The Poverty Rate for Families in Kentucky Counties:

An Analysis Using Census 2000

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The problem of poverty in the United States has attracted renewed interest on the part of economists primarily because the economic growth of the eighties and the nineties did not result in a major reduction in poverty. This is in contrast to the sizeable reduction in overall poverty rate, 18% to 9%, that occurred in the previous long expansion during the 1960-73 period. A variety of explanations, both economic and demographic, has been offered for the persistence of poverty in the face of substantial economic growth. The economic ones focus on labor market developments where the major point is that economic growth of the nineties did not result in a tighter labor market for those at the lower end [Blank and Card, 1993]. Economic growth was accompanied by the relative decline of manufacturing and by technological change that increased the demand for high-skilled workers relative to low-skilled ones [Cutler and Katz, 1991 and Juhn, Murphy and Pierce, 1993]. In addition, increased immigration of low skilled workers and a decline in the ratio of college graduates compared to high school drop out may have caused deterioration on the supply side [Juhn 199? and Borjas et al. 1996] The demographic explanations focus heavily on the increase in the percentage of families which are headed by single females. The percentage has doubled in the past four decades [Blank and Hanratty, 1992].

Approaches to the study of poverty in the U.S. tend to fall into three groups. One is ethnographic studies of particular communities, which are non-quantitative and place great emphasis on the role of social and political structures in the incidence and persistence of poverty in a community [Fitchen, (1981), Duncan (1997)]. The second approach, which Weber and Jensen (2004) have called contextual, focuses on why an individual is poor and examines the effects of personal and community characteristics on the incidence of poverty for individuals . These studies rely on data on individuals from either the Census PUMS sample or the Current Population Survey and link them with community and labor market characteristics [Haynie and Gorman (1999), Cotter (2002)]. The third approach focuses on the question of why the proportion of economic units, usually families, that are poor, the poverty rate, varies across regions or across time within a particular region. These studies have ranged from the national level, across states [Triest (1197)], multi-counties regions [Cotter (2002)], counties [Albecht et al.

(2000), Jensen et al. (2004), Levenier et al. (2000) and smaller units. The current study deals with the variation in family poverty rates across counties in a particular state, namely, Kentucky, and uses data from the 2000 U.S. Census of Population.

Kentucky's overall poverty rate was 14.3% compared to the U.S value of 11.9% in 1999. While other states such as Texas, Louisiana, and Mississippi have higher rates, there is large variation in poverty rates across Kentucky. Across the 120 counties in the State, the family poverty rate varied in 1999 from a low of 2.2% in Oldham to a high of 41.7% in Oswley. The counties with high poverty rates tend to be concentrated geographically. In addition to eliminating poverty for its own sake, policy makers in Kentucky have an additional interest in the matter. Per capita income in Kentucky is about 85% of the U.S. figure. The State, its government and leaders, is interested in improving its relative position by more rapid economic growth. The presence and persistence of substantial poverty in regions of the State is a significant obstacle to long-term growth. Areas with high levels of poverty are also areas with a variety of other problems, such as low levels of health and longevity, poor schools, low high school completion rates and other social problems. None of these conditions is conducive to rapid economic growth.

The purpose of this paper and the larger project is to enhance understanding of the causes of inter-county variation in poverty rates in Kentucky in light of the evidence from the most recent Census and provide policy makers with more precise information on the effectiveness of alternative strategies for poverty alleviation. There is an additional agenda. I am interested in convincing investigators that it is possible to improve our approach to modeling in this area. The typical study in this area at present involves regression of the poverty rate on a large number of demographic, economic and location variables. The result is a set of coefficients that are difficult to interpret and provide at best vague advice to policy makers. There is an addition problem that county observations from a large number of states are used without explicit recognition of within state variation.

The remainder of the paper is organized as follows. The next section provides descriptive information about family poverty rates for counties. In addition, it models

poverty rates as a function of region, urbanization, and location. The following section presents a relatively parsimonious model of poverty rates using economic and demographic variables. We then present the results of combining the two models. The next section examines the extent to which the level and effect of important factors vary with region and urbanization.

Geographical Aspects of Poverty

With the exception of the regional and location variables, the data for the variables used in this study come from the 2000 Census of Population and Housing. The poverty rates are those for families. Poverty in the U.S. is defined in absolute terms. The current level is approximately $19,000 for a family of two adults and two children. We examine the poverty rate for all families, POVFALL, the percentage poverty rate for intact families, POVIFALL, and the percentage poverty rate for female-headed families, POVFHALL.

The regional classification of counties that is used in this paper was developed from a hybrid of the Area Development District classification, which has fifteen districts, and the Appalachian classification of counties by use of hypothesis testing. A map of the counties and the Area Development Districts is provided in Figure 1 (at end). We divided the counties in the State into five regions. The regions are most easily described by means of the map.

1. Western: Purchase, Pennyrile, Green River, Lincoln Trail, Taylor County in Lake Cumberland, and Barren River excluding Edmonson, Hart, and Monroe County

2. Appalachia II: Lake Cumberland excluding Taylor County, Fivco, Gateway, and Lewis and Fleming County in Buffalo Trace.

3. Appalachia I: Cumberland Valley, Kentucky River, and Big Sandy.

4. Periphery: Bracken, Mason, and Robertson County in the Gateway and Estill, Powell, Clark, Madison, Garrard, and Lincoln County in the Bluegrass.

5. Triangle: KIPDA, Northern Kentucky, and the Bluegrass excluding Estill, Powell, Clark, Madison, Garrard, and Lincoln County.

Appalachia consists of 51 counties in the Eastern part of the state. Appalachia 1 consists of 21 counties in the southeastern part while Appalachian 2 consist of 24 the remaining counties, while the remaining six are included in the Periphery. The Periphery also includes three counties that are adjacent the Appalachian 2 region. The Triangle region is defined by the three major urban areas in the State, namely, Louisville, Lexington and the Cincinnati suburbs in Northern Kentucky. The Western Region consists of 40 counties in the western part of the State.

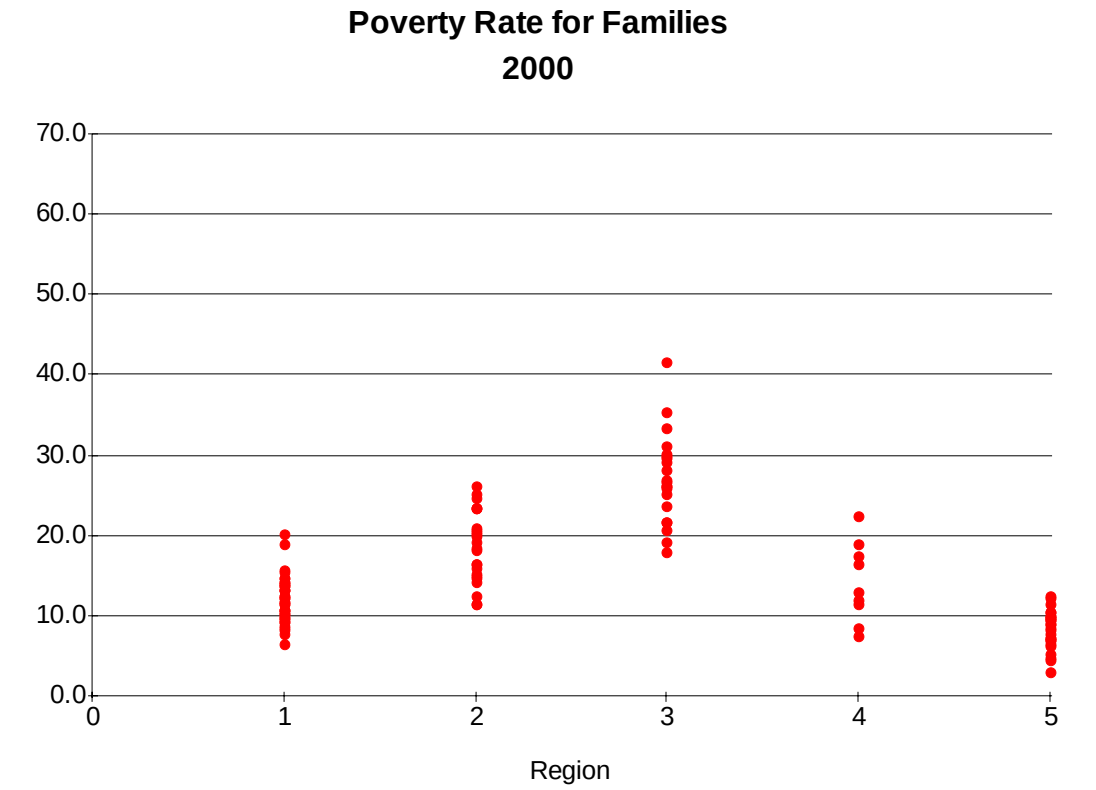
The observations for the poverty rate for each county by family type are plotted by region in Figure 2. The following table gives the average poverty rate by family type for the counties in each region and for all counties in Kentucky.

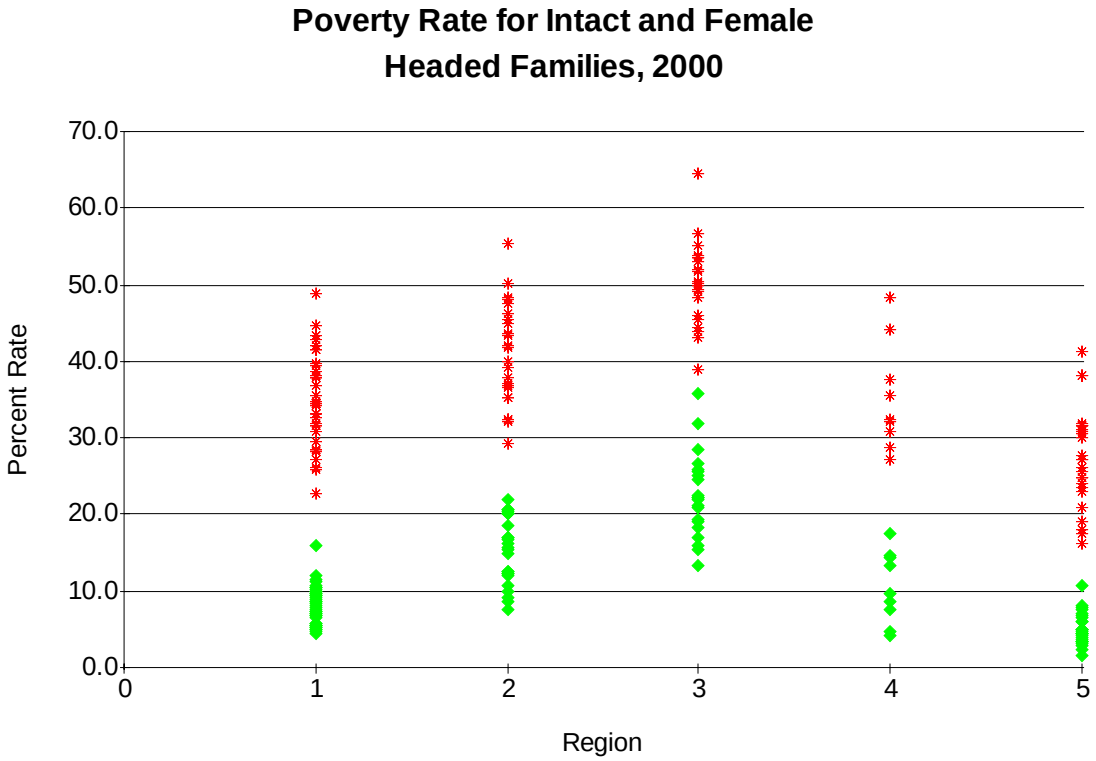
Table 1. Mean Poverty Rates of Counties by Region and Family Type

Family Type	Western	Appal 2	Appal 1	Periphery	Triangle	All
All	12.0	18.7	27.1	14.2	8.3	15.3
Intact	8.2	15.4	22.2	10.2	5.0	11.5
Female Head	35.2	41.1	49.9	34.6	27.4	37.2

The graphs in Figure 2 and the means in the above table convey some well-known facts regarding poverty. The poverty rate is much greater for female-headed families than other families. Poverty rates in Kentucky display a distinct regional pattern. Poverty follows a well-defined regional pattern in Kentucky. The regional pattern holds for both intact families and families headed by a female. The poverty rate is lowest in the Triangle region followed by the Western region and the Periphery. The highest poverty rate is in the Appalachia 1 region followed by the Appalachia 2 region. There are differences between the regions are highly significant except between the Periphery and the Western region.

Figure 2. Poverty Rates by County and Family Type





Before getting into the more detailed socioeconomic analysis, we provide an analysis of the variation in poverty rates using variables that reflect region, urbanization, and location.

We define dummy variables for each region. Urbanization is measured by a dummy variable, MSA, for a county that is part of a Metropolitan Statistical Area. The definition of a MSA is a county or set of economically and socially connected counties with a substantial population. The area will have a population of 100,000 and the primary city a population of 50,000. PMSA means that the county is the one with the primary city in the MSA while SURB means that the county is a suburban one. The location of a county is measured by the distance to the nearest primary MSA county, DISTMIN1.

The results of estimation are presented in Table 2. The results for the regional dummy variables are consistent with those in Figure 1 and Table 1. The omitted category is the Triangle region. The regions fall into three groups. The Western counties and those in what we call the Periphery have poverty rates about three points higher than the base county. The Appalachian II counties have an average poverty rate that is about seven points higher than the base and the Appalachian core have an average poverty rate that is about 14% points higher than the base counties. The regional differentials for the female-headed households are somewhat greater than for the intact families.

For intact families the poverty rates for MSA counties is about two percentage points lower than for non-metro counties. However, the differential is not significant for the female-headed households. Variation in region, urbanization, and location relative to urban centers can account for over thee quarters of the inter-county variation in the poverty rates of intact families and three fifths of the variation in the poverty rate of female-headed households. Location relative to MSA is significant in both types of families but the coefficient is twice as large for female-headed families.

Table 2. Region, Urbanization, and Location as Factors in Poverty

Dependent Variable: POVFALL - All Families

Variable	Coefficient	Std. Error	t-Statistic	Prob.
WESTERN	2.704	0.621	4.357	0.000
APPAL2	7.783	0.978	7.958	0.000
APPAL1	14.483	1.669	8.676	0.000
PERIPHERY	4.145	1.462	2.835	0.005
MSA	-1.950	0.716	-2.724	0.008
DISTMIN1	0.050	0.020	2.506	0.014
C	8.319	1.021	8.151	0.000
R-squared	0.779	Mean dependent var		15.338
Adjusted R-squared	0.767	S.D. dependent var		7.482
F-statistic	66.404	Prob(F-statistic)		0.000

Dependent Variable: POVIFALL- Intact Families

WESTERN	2.189	0.575	3.808	0.000
APPAL2	7.657	1.017	7.531	0.000
APPAL1	12.608	1.560	8.085	0.000
PERIPHERY	3.413	1.432	2.384	0.019
MSA	-1.933	0.695	-2.780	0.006
DISTMIN1	0.054	0.020	2.757	0.007
C	4.874	0.995	4.901	0.000
R-squared	0.772	Mean dependent var		11.541
Adjusted R-squared	0.760	S.D. dependent var		7.091
F-statistic	63.679	Prob(F-statistic)		0.000

Dependent Variable: POVFHALL - Female Headed Families

WESTERN	7.290	1.560	4.673	0.000
APPAL2	10.431	1.936	5.388	0.000
APPAL1	15.954	2.391	6.673	0.000
PERIPHERY	5.283	2.603	2.030	0.045
PMSA	-0.232	1.955	-0.119	0.906
SURB	-0.352	1.534	-0.230	0.819
DISTMIN1	0.106	0.030	3.568	0.001
C	24.741	1.947	12.706	0.000
R-squared	0.643	Mean dependent var		37.210
Adjusted R-squared	0.621	S.D. dependent var		9.607
F-statistic	28.816	Prob(F-statistic)		0.000

Economic and Demographic Factors

Two kinds of questions arise from the foregoing observations regarding the variation in poverty rates across, family structure, and urbanization. What socioeconomic features of counties explain the differences in poverty rates? Are there differences in level of poverty rate and are there differences in the effect of variables across categories? We now turn to examining the extent to which a relatively parsimonious socio-economic model might explain the variation in poverty rates across counties.

The incidence of poverty in a county reflects the presence of families who for one reason or another do not succeed in receiving an income above the poverty line. This may be due to the family's access to and its members' capacity to enter the labor market, its ability to earn income once its members are in the labor market. A simple and parsimonious model suggests that the extent to which people are employed, the level of earnings when fully employed, and the presence of children are important factors influencing the poverty rate for families in a county. Given the level of employment and the median earnings, there are compositional features of the labor market, which can affect the poverty rate for a county. One is the degree of attachment to the labor market as indicated by the proportion of the year that people are employed. A second factor is the occupational structure that people in the county experience. Counties with a high proportion of persons employed in low wage occupation are likely to have higher poverty rates.

As before, models are estimated for all families, intact families, and female-headed families. For convenience, the names of variables are listed in Table 3. For all families, we use the employment rate of persons aged 21-64, EMPLR2164. This is calculated by taking the number of persons aged 21-64 employed and dividing by the number of person aged 21-64 in the non-institutionalized population of the county. The level of earnings is measured by the median earnings of males who are employed full time, MERNM. The measure of the presence of children is the percentage of all families which have children under 18, FCU18. The extent of attachment to the labor market is measured by the

percentage of the employed population of males who reported that they normally worked 35 weeks or less per year, L35WKSM. For intact families, the first two variables are the same but the presence of children is measured by the percent of intact families, which have children under age 18, IFCU18. For female headed households, the employment rate is for females aged 21-64, EMR2164F, the earnings variable is median earnings for females employed full time, MERNF, and the presence of children is measured by the percentage of female headed households which have children under age 18, FHFCU18PC.

Table 3. Variable Names

POVFALL	Percentage poverty rate for all families
POVIFALL	Percentage poverty rate for intact families
POVFHALL	Percentage poverty rate for families which are headed by a single female
WESTERN	Dummy variable for a county in the Western region
APPAL2	Dummy variable for a county in the Appalachian II region
APPAL1	Dummy variable for a county in the Appalachian I region
PERIPHERY	Dummy variable for a county in the Periphery region
TRIANGLE	Dummy variable for a county in the Triangle region
MSA	Dummy variable for a county in a Metropolitan Statistical Area
PMSA	Dummy variable for the primary county in a Metropolitan Statistical Area
SURB	Dummy variable for a suburban county in an MSA
DISTMIN1	Minimum distance in miles to the nearest primary MSA county
EMPLR2164	Employment rate for the civilian non-institutionalized population aged 21-64
MERNM	Median earnings of males employed full time
L35WKSM	Percentage of employed males who normally work less than 35 weeks per year
FCU18	Percent of families with children under age 18
IFCU18	Percent of intact families with children under age 18
EMR2164F	Employment rate for the civilian non-institutionalized population of females aged 21-64
MERNF	Median earnings of males employed full time
L35WKSF	Percentage of employed females who normally work less than 35 weeks per year
FHFCU18PC	Percent of female-headed families with children under age 18

The results of estimating the model are in Table 4. The signs of coefficients are as expected. The explanatory power of the model is quite good even in the case of female-headed households. The results for all families and intact families are similar, as one would expect because approximately 85% of families are intact. The coefficients of the employment rate and median earnings of the fully employed are highly significant in all three equations. The results suggest that median earnings have a greater impact for the female-headed families than for intact families. The proportion of families with children under 18 is significant in all three types. As one would expect, the sensitivity of the poverty rate to the presence of children under age 18 is estimated to be greater for female headed-families. It might be noted that the variable for children may also be capturing the effect of family size. Finally, the variable measuring attachment to the labor market, L35WKSM, is marginally significant in the equation for all families and less so for intact families. When the comparable variable for females, L35WKSF, was used in the equation for female-headed it was highly insignificant. When the variable for males is used, it is significant. This may suggest that it is a better measure of conditions in the local labor markets.

Table 5 presents the results of combining the specification of the prior section with that of this section. In effect, the model allows for the effects of the socioeconomic variables and allows for the possibility that the level of the poverty rate differs across regions and between urban (MSA) counties and rural counties. In addition, the location of the county relative to a primary MSA county is considered. The estimated coefficients for the labor market and demographic variables are very similar to those in Table 4. The one regional variable that is significant is the Appalachian I variable in the equations for all families and intact families. The location variable is significant in the equation for the female-headed households.

Table 4. Results for Economic and Demographic Variables

Dependent Variable: POVFALL - All Families

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMPLR2164	-0.655	0.030	-22.015	0.000
MERNM	-0.316	0.051	-6.179	0.000
L35WKSM	0.257	0.136	1.887	0.062
FCU18	0.229	0.076	3.019	0.003
C	52.928	3.774	14.023	0.000
R-squared	0.924	Mean dependent var		15.338
Adjusted R-squared	0.921	S.D. dependent var		7.482
F-statistic	348.845	Prob(F-statistic)		0.000

Dependent Variable: POVIFALL - Intact Families

EMPLR2164	-0.594	0.038	-15.503	0.000
MERNM	-0.338	0.064	-5.275	0.000
L35WKSM	0.221	0.139	1.595	0.114
IFCU18	0.173	0.072	2.416	0.017
C	49.582	3.456	14.345	0.000
R-squared	0.891	Mean dependent var		11.541
Adjusted R-squared	0.887	S.D. dependent var		7.091
F-statistic	235.082	Prob(F-statistic)		0.000

Dependent Variable: POVFHALL - Female Headed Families

EMR2164F	-0.759	0.070	-10.905	0.000
MERNF	-1.039	0.207	-5.015	0.000
L35WKSM	0.355	0.160	2.218	0.029
FHFCU18PC	0.445	0.103	4.306	0.000
C	68.746	7.606	9.039	0.000
R-squared	0.773	Mean dependent var		37.210
Adjusted R-squared	0.765	S.D. dependent var		9.607
F-statistic	97.912	Prob(F-statistic)		0.000

Variation of Impact by Region and Urbanization

In this section, we report the results of allowing for the effect of the labor market and demographic variables to vary regionally and by urbanization. The results are shown in Table 6. For intact families the coefficients for Appalachian I region and for the MSA are highly significant. The poverty rate for a county in Appalachia I is estimated to be 24 points higher than for a county in the Triangle region while a MSA or metro county is estimated to have a poverty rate 19 percentage points les than a comparable non-metro or rural county. The impact of the employment rate, EMPLR2164, is significantly lower in metro counties than in non-metro counties. While the percentage of families with children under eighteen, IFCU18, is positive and significant for non-metro counties, its estimated effect in MSA counties is effectively zero. On the other side, the coefficient of the median earnings of a male employed full-time, MERNM, is significantly and substantially larger for counties in the Appalachian I region than in the other regions. The effect of location as measured by distance to the nearest primary MSA county, DISTMIN1, is positive and significant at the .09-level for a two-tailed test

The results for female-headed families are decidedly different from those for intact families in terms of geographical effects. There is no evidence of significant difference in the level of the poverty rate across regions or for MSA and non-MSA counties. In the MSA counties, the estimated effect of the employment rate of females, EMR2164F, is close to zero while the effect of the median wage of females in full-time employment, MERNF, is substantially higher than its effect in non-metro counties. (The low level of significance of MERNF in the equation reflects Interco relation with the location variable, DISTMIN1.) The location variable is significant and its estimated coefficient is three times larger than that for intact families.

Table 5.
Combining Geographic and Economic Factors

Dependent Variable: POVFALL			Dependent Variable: POVIFALL			Dependent Variable: POVFHALL		
All Families			Intact Families			Female Headed Families		
Variable	Coefficient	t-Statistic	Variable	Coefficient	t-Statistic	Variable	Coefficient	t-Statistic
EMPLR2164	-0.557	-13.372	EMPLR2164	-0.482	-8.446	EMR2164F	-0.576	-7.364
MERNM	-0.318	-4.868	MERNM	-0.301	-3.934	MERNF	-0.947	-3.062
L35WKSM	0.247	1.731	L35WKSM	0.204	1.341	L35WKSM	0.368	2.529
FCU18	0.223	2.802	IFCU18	0.176	2.191	FHFCU18P C	0.467	4.796
WESTERN	0.286	0.368	WESTERN	0.086	0.125	WESTERN	0.892	0.553
APPAL2	0.590	0.604	APPAL2	1.263	1.307	APPAL2	0.915	0.432
APPAL1	2.664	2.401	APPAL1	2.418	1.940	APPAL1	2.822	1.249
PERIPHERY	0.861	1.093	PERIPHERY	0.577	0.568	PERIPHERY	-0.306	-0.175
MSA	-0.498	-0.900	MSA	-0.605	-0.923	MSA	0.961	0.765
DISTMIN1	0.003	0.247	DISTMIN1	0.011	0.900	DISTMIN1	0.063	2.501
C	46.352	7.715	C	40.164	6.728	C	50.318	4.325
R-squared	0.930			0.898			0.799	
Adjusted R-sq	0.923			0.889			0.780	
F-statistic	143.938			96.049			43.210	
Prob(F-statistic)	0.000			0.000			0.000	

Table 6.

Dependent Variable: POVFALL

All Families

Variable	Coefficient	t-Statistic
EMPLR2164	-0.617	-14.523
MERNM	-0.300	-3.428
L35WKSM	0.159	1.281
FCU18	0.343	3.892
WESTERN	1.212	1.843
APPAL2	1.150	1.202
APPAL1	16.922	2.669
PERIPHERY	1.199	1.398
APPAL1*MERNM	-0.550	-2.439
MSA	-10.799	-1.579
MSA*EMPLR2164	0.427	5.810
MSA*MERNM	0.029	0.266
MSA*FCU18	-0.419	-3.314
DISTMIN1	0.008	0.742
C	44.268	5.849
R-squared	0.951	
Adjusted R-sq.	0.945	
F-statistic	145.818	

Dependent Variable: POVIFALL

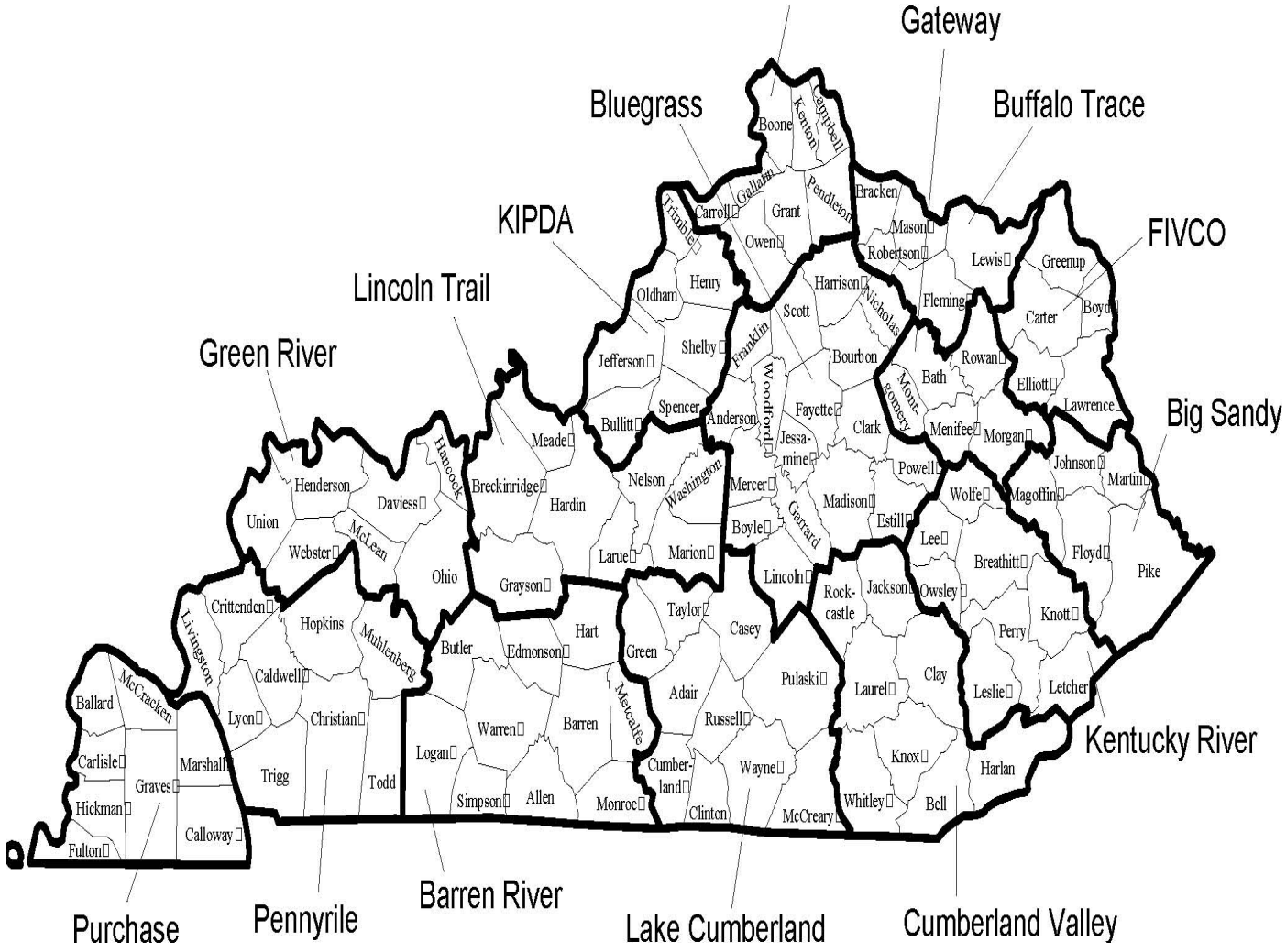
Intact Families

Variable	Coefficient	t-Statistic
EMPLR2164	-0.555	-10.544
MERNM	-0.283	-2.859
L35WKSM	0.086	0.651
IFCU18	0.241	2.515
WESTERN	1.087	1.878
APPAL2	1.719	1.774
APPAL1	24.012	3.117
PERIPHERY	1.074	1.069
APPAL1*MERNM	-0.822	-2.973
MSA	-19.170	-2.604
MSA*EMPLR2164	0.379	5.177
MSA*MERNM	0.136	1.137
MSA*IFCU18	-0.272	-2.192
DISTMIN1	0.019	1.713
C	42.130	5.051
R-squared	0.929	
Adjusted R-sq.	0.919	
F-statistic	97.918	

Dependent Variable: POVFHALL

Female Headed Families

Variable	Coefficient	t-Statistic
EMR2164F	-0.686	-9.033
MERNF	-0.525	-1.575
L35WKSM	0.342	2.354
FHFCU18PC	0.567	5.430
WESTERN	1.167	0.731
APPAL2	2.279	1.054
APPAL1	2.465	1.142
PERIPHERY	-0.324	-0.180
MSA	2.056	0.136
MSA*EMR2164F	0.803	3.495
MSA*MERNF	-1.444	-2.716
MSA*FHFCU18PC	-0.293	-1.439
DISTMIN1	0.063	2.568
C	41.463	3.330
R-squared	0.819	
Adjusted R-sq.	0.797	
F-statistic	36.838	


Gateway
Bluegrass
Buffalo Trace
KIPDA
FIVCO
Lincoln Trail
Green River
Big Sandy
Kentucky River
Purchase
Pennyrile
Barren River
Lake Cumberland
Cumberland Valley
Boone
Kenton
Campbell
Gallatin
Pendleton
Bracken
Trimble
Carroll
Grant
Mason
Owen
Robertson
Lewis
Greenup
Oldham
Henry
Harrison
Nicholas
Fleming
Carter
Boyd
Scott
Jefferson
Shelby
Franklin
Bourbon
Rowan
Woodford
Bath
Elliott
Spencer
Anderson
Fayette
Clark
Menifee
Morgan
Lawrence
Bullitt
Jessamine
Powell
Johnson
Meade
Nelson
Mercer
Madison
Wolfe
Magoffin
Martin
Henderson
Daviess
Hancock
Breckinridge
Hardin
Washington
Union
Boyle
Estill
Lee
Webster
McLean
Larue
Marion
Garrard
Breathitt
Floyd
Pike
Ohio
Grayson
Lincoln
Rock-castle
Jackson
Owsley
Crittenden
Taylor
Casey
Hopkins
Hart
Knott
Livingston
Muhlenberg
Butler
Edmonson
Green
Perry
Caldwell
Adair
Pulaski
Clay
Laurel
Leslie
Letcher
McCracken
Ballard
Lyon
Christian
Warren
Barren
Metcalfe
Russell
Logan
Knox
Harlan
Carlisle
Marshall
Trigg
Todd
Cumber-land
Wayne
Graves
Simpson
Allen
Monroe
Clinton
McCreary
Whitley
Bell
Hickman
Calloway
Fulton