

# Considering Local Measures of Poverty Using Shift-Share Techniques: A Comparative Analysis

Gregory L. Hamilton,  
Institute for Economic Advancement  
University of Arkansas at Little Rock

Melody Muldrow,  
Institute for Economic Advancement  
University of Arkansas at Little Rock

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## **Background**

**Persistent Poverty in Areas in Arkansas**

**Industrial Transformation = Structural Change Conducive to Poverty**

**Sorting External Poverty Factors from Local Poverty Factors**

## **Research Question**

**Does using a shift-share technique to decompose poverty measures add any information about factors affecting poverty? That is, does shift-share's competitive effect component when used as a dependent variable improve the explanatory power of regression equations commonly used in regression studies focused on the causes of poverty.**

## **Methodology**

**Use shift-share technique to compute a competitive effect component to create a local poverty measure.**

**Use the local poverty measure as a dependent variable in a regression analysis to discover if it enhances our understanding of the causes of poverty in Arkansas as compared to a unadjusted poverty measures.**

## Shift-Share Analysis

A tool to partitions the growth in an economic variable in a particular area (i.e., state, region and city) into various components.

Chun-Yun Shi and Yang. "A Review of Shift-Share Analysis and Its Application in Tourism," *International Journal of Management Perspectives*, ISSN: 1307-1629, 2008, 1(1), 21-30.

The shift-share method of analyzing regional growth apparently was originated in the early 1940s and induced by Dunn:

Dunn, E. S. (1960). *A statistical and analytical technique for regional analysis*. Paper presented at the Papers and Proceedings of the Regional Science Association.

Recent example of shift-share analysis:

Valente J. Matlaba, Mark Holmes, Philip McCann and Jacques Poot. (2012) "Classic and Spatial Shift-Share Analysis of State-Level Employment Change in Brazil," Working Paper 2012, Economics Department, University of Waikato, Hamilton, New Zealand

Studies focused on Poverty

Albrecht, Don, Carol Albrecht, and Stan Albrecht. (2000) "Poverty in Nonmetropolitan America: Impacts of Industrial, Employment, and Family Structure," *Rural Sociology*, Vol. 65, No.1, March.

Celli, Stephanie, Sign-Mary McKernan, and Caroline Ratcliffe. (2008) "The Dynamics of Poverty in the United States: A Review of Data, Methods, and Finding," Working Paper January 2008, George Washington, University.

Levernier, William, Mark Partridge, and and Dan Rickman. (2000). "The Causes of Regional Variations in U.S. Poverty: Cross-County Analysis," *Journal of Regional Science*, Vol. 40, No.3, 2000, pp. 473-497.

## Applying a shift-share technique to analyze poverty change

A shift-share analysis is a descriptive technique to identify components of regional growth and decline.

Traditionally, the components are associated with a national effect, an industrial mix effect and a competitive effect.

Study's Approach: State Effect, Regional Effect, and Local Effect

Note: Shift-Share competitive effects and local poverty measure are residual measures and as such should have a zero mean in repetitive sampling if they are random effects.

Decompose a counties change in the number of persons in poverty as follows:

$$\Delta \text{POV}_i^{t+n} = (\text{POV}_i^{t+n} - \text{POV}_i^t) = G^{t+n} \times \text{POV}_i^t + (G_r^{t+n} - G^{t+n}) \times \text{POV}_i^t + (g_i^{t+n} - G_r^{t+n}) \times \text{POV}_i^t$$

Where:

$\text{POV}_i^{t+n}$  = Number of persons in poverty in the  $i^{\text{th}}$  county at time  $t+n$ .

$\text{POV}_i^t$  = Number of persons in poverty in the  $i^{\text{th}}$  county at time  $t$ .

$G^{t+n}$  = State's growth rate in the number of persons in poverty between time  $t$  and  $t+n$ .

$G_r^{t+n}$  = Growth rate in the number of persons in poverty in  $r^{\text{th}}$  between time  $t$  and  $t+n$ .

$g_i^{t+n}$  = Growth rate in the number of persons in poverty in region  $r$  between time  $t$  and  $t+n$ .

Descriptive Statistics: Shift-Share Decomposition of Arkansas' Counties Poverty Change				
2000-2010				
Arkansas's Counties	Population Change	State Effect	Regional Effect	Local Poverty Effect
	$\Delta \text{POP}_i^{t+n}$	$G^{t+n} \times \text{POV}_i^t$	$(G_r^{t+n} - G^{t+n}) \times \text{POV}_i^t$	$(g_i^{t+n} - G_r^{t+n}) \times \text{POV}_i^t$
Mean	1,796.7	1,796.7	1,480.1	-1,480.1
Median	614.0	1,166.5	911.2	-1,283.6
Standard Error	413.6	232.8	204.7	149.3
Range	20,652.0	14,781.4	10,425.3	7,956.4
Minimum	-281.0	275.7	119.9	-5,223.7
Maximum	20,371.0	15,057.1	10,545.2	2,732.8

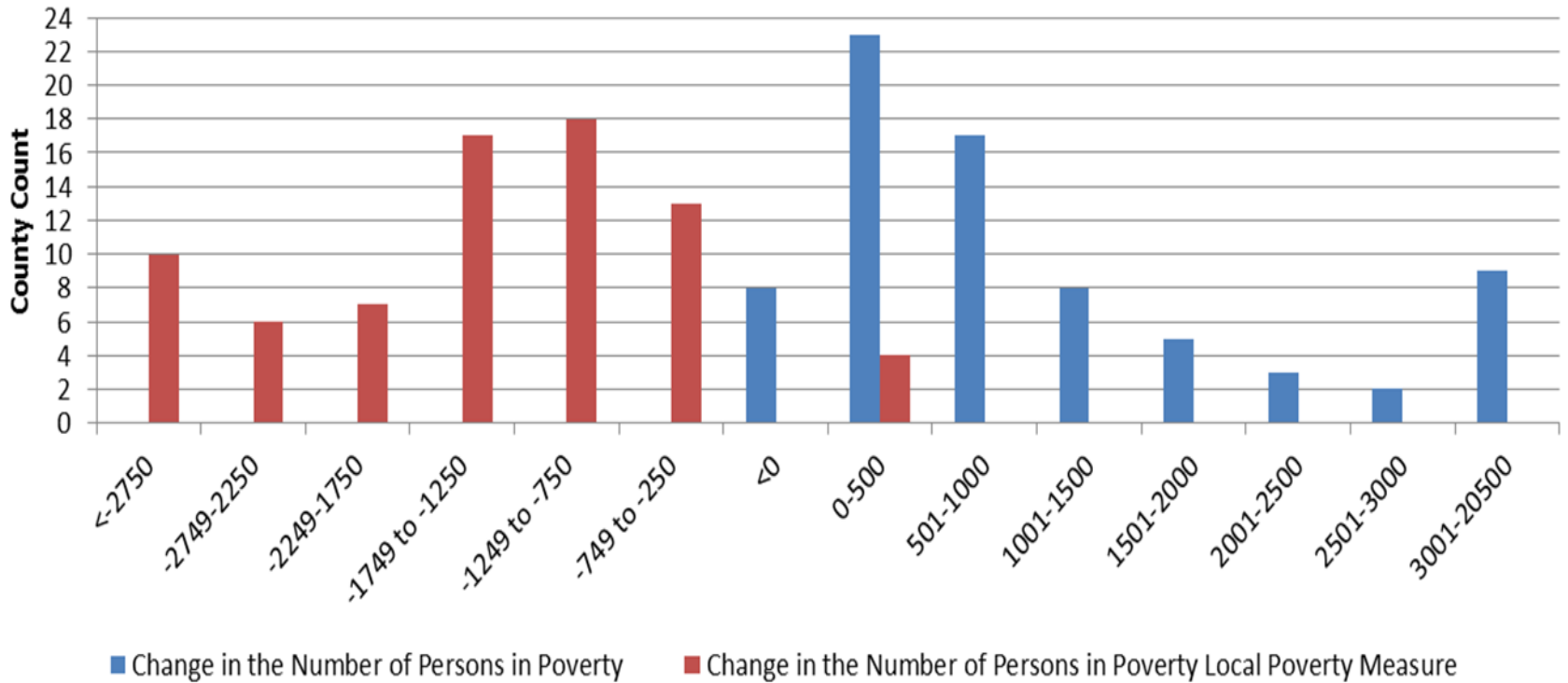
**Descriptive Statistics of Comparative Measures of Persons in Poverty  
by Counties in Arkansas 2000-2010**

<b>Arkansas Counties</b>	<b>Mean</b>	<b>Standard Error</b>	<b>Median</b>	<b>Range</b>	<b>Minimum</b>	<b>Maximum</b>	<b>State Total</b>	<b>Count</b>
<b>Number of Persons in Poverty 2000</b>	5,266	682	3,419	43,323	808	44,131	394,957	75
<b>Number of Persons in Poverty 2010</b>	7,063	1,069	3,976	63,698	804	64,502	529,713	75
<b>Change in the Number of Persons in Poverty</b>	1797	414	614	20652	-281	20371	134756	75
<b>Change in the Number of Persons in Poverty Local Poverty Measure</b>	-1480	149	-1284	7956	-5224	2733	-111005	75

Source: SAIPE, U.S. Census Bureau

## Frequency Distributions

### Change in the Number of Persons in Poverty 2000-2010 by County in Arkansas



## Regression Specification

Sample: Arkansas Counties, Change over the 2000-2010 period

Group Variable (Panel): Planning and Development Districts

Dependent Variable:

Data source: Number of people in poverty (SAIPE), Census

Variables: A poverty rate per thousand people variable

Change in the Poverty Rate

Change in the Local Poverty Rate Measure

## Estimator Form

OLS

$$Y_i = \mathbf{XB} + \mu_i$$

Fixed Effect (FE)

$$Y_i = \mathbf{XB} + \alpha_i + \mu_i$$

Where:

$Y_i$  = Poverty Measure for  $i^{\text{th}}$  county

$\mathbf{XB}$  = Matrix of explanatory variables and array of estimated coefficients.

$\alpha_i$  and  $\mu_i$  : fixed effect and random error term for the  $i^{\text{th}}$  county.



Explanatory variables

Descriptive Statistics 2000,2010							
-> YEAR = 2000							
Variable	Description	Obs	Mean	Std. Dev.	Min	Max	
POVERTY	Number of people living in poverty	75	5,266	5,910	808	44,131	
POP	Annual population estimate	75	35,715	49,130	5,709	361,876	
TEMP	Annual number of full and part time workers	75	19,910	37,965	2,026	298,107	
EDLHS	Education attainment is less than high school	75	3,533	3,679	786	26,667	
EDHS	Education attainment high school	75	7,872	9,029	1,701	63,911	
AHHY	Average Household Income	75	38,285	4,686	28,519	51,922	
EPOW	Earnings by Place of Work	75	598,447	1,400,992	38,986	11,300,000	
TBPOP	Total Black Population	75	5,607	14,390	3	115,620	
WBFPOP	Workng Population Black Females	75	1,881	5,079	1	41,242	
WPOP	Working Age Population	75	23,168	32,946	3,679	243,955	
MHHY	Median Household Income	75	29,058	4,396	20,510	42,569	
LF	Labor_force	75	16,803	25,044	2,558	184,404	
-> YEAR = 2010							
Variable	Description	Obs	Mean	Std. Dev.	Min	Max	
POVERTY	Number of people living in poverty	75	7,063	9,257	804	64,502	
POP	Annual population estimate	75	38,955	56,868	5,331	383,581	
TEMP	Annual number of full and part time workers	75	20,608	40,676	2,112	308,839	
EDLHS	Education attainment is less than high school	75	455	617	23	4,251	
EDHS	Education attainment high school	75	8,939	10,347	1,794	69,368	
AHHY	Average Household Income	75	46,402	6,354	35,095	65,345	
EPOW	Earnings by Place of Work	75	856,009	2,068,864	52,579	16,100,000	
TBPOP	Total Black Population	75	6,054	16,467	9	134,917	
WBFPOP	Workng Population Black Females	75	2,130	6,092	2	50,199	
WPOP	Working Age Population	75	25,384	38,123	3,581	259,401	
MHHY	Median Household Income	75	34,983	5,841	21,676	51,589	
LF	Labor_force	75	18,088	27,983	2,597	188,184	

Model 1						
Dependent Variable Poverty Measure		Explanatory	Time Period	Differences	Explanatory Variable Time Period	Sample Size
Poverty Rate	Discrete	Discrete	2000, 2010		2000, 2010	150
Local Poverty Rate	First Difference	Discrete	1989-2000, 2000-2010		2000, 2010	150

Y Variable	POVRATE	LOCPOVRATE	POVRATE	LOCPOVRATE
Estimator	OLS	OLS	FE	FE
MHHY	-.00447816***	.00327625***	-.00415932***	.00323434***
EPOWTEMP	-.00091106*	.00163616**	-.00093888**	.0004794
_IYEAR_2010	64.118349***	-103.78337***	62.571878***	-100.03891***
AVEMEDHHY	-4.0957002	-.92001485	-1.7251949	3.5984755
LFPART	-.10390952**	-.02128675	-.09811528**	-.02634774
BWHPOP	.05226093***	-.03778114***	.05212369***	-.07263837***
EDLHSHSRATE	-.07721679*	-.07477249	-.07386794	-.31006658***
FEMHHRATE	.02685922*	-.08006281***	.02974102**	-.06526077***
_cons	425.37877***	-62.288425	407.39596***	100.22383
N	150	150	150	150
F	80.721903	49.722076	62.207017	69.399988
rho			.06140465	.56342448
r2_a	.80431773	.66916455	.76411216	.78380728

legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

estimates table OLS3 LPOLS3 FE3 FELPOLS3, star stats(N F rho r2\_a)

(AN\_POV\_PANEL\_Metro)

Model 2					
Dependent Variable Poverty Measure		Explanatory Variables	Time Period	Explanatory Variable Time Period	Sample Size
Local Poverty Rate	First Difference	First Difference	(2000-2010)	2000-2010	75

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Change-Rates | LOCPOVRATE2010   LOCPOVRATE2010
              |           OLS           FE*
-----+-----
DMHHY | -.01432442   -.01199411
DEPOWTEMRATE | -.06800107   -.07668521
DLFPOPRATE | -.93679782   -.65607937
DBWPOPRATIO | -8.3410882** -8.4159869**
DEDLHSHSRATE | -4.8013795   -2.7853169
DFEMHHRATE | -.38549295   .81272604
DAHHYMHY | 17.305222    26.979546
_cons | -858.17616   -735.81868
-----+-----
N | 75           75
F | 2.2330041    2.7019274
rho | .31580983
r2_a | .10445263    .06226428
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legend: * p<0.05; ** p<0.01; *** p<0.001
FE*   Prob > F < 0.05 (Significant FE)

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. estimates table LPALL20106 LPALL2010FE6, star stats(N F rho r2\_a)

(AN\_LPALL\_CHANGE00-10\_POV-Panel-3)

Model 3					
Dependent Variable Poverty Measure		Explanatory Variables	Time Period	Explanatory Variable Time Period	Sample Size
Poverty Rate	First Difference	Frist Difference	2000- 2010	(2000-2010)	75
Local Poverty Rate	Second Difference	First Difference	(1989-2000)-(2000-2010)	(2000-2010)	75

Change-Rates	DPOVRATE OLS	DLOCPOVRATE FE	DPOVRATE OLS	DLOCPOVRATE FE
DMHHY	-.00044456	.00048549	-.00012607	.00080823
DEPOWTEMRATE	.00093296	.00074058	.00061121	.00060771
DLFPOPRATE	-.07328306	.07114017	-.05485317	.07601828
DBWPOPRATIO	.10077363	-.01233132	.07002909	-.02216464
DEDLHSHSRATE	-.04499045	-.03368035	-.08233432	-.02554304
DFEMHHRATE	-.0031543	-.00318065	-.01597009	-.01231224
DAHMYMHHY	-1.7436066	1.2676114	-1.3884795	1.1923927
_cons	28.926513**	-9.8116121	28.300153**	-10.316294
N	75	75	75	75
F	1.8470046	.77302462	1.2391487	.71001793
rho			.12551013	.08364263
r2_a	.0741787	-.02194175	-.07755418	-.13898502

legend: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001

estimates table OLS6 DLPOLS6 FE6 DLPFE6, star stats(N F rho r2\_a)  
(AN\_LPALL\_CHANGE00-10\_POV-Panel-3)

## **Conclusions:**

**Does shift-share's competitive effect component when used as a dependent variable improve the explanatory power of regression equations commonly used in regression studies focused on the causes of poverty.**

**Not in this case!**

**Why?**

**Local poverty measure is a residual measure.**

**Time frame in this study is too short and not enough observations- Use a Dynamic Shift-Share Technique and more states**

**Alternatives**

**Alternative local poverty measures**

**Alternate Regression Analysis with explanatory variables controlling for external factors and then analyze the local factors.**