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The effects of automobile production and local government expenditure on poverty in alabama

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Abstract

This paper studies the impact of automobile production on the poverty rate of Alabama's counties. The findings suggest that automobile production in Alabama significantly reduces the poverty rate in all counties. The impact of automobile production on poverty reduction in distressed black belt counties is greater than in other counties. The local government expenditure is not very effective in reducing the poverty. This implies that industrial development may be more effective in reducing poverty than government programs.

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1. Introduction

Poverty reduction is one of the major concerns for policy makers and local governments in most of the countries. In the United States, Poverty is unevenly distributed across counties. Poverty rates remains high in the most isolated rural counties, particularly in counties far from metropolitan areas (Glasmeier and Farrigan, 2003; Swaminathan and Findeis, 2004; Partridge and Rickman, 2006, Ch. 2). Poverty rate in the United States increased from 11.3% in 2000 to 12.3% in 2006 (DeNavas-Walt, Bernadette, and Smith 2007). In the United States, the Appalachian Region has been the center of attention for poverty reform because most of the counties are isolated rural counties and far behind in the social and economic development from the rest of the nation (Pollard, 2003). National and local policy programs to alleviate poverty in this region have shown a substantial improvement in economic conditions over the past several decades.

The poverty rate in Alabama was 15.3 percent in 2003. In Alabama counties, the poverty rate ranged from 6.8 percent in Shelby County to 28.7 percent in Perry County. Among the counties, fourteen had poverty rates of 20 percent or higher. The Economic Research Service, USDA, classifies counties as persistent poverty counties if they have had poverty rates of 20 percent or higher in each decennial census from 1970 through 2000. In Alabama, 22 counties are classified as persistent poverty counties. 17 counties of these 22 counties are non-metro counties (RUPRI, 2007). Alabama is the tenth poorest state in the nation and one of 20 states that have established a commission on poverty. The Alabama state legislature has formed the State Commission to study state-supported programs, policies and services and make recommendations on proposed legislation concerning poverty.

Figure 1:

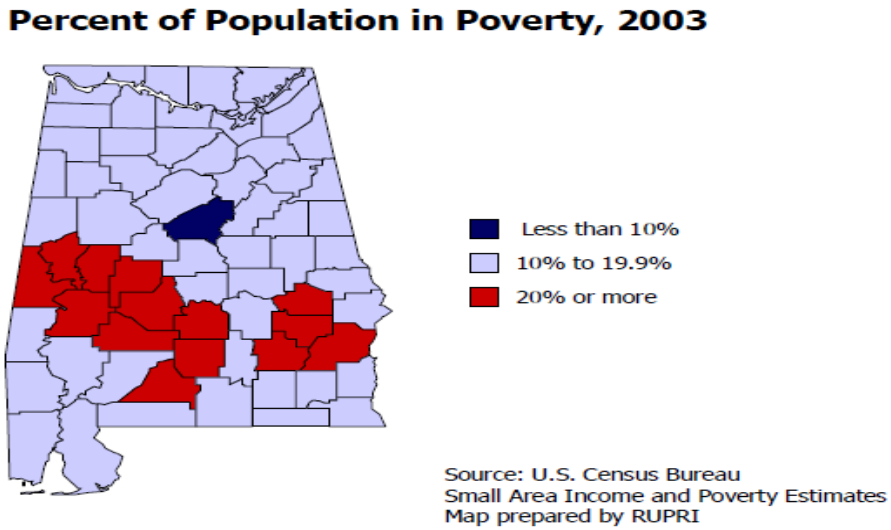
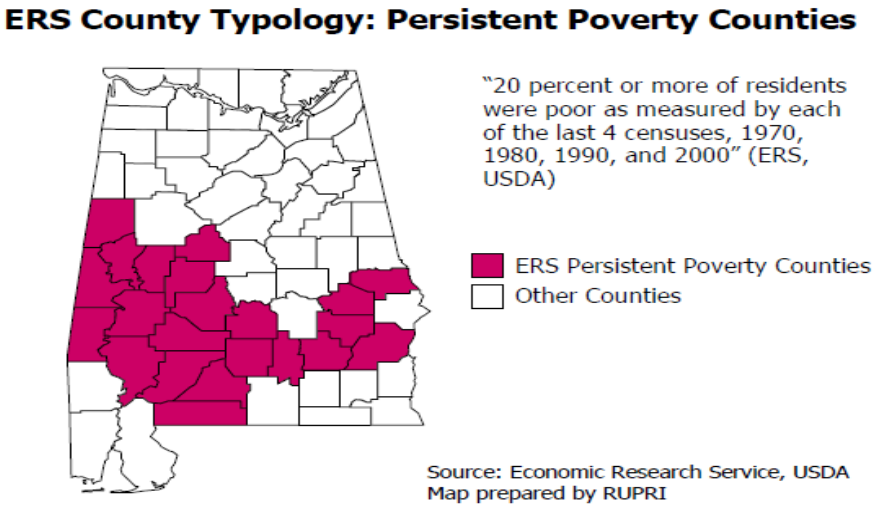


Figure 2:



Since the state government has expanded economic incentives to attract auto industry to create additional employment and generate personal income, large auto mobile firms and its input suppliers have located in several Alabama counties. The auto industry in Alabama accounted for 47,457 direct jobs and 85,700 indirect jobs through their purchases and expenditures with annual payroll of $5.2 billion by 2007 (AAMA 2008). Jobs in 40 of the state's 67 counties now are tied directly or indirectly to auto manufacturing (AAMA 2008). Private investments and government expenditures are sources of both employment and income. In addition to the socio, economic, demographic and other factors, these two sources substantially contribute to the family poverty rate on county level.

2. Literature Review

There are several studies on the determinants of poverty in urban and rural areas. Most of these studies model poverty rates or changes in poverty rates as functions of demographic characteristics and local economic conditions, using county-level data. Gibbs (1994) and Davis and Weber (2002) argue that rural labor markets are thinner with poorer employer-employee matches than their urban counterparts, Fisher (2005; 2007) shows that while part of the higher rate of poverty in rural areas is attributable to poor economic opportunities in rural areas and self-selection of poor people locating into rural areas. Some studies have examined spatial externalities in poverty research. Rupasingha and Goetz (2000) have developed a spatial econometric model and found that changes in poverty are affected by the poverty of neighboring counties. Several researchers have investigated the effects of changes in economic, social, political, and demographic conditions on the poverty rate. Levernier, Partridge, and Rickman (2000) in their study found that economic development targeting African-American communities and non-MSA counties would be most effective in reducing poverty. Triest (1997) concluded that increased employment and educational opportunity of the low-income population would narrow the interregional gap in poverty. Rupasingha and Goetz (2007) suggested that public investment in social capital can reduce poverty rates by easing transaction costs paid by local associations. Fan, Linxiu, and Xiaobo (2002) concluded that government expenditures on rural

education and infrastructure reduced the rural poverty rate. Jung and Thorbecke (2003) found that increased expenditure on education can contribute to economic growth and poverty alleviation by supplying more educated and skilled labor. Education is another key for reducing poverty rates for the counties with minorities (Swail, Redd, and Perna 2003). But, Gomanee et al. (2005) found that public spending on social services was ineffective in reducing poverty and suggested that new techniques should be developed to improve the efficiency of public spending. Industry composition also can affect the poverty rate. Levernier, Partridge, and Rickman (2000) found that counties with above-average shares of employment in agriculture, trade, and services have higher poverty rates.

The purpose of the research is to determine the effects of the auto industry and local government expenditure on the poverty of Alabama's counties. This research improves on existing research in many ways. First, we include the initial level of poverty rate, which allow us to test whether the equation converges with the respective to dependent variable. Second, we are able to estimate the differential impact of auto production on proportional change in the poverty rate in the distressed black belt counties by introducing an interaction term of auto production and these counties. Third, we incorporate spatial components to capture the role of poverty rate of neighboring counties. Finally, we include the initial level of employment, per capita income, population, and other socio, economic, demographic and policy variables to control their effect on the dependent variable. Since these variables are 10 years lagged, the endogenous problem from these variables can be avoided. The analysis will be based on county data for the study period 1970 – 2000. A major goal is to determine whether poverty rate in the distressed counties in the state's Black Belt are reduced from the auto boom.

3. Model

This model developed using the idea that private investments are important sources for generating employment and income. In addition to the socio, economic, demographic and other factors, private investments can substantially influence the poverty rate on a county level. Poverty rate, in county level are influenced by the socio, economic, demographic and policy variables and spatial components of poverty rate of neighboring counties.

4. Data and Sources

Data for sixty seven counties in Alabama are drawn from several sources (Table I). These data were collected for the study period for the years 1970 to 2000. The growth of poverty rate was constructed using 10 years interval between the beginning and end period, like 1970-1980, 1980-1990 and 1990-2000. Independent variables include demographic, human capital, labor market, automobile production, interaction term of automobile production and distressed Black Belt county and policy variables. The initial values of the independent variables are lagged 10 years. But automobile production variable is lagged 2 years in this equation. This formulation reduces the problem of endogeneity. The variable, automobile production ($\boldsymbol{lnA_{t-i}}$), was constructed as ***ln*** (automobile production/ distance). All independent variables are in log form except those that can take negative or zero values. Per capita income, per capita local government expenditure and per capita local tax were deflated using consumer price index (CPI). The descriptive statistics of the variables are given in Table II.

Table I: Variable Description and Data Sources

Variable	variable Description	unit	Source
POV	Poverty Rate, t	%	A, D
Auto	No. of automobile/distance, t- 2 years	Number/mile	A, G, H
Autoblack	Interaction of auto and Black Belt county		
Lpov	Poverty Rate, t- i	%	D
Lgexp	Per Capita Local Government Expenditure, t-i	$/person	D
Lpop	population, t-i	number	B
Lpcip	per capita income, t-i	$/person	B
Ltem	employment, t-i	number	B
Unemp	Unemployment Rate, t-i year	%	E
D17years	% of population below 17years, t-i	%	C, D
D65years	% of population above 65years, t-i	%	C, D
Hsch	% of high school degree or above,t-i	%	C, D
Fhh	% of Female household Head family, t-i	%	C, D
Tax	per capita local tax	$/person	D
Hway	road density, t-i	mile/square mile	F
Metro	dummy variable for metro area	Dummy value	
$(I \otimes W)POV$	Spatial Lag of Growth Rate of Poverty, t	%	A, D

A- Computed, B- US Department of Commerce, Bureau of Economic Analysis (REIS database), C- County & City Data Book, D- U.S Census Bureau, E- Bureau of Labor Statistics, F – US Bureau of Transportation Statistics, G- Map Quest, H - Mercedes-Benz U.S. International, Tuscaloosa, AL, Honda Manufacturing of Alabama, Lincoln, AL, Hyundai Motor Manufacturing Alabama, Montgomery, AL, Toyota Motor Manufacturing Alabama, Huntsville, AL, Automotive News Market Data Book

Table II: Descriptive Statistics for Alabama Counties

Variable	variable Description	Mean	Std Dev
POV	Poverty Rate, t	19.93	10.69
Auto	No. of automobile/distance, t-2 years	566.4	4853
Autoblack	Interaction of auto and Black Belt county	62.25	280.5
Lpov	Poverty Rate, t- i	25.12	12.05
Lgexp	Per Capita Local Government Expenditure, t-i	1614	784.6
Lpop	population, t-i	56717	91682
Lpcip	per capita income, t-i	16476	4009
Ltem	employment, t-i	25899	50298
Unemp	Unemployment Rate, t-i year	9.6	5.22
D17years	% of population below 17years, t-i	31.52	4.78
D65years	% of population above 65years, t-i	12.36	2.59
Hsch	% of high school degree or above,t-i	47.93	12.92
Fhh	% of Female household Head family, t-i	18.18	7.23
Tax	per capita local tax	292.61	131.1
Hway	road density, t-i	0.126	.031
Metro	dummy variable for metro area	.179	.384
$(I \otimes W)POV$	Spatial Lag of Growth Rate of Poverty, t	- 13.9	11.1

i is 10 years

5. Estimation Issues

A panel model is estimated using 201 observations. This panel model contains three time periods for 67 Alabama counties. This panel model was used to control unobserved heterogenity and to investigate inter-temporal changes. Since the panel data provide more information and variables, the degree of freedom and efficiency increases and multicollinearity is less likely to occur.

Many studies suggest that geographical location and location parameters significantly affect productivity, inequality and growth (Quah 1996, Redding and Venables 2002, Rupasingha et al. 2002, Rupasingha and Goetz 2007). The presence of spatial dependence can result in misleading results from employing models using OLS (LeSage 1999). Poverty in a given county may have spillover effects to the neighboring county. Then, the errors are dependent. In this study, three alternative spatial specification models and a model without spatial component were estimated. The three alternative spatial specification models are Spatial Lag model, Spatial Error Model (SEM) and Spatial Autoregressive model (SAR). Spatial Lag model was estimated by Maximum Likelihood Estimation method. Spatial Error Model and Spatial Autoregressive Model were estimated by a Method of Moments Approach. The Spatial Lag model accounts for the spatial dependence in the dependent variable and SEM incorporates spatial dependence in the error term. The SAR model accounts for both spatial dependence in the dependent variable and error term.

The Spatial Lag model takes the following form:

$$y_i = \rho W y_i + X_i\beta + \varepsilon_i \quad (1)$$
$$\varepsilon_i \sim N(0,\sigma^2)$$

Y is the dependent variable and X is a vector containing all the independent variables and ε is a normally distributed error term. ρ is autoregressive coefficient and W is the weighting matrix that was constructed on the queen based adjacency criteria. This weight matrix controls only spatial spillover effect of neighboring counties.

Spatial dependence could also arise if a shock to an omitted variable in the model affects the dependent variable. The SEM takes the following:

$$y = X\beta + u \quad (2)$$
$$u = \delta W u + \varepsilon \quad (3)$$
$$\varepsilon_i \sim N(0,\sigma^2)$$

Where δ is the scalar spatial error coefficient. The spatial Autoregressive Model incorporates spatial dependence in both the dependent variable and shocks to omitted variables in the model. It takes the following form:

$$y = \rho W y + X\beta + u \quad (4)$$
$$u = \delta W u + \varepsilon \quad (5)$$
$$\varepsilon_i \sim N(0,\sigma^2)$$

6. Results and Discussion

The parameter estimates of the four regression models and long run elasticity were given in Table III and Table IV respectively. In general, the results are consistent with theoretical expectations and previous studies. The results of Moran I statistics and spatial dependence models indicate that there is no spatial dependence in dependent variable and in error terms. The significant coefficient of initial level of poverty rate (0.169) implies that there is conditional convergence with respect to the poverty rate. It also indicate that, other thing being equal, a county which had higher initial level of poverty rate will have higher poverty rate than a county which had lower initial poverty rate.

Table III: The Estimation Results of Regression Models

	OLS		Spatial Lag		SEM		Spatial Autoregressive	
Variable	coeff.	t	coeff.	t	coeff.	t	coeff.	t
const	10.16	4.54	10.29	4.47	9.59	4.29	9.71	4.22
auto	-0.0326	-2.79	-0.0322	-2.73	-0.0327	-2.85	-0.0324	-2.79
autoblack	-0.0259	-2.26	-0.0259	-2.25	-0.0267	-2.32	-0.0266	-2.31
unemp	0.0966	2.37	0.0975	2.38	0.1000	2.49	0.1006	2.48
d17years	0.0880	0.37	0.0827	0.35	0.1317	0.56	0.1256	0.53
d65years	0.1567	1.32	0.1545	1.29	0.1653	1.39	0.1634	1.36
hsch	0.1292	0.76	0.1253	0.73	0.1164	0.69	0.1136	0.67
fhh	0.2903	3.61	0.2907	3.6	0.2832	3.54	0.2837	3.54
tax	-0.0376	-0.52	-0.0360	-0.49	-0.0428	-0.6	-0.0414	-0.57
lpop	-0.0298	-0.3	-0.0298	-0.3	-0.0276	-0.28	-0.0277	-0.28
lpci	-1.0738	-4.77	-1.0793	-4.76	-1.0297	-4.61	-1.0354	-4.6
ltem	0.0623	0.68	0.0628	0.69	0.0624	0.69	0.0628	0.69
lgex	0.0505	0.81	0.0502	0.81	0.0561	0.92	0.0556	0.9
lpov	0.1642	2.01	0.1638	2	0.1677	2.07	0.1674	2.06
hway	-0.0231	-0.35	-0.0245	-0.37	-0.0179	-0.28	-0.0191	-0.29
metro	-0.0121	-0.23	-0.0118	-0.22	-0.0169	-0.32	-0.0165	-0.31
(I⊗W)povr			-0.0191	-0.25			-0.0144	-0.19
Rho					0.1165	0.62	0.1385	0.74
sigv					0.0390	4.83	0.0391	4.8
sig1					0.0436	3.25	0.0434	3.25
Adj R-squared	0.7521		0.7508		0.7565		0.7551	
N	201		201		201		201	

Table IV: Long Run Elasticities of Exogenous Variables

auto	-0.039
autoblack	-0.031
unemp	0.116
fhh	0.347
lpci	-1.285

In the equation of poverty rate, the coefficient of automobile production (-.0326), and the interaction term of automobile production and distressed black belt county (-0.026) are negative and significant at the 5% level. The long run elasticity of automobile production (-.039), and the interaction term of automobile production and distressed Black Belt county (0.031) suggest that if automobile production in a given plant can increase by 10%, the poverty rate of a county where the plant locates will decrease by 0.39% but if a county is a distressed Black Belt County, the poverty rate will decrease by 0.7%. The poverty rate of other counties decreases but this decrease in poverty declines with distance from a county where the plant locates. This result shows that automobile production in Alabama significantly reduced the poverty of the distressed Black Belt counties, compare to other counties.

The coefficient of female household head (0.29) suggests that the poverty rate in a given county is positively associated with the percentage of female headed households. The long run elasticity of female household head (0.35) indicates that a 10% increase in the percentage of female household heads in a given country is associated with 3.5% increase in the poverty rate in the given county. This positive sign is consistent with previous studies. Poverty rates are also higher for female-headed families, among most minority groups and among families with larger numbers of children (Farmer et al., 1989, Levernier et al., 2000). The results show that unemployment is positively related to the poverty rate. The long run elasticity of unemployment rate (0.116) suggests that a10 % increase in unemployment rate of a given county will raise the poverty rate of the county by 1.6%. In this study period, the coefficient of per capita local government expenditure is insignificant. It indicates that the local government expenditure is ineffective in reducing the poverty rate of the given county. Gomanee et al. (2005) also found that public spending on social services was not effective in reducing poverty and highlighted the need for new techniques to improve the efficiency of public spending. The results show that the poverty rate is negatively associated with the initial level of per capita income. The long run elasticity of the initial level of per capita income (-1.28) implies that a 10 % increase in the initial level of per capita of income of a given county will reduce the poverty rate of the county by 12.8%.

7. Conclusions and Policy Implications

The empirical findings suggest that automobile production in Alabama significantly reduced the poverty rate in all counties. The impact of automobile production on poverty reduction in distressed Black Belt counties is greater than in other counties. Local government expenditures aimed at reducing poverty was found to be ineffective. This result suggests that industrial development may be more effective in reducing poverty than government programs.

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