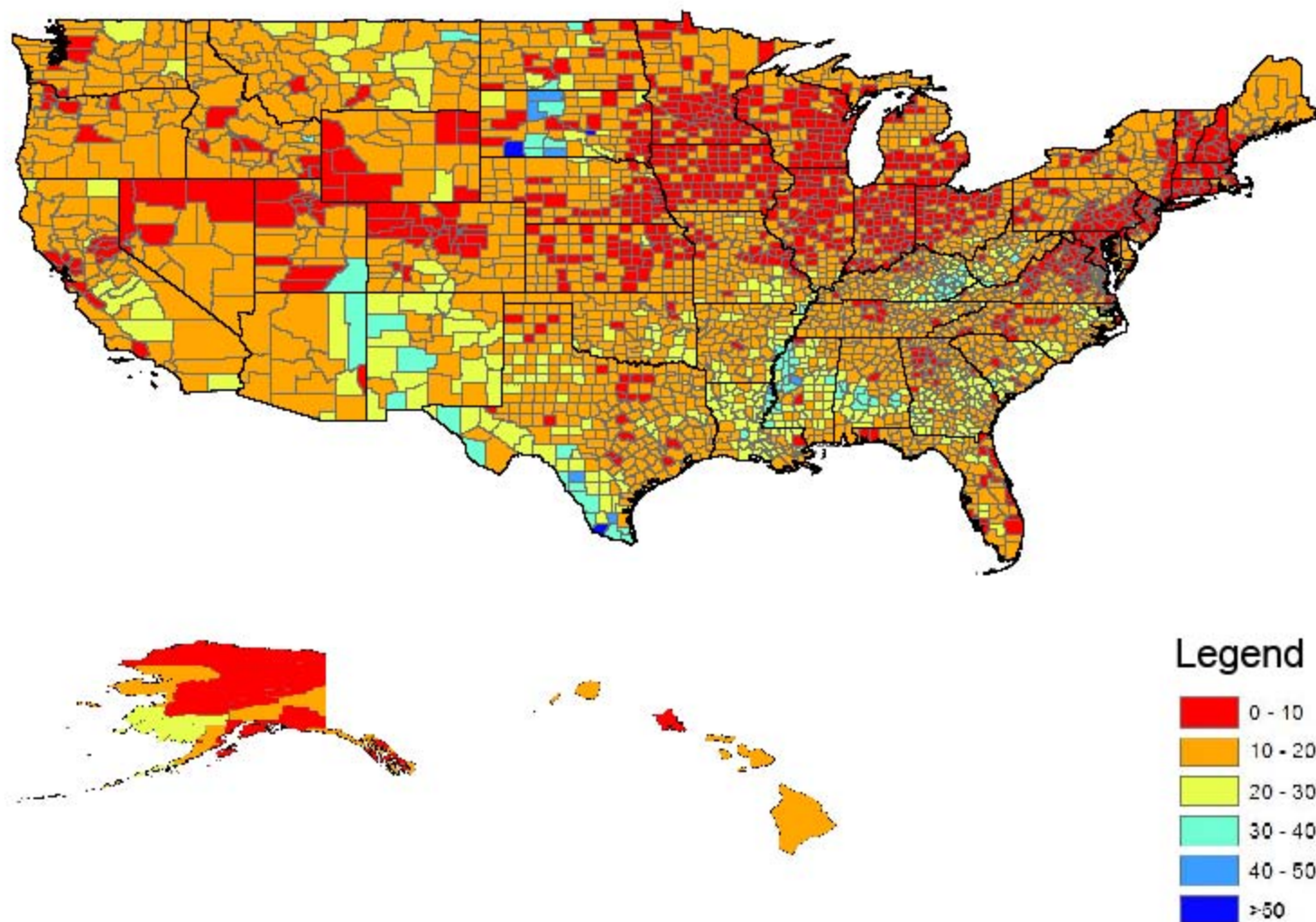


Figure 4: ARA Eligible, ARA Ineligible and Boundary Counties
in the Appalachian Region

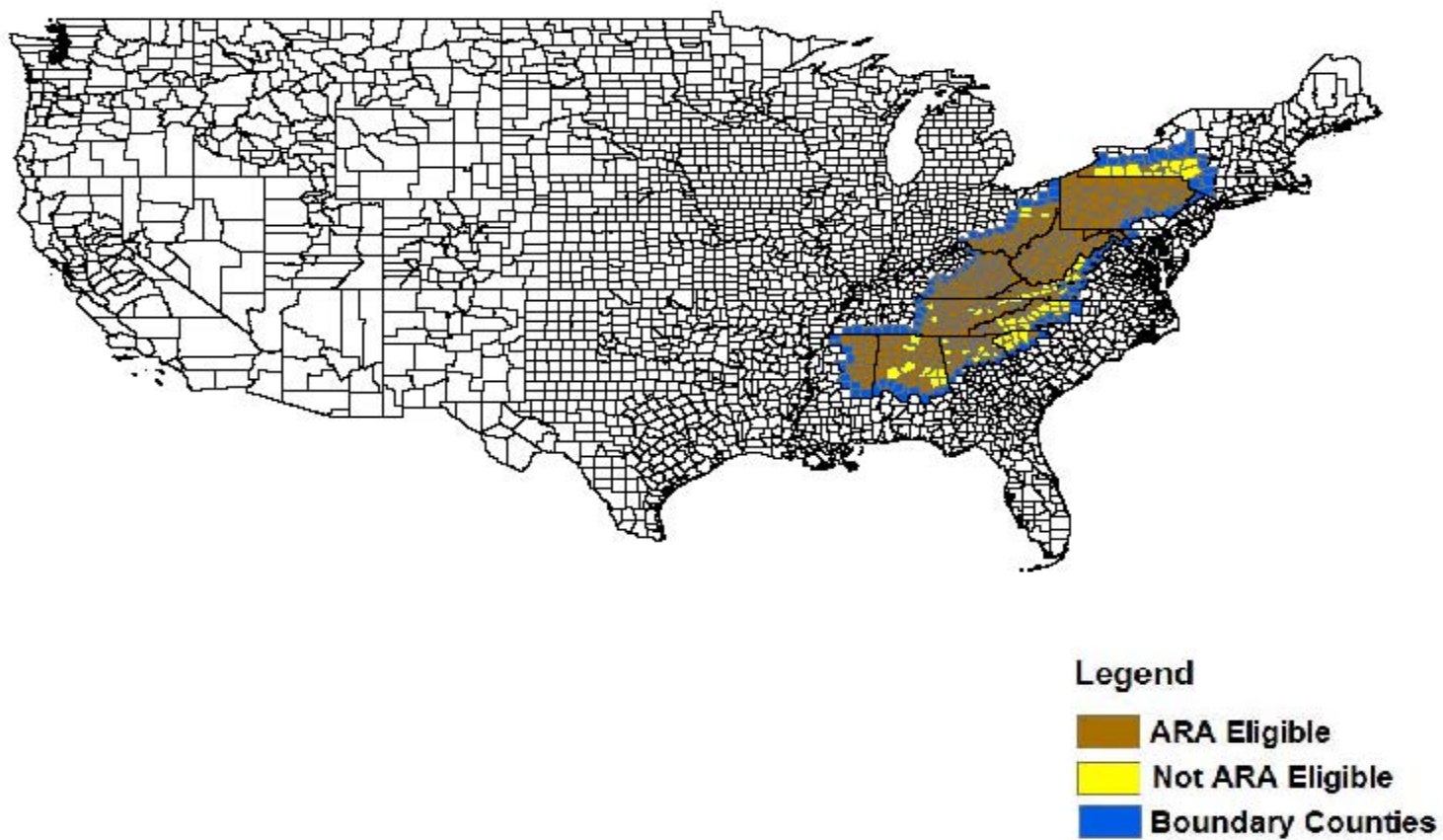


Table 1: Average Outcomes in Appalachia and Alternative Comparison Groups in 1960

	Appalachia	Rest of Country	Difference	Rural America	Difference	Adjacent Counties	Difference	Surrounding Counties	Difference
Real per Capita Income	5507 (84.85)	6799 (38.65)	-1292 [93.24]	6195 (40.39)	-688 [95.5]	6484 (182.2)	-977 [181.7]	6570 (150.3)	-1063 [160.5]
Log Real per Capita Income	8.564 (0.016)	8.779 (0.006)	-0.215 (0.017)	8.691 (0.007)	-0.126 [0.016]	8.720 (0.031)	-0.156 [0.033]	8.719 (0.024)	-0.154 [0.028]
Poverty Rate	0.425 (0.008)	0.325 (0.003)	0.100 [0.009]	0.366 (0.004)	0.059 [0.009]	0.355 (0.016)	0.070 [0.017]	0.363 (0.012)	0.063 [0.014]
Percent High School Completion	0.257 (0.005)	0.360 (0.002)	-0.102 [0.005]	0.339 (0.002)	-0.082 [0.006]	0.308 (0.008)	-0.050 [0.009]	0.310 (0.007)	-0.053 [0.008]
Percent Labor Force Growth	-0.014 (0.009)	0.058 (0.006)	-0.072 [0.011]	-0.035 (0.005)	0.021 [0.011]	0.082 (0.016)	-0.096 [0.018]	0.095 (0.015)	-0.109 [0.016]
Share of Population in Urban Area	0.228 (0.011)	0.336 (0.006)	-0.107 [0.013]	0.225 (0.005)	0.003 [0.013]	0.369 (0.022)	-0.141 [0.023]	0.364 (0.017)	-0.136 [0.020]
Share of Population Black	0.062 (0.005)	0.103 (0.003)	-0.042 [0.006]	0.104 (0.004)	-0.042 [0.009]	0.166 (0.017)	-0.104 [0.013]	0.192 (0.013)	-0.131 [0.012]

Note: Means are presented in the first line of each variable, standard deviation in parentheses, and standard errors for difference in means are in square brackets. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them.

Table 2: Average Outcomes in Subregions of Appalachia in 1960

	1960			Difference with the Rest of the Country		
	Central Appalachia	Northern Appalachia	Southern Appalachia	Central Appalachia	Northern Appalachia	Southern Appalachia
Per Capita Income	4047 (127.2)	6876 (120.0)	5095 (94.13)	-2752 [217.5]	77.74 [126.1]	-1703 [155.3]
Log Per Capita Income	8.266 (0.030)	8.812 (0.019)	8.507 (0.019)	-0.513 [0.034]	0.033 [0.026]	-0.272 [0.024]
Poverty Rate	0.584 (0.013)	0.288 (0.010)	0.461 (0.008)	0.259 [0.018]	-0.038 [0.014]	0.136 [0.013]
High School Completion	0.167 (0.007)	0.335 (0.006)	0.238 (0.005)	-0.193 [0.012]	-0.025 [0.009]	-0.121 [0.008]
Labor Force Growth	-0.150 (0.017)	-0.003 (0.012)	0.044 (0.013)	-0.208 [0.036]	-0.061 [0.028]	-0.013 [0.026]
Fraction in Urban Area	0.115 (0.018)	0.313 (0.020)	0.214 (0.016)	-0.220 [0.031]	-0.022 [0.025]	-0.122 [0.023]
Share of Population Black	0.027 (0.004)	0.016 (0.002)	0.118 (0.010)	-0.077 [0.018]	-0.088 [0.014]	0.015 [0.013]

Note: Means are presented in the first line of each variable, standard deviation in parentheses, and standard errors for difference in means are in square brackets

Table 3: Average Outcomes in Appalachia and Alternative Comparison Groups in 2000

	Appalachia	Rest of Country	Difference	Rural America	Difference	Adjacent Counties	Difference	Surrounding Counties	Difference
Real per Capita Income	16555 (141.6)	18053 (79.28)	-1498 [162.3]	16788 (71.41)	-233 [167.2]	19040 (332.8)	-2484 [312.8]	19657 (308.9)	-3102 [304.7]
Log Real per Capita Income	9.700 (0.008)	9.778 (0.004)	-0.078 [0.011]	9.713 (0.004)	-0.013 [0.010]	9.836 (0.017)	-0.135 [0.018]	9.857 (0.015)	-0.157 [0.016]
Poverty Rate	0.158 (0.003)	0.134 (0.001)	0.024 [0.003]	0.143 (0.001)	0.015 [0.004]	0.127 (0.006)	0.030 [0.006]	0.127 (0.004)	0.031 [0.005]
Percent High School Completion	0.713 (0.004)	0.782 (0.002)	-0.069 [0.005]	0.767 (0.002)	-0.055 [0.005]	0.759 (0.007)	-0.047 [0.008]	0.761 (0.005)	-0.048 [0.007]
Percent Labor Force Growth	0.123 (0.007)	0.138 (0.003)	-0.015 [0.008]	0.128 (0.004)	-0.006 [0.009]	0.132 (0.013)	-0.009 [0.014]	0.139 (0.010)	-0.016 [0.012]
Share of Population in Urban Area	0.303 (0.013)	0.414 (0.006)	-0.111 [0.014]	0.277 (0.006)	0.026 [0.013]	0.465 (0.024)	-0.162 [0.026]	0.471 (0.019)	-0.168 [0.022]
Share of Population Black	0.054 (0.005)	0.093 (0.003)	-0.039 [0.006]	0.089 (0.004)	-0.033 [0.008]	0.146 (0.016)	-0.093 [0.012]	0.172 (0.012)	-0.118 [0.011]

Note: Means are presented in the first line of each variable, standard deviation in parentheses, and standard errors for difference in means are in square brackets. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them.

Table 4: Average Outcomes in Subregions of Appalachia in 2000

	2000			Difference with the Rest of the Country		
	Central Appalachia	Northern Appalachia	Southern Appalachia	Central Appalachia	Northern Appalachia	Southern Appalachia
Per Capita Income	14040 (243.6)	16773 (169.1)	17638 (222.2)	-4013 [445.9]	-1281 [186.8]	-415.2 [319.6]
Log Per Capita Income	9.537 (0.017)	9.720 (0.010)	9.765 (0.012)	-0.241 [0.023]	-0.058 [0.018]	-0.013 [0.016]
Poverty Rate	0.229 (0.008)	0.140 (0.004)	0.136 (0.003)	0.096 [0.007]	0.006 [0.005]	0.003 [0.005]
High School Completion	0.614 (0.007)	0.779 (0.005)	0.707 (0.005)	-0.168 [0.009]	-0.003 [0.007]	-0.075 [0.007]
Labor Force Growth	0.092 (0.012)	0.084 (0.008)	0.171 (0.013)	-0.046 [0.018]	-0.054 [0.014]	0.033 [0.013]
Fraction in Urban Area	0.188 (0.021)	0.370 (0.020)	0.305 (0.020)	-0.225 [0.034]	-0.044 [0.027]	-0.109 [0.024]
Share of Population Black	0.017 (0.002)	0.019 (0.002)	0.101 (0.010)	-0.076 [0.016]	-0.074 [0.013]	0.008 [0.011]

Note: Means are presented in the first line of each variable, standard deviation in parentheses

Table 5: Regression-Adjusted Effects of ARDA on Poverty Rates, 1960-2000

	Rest of Country	Rural America	Adjacent County Border	Surrounding Border Counties
Appalachia	-0.076 (0.007)	-0.045 (0.007)	-0.040 (0.012)	-0.032 (0.010)
Central Appalachia	-0.163 (0.014)	-0.132 (0.013)	-0.053 (0.019)	-0.059 (0.016)
Northern Appalachia	0.044 (0.011)	0.075 (0.010)	-0.076 (0.014)	-0.081 (0.011)
Southern Appalachia	-0.133 (0.010)	-0.101 (0.010)	-0.003 (0.004)	0.012 (0.012)
ARA Eligible Appalachia	-0.084 (0.008)	-0.052 (0.007)	-0.047 (0.012)	-0.039 (0.011)
Central ARA Eligible	-0.166 (0.014)	-0.135 (0.013)	-0.056 (0.019)	-0.062 (0.016)
Northern ARA Eligible	0.036 (0.011)	0.068 (0.011)	-0.084 (0.014)	-0.089 (0.011)
Southern ARA Eligible	-0.158 (0.012)	-0.126 (0.010)	-0.028 (0.015)	-0.013 (0.013)

NOTE: Standard errors in parentheses. All models control for 1960 county level shares of high school graduates, shares of African Americans, shares of persons living in urban areas, and labor force growth. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them

Table 6: Regression-Adjusted Effects of ARDA on Real Per Capita Income, 1960-2000

	Rest of Country	Rural America	Adjacent County Border	Surrounding Border Counties
Appalachia	-206 (193)	455 (161)	-1507 (254)	-2039 (239)
Central Appalachia	-1261 (405)	-600 (326)	-2275 (354)	-2847 (352)
Northern Appalachia	-1358 (315)	-697 (255)	-2164 (325)	-3215 (380)
Southern Appalachia	1288 (291)	1950 (237)	-602 (399)	-766 (367)
ARA Eligible Appalachia	-479 (212)	187 (174)	-1781 (255)	-2312 (251)
Central ARA Eligible	-1331 (413)	-670 (322)	-2344 (354)	-2917 (355)
Northern ARA Eligible	-1313 (322)	-651 (268)	-2118 (339)	-3170 (398)
Southern ARA Eligible	1057 (352)	1719 (285)	-833 (436)	-997 (442)

NOTE: Standard errors in parentheses. All models control for 1960 county level shares of high school graduates, shares of African Americans, shares of persons living in urban areas, and labor force growth. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them.

Table 7: Regression-Adjusted Effects of ARDA on Log Real per Capita Income, 1960-2000

	Rest of Country	Rural America	Adjacent County Border	Surrounding Border Counties
Appalachia	0.137 (0.014)	0.114 (0.014)	0.021 (0.024)	-0.003 (0.019)
Central Appalachia	0.272 (0.029)	0.249 (0.028)	0.042 (0.043)	0.046 (0.034)
Northern Appalachia	-0.091 (0.023)	-0.114 (0.022)	0.027 (0.026)	0.020 (0.023)
Southern Appalachia	0.259 (0.021)	0.236 (0.020)	-0.012 (0.030)	-0.037 (0.026)
ARA Eligible Appalachia	0.145 (0.016)	0.122 (0.015)	0.029 (0.024)	0.005 (0.020)
Central ARA Eligible	0.276 (0.030)	0.253 (0.029)	0.047 (0.043)	0.051 (0.034)
Northern ARA Eligible	-0.078 (0.024)	-0.101 (0.023)	0.050 (0.027)	0.033 (0.023)
Southern ARA Eligible	0.300 (0.025)	0.277 (0.024)	0.029 (0.033)	0.004 (0.030)

NOTE: Standard errors in parentheses. All models control for 1960 county level shares of high school graduates, shares of African Americans, shares of persons living in urban areas, and labor force growth. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them.

Table 8: Short-Run Regression-Adjusted Effects of ARDA, 1960-1970

	Rest of Country	Rural America	Adjacent Border County	Surrounding Border Counties
Poverty Rates	-0.050 (0.006)	-0.035 (0.006)	-0.019 (0.010)	-0.019 (0.009)
Real per Capita Income	-59 (87)	7 (79)	-395 (107)	-410 (92)
Log Real per Capita Income	0.061 (0.012)	0.042 (0.012)	0.003 (0.019)	0.001 (0.015)

NOTE: Standard errors in parentheses. All models control for 1960 county level shares of high school graduates, shares of African Americans, shares of persons living in urban areas, and labor force growth. Rural America refers to those counties outside of Appalachia with a 1974 rural-urban continuum code > 5. Adjacent Counties are those immediately bordering Appalachia, and Surrounding Counties include Adjacent Counties plus those counties immediate bordering them.