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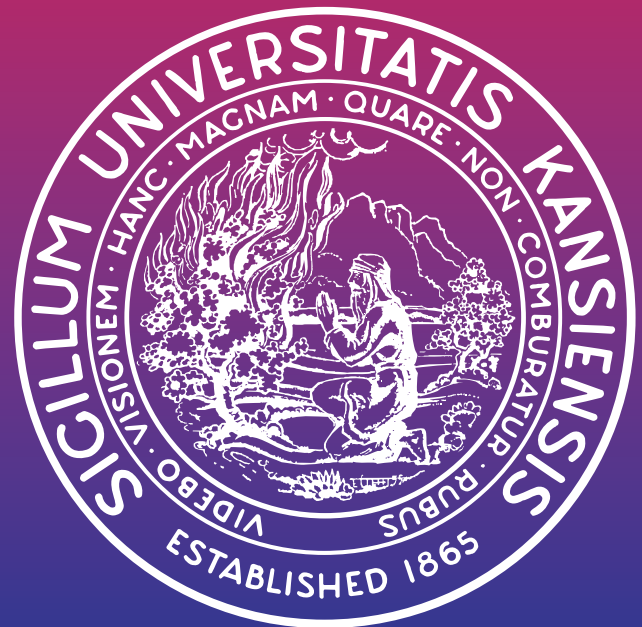
Supporting Regional Economic Development through Analysis and Education

EXAGGERATED
TALES OF
RURAL
ECONOMIC
DECLINE

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About The Center for Applied Economics

The KU School of Business established the Center for Applied Economics in February of 2004.

The mission of the Center for Applied Economics is to help advance the economic development of the state and region by offering economic analysis and economic education relevant for policy makers, community leaders, and other interested citizens.

The stakeholders in the Center want to increase the amount of credible economic analysis available to decision makers in both the state and region. When policy makers, community leaders, and citizens discuss issues that may have an impact on the economic development potential of the state or region, they can benefit from a wide array of perspectives. The Center focuses on the contributions that markets and economic institutions can make to economic development. Because credibility is, in part, a function of economic literacy, the Center also promotes economics education.

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EXAGGERATED TALES OF RURAL ECONOMIC DECLINE

I. INTRODUCTION

Stories of rural economic decline in the United States have been exaggerated because of consistent measurement error on the part of researchers. The exaggerated stories, in turn, have motivated policy-makers to justify numerous government programs designed to stop the reported decline in rural population, employment, and incomes. For example, recently proposed federal legislation (the New Homestead Act) proposes government provision of venture capital and tax incentives for individuals and businesses to locate in rural areas to counter decades of decline in jobs and population that have resulted in the “decimation of America’s Heartland.”¹

Population loss and slow income and employment growth are real issues for some rural counties. However, the federal reclassification of growing rural counties as urban or metropolitan and the reclassification of some shrinking urban counties as rural creates a consistent downward bias in measures of rural economic growth. Both researchers and policy-makers frequently ignore this bias when evaluating and formulating prescriptions for rural growth. This report documents the magnitude of the bias and the often large mistakes that can result.

Researchers interested in examining differences in socioeconomic outcomes between non-metropolitan and metropolitan areas commonly use classifications called Beale codes to define the rural-urban continuum. The U.S. Bureau of the Census is the federal government agency responsible for assigning Beale codes to U.S. counties. These codes change over time as county population increases or

decreases. The most successful rural counties in terms of population growth will grow out of the rural designation and become urban or metropolitan counties. At the same time, the least successful urban counties may lose enough population to change to rural status. If researchers define the rural status of counties by the most recently reported Beale codes, they will seriously understate average rural population growth, because they will select out the fastest growing rural counties and select in the slowest growing urban counties.

Consequently, how and when rural status is defined can alter the outcome of the data analysis. In order to avoid biased estimates and subsequent flawed interpretations, researchers and policy-makers should define rural-urban classification at the beginning of the period rather than at the end of the period. In that way, they will not eliminate the fastest growing rural counties from the analysis.

II. DEFINING RURAL STATUS

The staff at the Economic Research Service of the U.S. Bureau of the Census developed Beale codes (also called rural-urban continuum codes) in the mid-1970s in order to provide more meaningful classifications than was possible using simple classifications like urban/rural or metro/non-metro.² The codes classify counties into categories, based on population data from the U.S. Census taken each decade, according to geographic proximity to metropolitan areas. The Census Bureau updated the 1974-released codes in 1983 to reflect population changes between the 1970 and 1980

Beale Code Definitions

METROPOLITAN COUNTIES (1-3)*

- 1—Counties in metro areas of 1 million population or more
- 2—Counties in metropolitan areas of 250,000 - 1,000,000 population
- 3—Counties in metropolitan areas of less than 250,000 population

NON-METROPOLITAN COUNTIES (4-9)

- 4—Urban population of 20,000 or more, adjacent to a metropolitan area
- 5—Urban population of 20,000 or more, not adjacent to a metropolitan area
- 6—Urban population of 2,500-19,999, adjacent to a metropolitan area
- 7—Urban population of 2,500-19,999, not adjacent to a metropolitan area
- 8—Completely rural (no places with a population of 2,500 or more) adjacent to a metropolitan area
- 9—Completely rural (no places with a population of 2,500 or more) not adjacent to a metropolitan area

* The most recent Beale codes, released in 2003 to capture the 2000 Census, created a new category #1 by combining two categories reported in past years: “Central counties of metropolitan areas of 1 million population or more” (formerly Code #0) and “Fringe counties of metropolitan areas of 1 million population or more” (formerly Code #1). To make results comparable over time, this report aggregates pre-2003 classifications 0 and 1 into a single class, and lists the combined classification as Code #1 in the report’s tables, consistent with the Census Bureau’s new reporting method.

Source: <http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/>

Censuses, and has updated them in each succeeding decade (1993, 2003) to reflect the most current Census data. With the exception mentioned in the box above, the classification categories have remained constant over time. However, definitional changes have altered how the Census Bureau classifies counties. For example, in the 1974 classification, a county was considered adjacent to a metropolitan area (called an SMSA for Standard Metropolitan Statistical Area) if it had (1) a border contiguous to the SMSA and (2) at least one percent of the county’s population commuted to the SMSA for work. The Census Bureau altered the adjacency condition in later versions of the Beale codes, requiring that at least two percent of the employed labor force commute to the SMSA.

For the 2000 Census, the Census Bureau made a significant revision in how it defines rural and urban boundaries, thereby changing the definition of urban population that is applied in the Beale code classification scheme. Prior to 2000,

the criteria for defining urban areas were based on a population threshold for “places”: legally incorporated cities, towns and villages or settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located. In 2000, the criteria were based on population density of census blocks and block groups. Census blocks are typically small geographical areas bounded by city streets. However in more rural areas, census blocks may contain several square miles. A block group is a cluster of census blocks containing between 600 and 3,000 people

One effect of this change is that cities, which previously had no rural population by definition, may now be comprised of both rural and urban residents. For example, in Des Moines, Iowa, 100 percent of the population was designated as urban in 1990; in 2000, 1,155 residents (0.6 percent of the city’s population) were classified as rural.

III. THE IMPORTANCE OF BEALE CODE SELECTION FOR POLICY ANALYSIS

Beale code selection involves choosing which reporting year to use as an analytical base of reference for evaluating rural, non-metropolitan, and metropolitan economic performance. Researchers tend to use the most recently released Beale code classifications to designate counties.³ This tendency produces analytical results that systematically understate the economic performance of rural areas, as *Table 1* illustrates. Notice, with regard to the number of counties in 1970 and 2000, that the general tendency over time is for greater urbanization (a shift of county classification toward lower Beale codes), especially in counties that are

adjacent to metropolitan areas. A researcher that chooses to use a 2000 (instead of a 1970) Beale code definition of rural will systematically exclude counties that have performed so well economically that they grew out of their rural status—creating a systematic sample bias that understates past economic performance.

This systematic sample bias can be seen in the last three columns of *Table 1*, which report comparative growth rates of population, employment, and real (inflation-adjusted) income. The figures in each of these three columns resulted from comparing two different 1970-to-2000 percentage growth calculations, one based on the 1970 Beale codes and the other based on the 2000 Beale codes. By subtracting the 1970 Beale code growth calculation from the 2000 Beale code growth calculation, one obtains the figures shown in the last three columns of *Table 1*. Notice that most of the resulting figures have negative signs, indicating that growth calculations

**Table 1:
Selected Economic Statistics
Related to 1970 and 2000 Beale Codes**

	Beale Code	No. of Counties in 1970	No. of Counties in 2000	Bias in Measured Population Growth (%) (2000 less 1970)	Bias in Measured Employment Growth (%) (2000 less 1970)	Bias in Measured Real Income Growth (%) (2000 less 1970)
Most Metro ↑ ↓ Most Rural	1	184	410	-6.6	-46.8	-28.6
	2	268	325	1.0	-11.2	4.8
	3	192	351	-4.3	-14.0	-20.6
	4	173	218	9.0	-4.2	4.0
	5	154	105	9.7	23.7	15.4
	6	562	606	-12.5	-12.8	-24.3
	7	732	446	-0.8	6.5	-0.3
	8	241	234	-42.6	-41.8	-69.9
	9	616	427	-21.8	-29.4	-40.8
	Total	3,122	3,122	*	*	*

Note: Researchers typically refer to Beale codes by the year in which they were released (e.g., 1974, 2003). In this report, for the sake of clarity, we reference the codes by the Census year upon which they are based (1970, 2000).

using the 1970 Beale codes generate higher growth rates (i.e., better economic performance) than calculations using the 2000 Beale codes. The figures in bold type indicate those measurement biases that have the greatest statistical reliability.

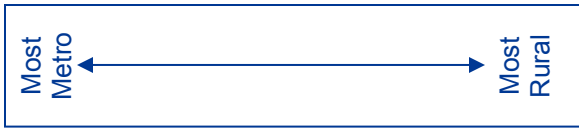
The figures revealing the greatest statistical bias from choice of Beale code constitute the least populated urban counties adjacent to metropolitan counties (code 6) and the “completely rural” counties (codes 8 and 9). The implication of this bias is

that official statistics consistently understate rural growth relative to metropolitan growth when rural classifications are allowed to change. Researchers or policymakers who fail to correct for such classification bias will create misleading information about the true growth of rural, non-metropolitan, and metropolitan areas.

Exhibits 1-4, which follow, illustrate in greater detail the information and measurement error reported in *Table 1*.

**Exhibit 1:
Number of U.S. Counties Classified by Beale Code, 1970 vs. 2000***

		1970 codes									2000 Total
2000 codes	1	2	3	4	5	6	7	8	9		
1	182	91	8	17		63	3	42	4	410	
2	1	156	64	13	3	58	2	23	5	325	
3		6	114	56	47	40	34	34	20	351	
4	1	10	1	85	34	53	30	2	2	218	
5				1	64		38		2	105	
6		5	4	1	2	317	206	43	28	606	
7					3	18	377		48	446	
8			1		1	12	9	96	115	234	
9						1	33	1	392	427	
1970 Total	184	268	192	173	154	562	732	241	616	3,122	
1970 code	1	2	3	4	5	6	7	8	9		
% same code	99%	58%	59%	49%	42%	56%	52%	40%	64%		
% lower code	0%	34%	38%	50%	55%	38%	43%	60%	36%		
% higher code	1%	8%	3%	1%	4%	6%	6%	0%	0%		



* Researchers typically refer to Beale codes by the year in which they were released (e.g., 1974, 2003). For the sake of clarity, we reference the codes by the Census year upon which they are based (1970, 2000).

How to Read the Table

- The shaded cells represent the number of counties that had the same Beale code classifications in both 1970 and 2000. For example, 317 counties had a Beale code classification of six in both years.
- The right-hand column and the bottom row (labeled “2000 Total” and “1970 Total,” respectively) represent the total number of counties with a designated Beale code classification. In 1970, 184 counties had a Beale code classification of #1; in 2000, 410 counties had a classification of #1.

Key Observations

- More than 40 percent of counties (1,339 counties) were classified differently in 2000 than in 1970.
- Of the counties that changed classification, 92 percent or 1,228 counties acquired a lower Beale code classification. In general, acquiring a lower Beale code classification indicates that a county has increased its total population—89 percent of the counties that acquired a lower classification experienced population increases between 1970 and 2000. (A county can acquire a lower Beale code without gaining population if a bordering county grows into a metropolitan area.)
- Only 111 counties acquired a higher Beale code classification. Of those counties, 41 percent lost population. (A county can acquire a higher Beale code despite gaining population if a bordering county changes from metropolitan to non-metropolitan status.)
- Of the 857 counties categorized as rural in 1970 (types 8 or 9), 368 or 43 percent acquired lower Beale code classifications. About one-third of the rural counties acquiring lower classifications grew so much that they were classified as metropolitan by 2000. In total, 464 counties or about one-fifth of the non-metropolitan counties (codes 4 through 9) became metropolitan counties (codes 1 through 3) by 2000. While most of these growth counties were adjacent to a Standard Metropolitan Statistical Area in 1970, about one quarter (118) were categorized as non-adjacent.

**Exhibit 2:
Average Population Growth (in Percentage Change) by Beale Code, 1970 vs. 2000***

2000 codes	1970 codes									2000 Total
	1	2	3	4	5	6	7	8	9	
1	108.2	111.6	46.6	74.4	95.5	54.1	113.9	56.0	104.1	
2	120.9	44.7	103.2	129.0	179.6	53.1	42.1	125.5	51.4	68.4
3	32.3	31.5	62.2	58.5	63.1	69.0	45.8	79.8	51.4	
4	545.4	59.8	20.7	18.2	14.5	86.6	64.1	639.2	507.3	55.1
5				-10.1	16.5	65.4	392.0	41.1		
6		29.3	15.6	4.6	4.7	22.2	26.8	70.7	84.8	30.0
7					-21.8	27.0	13.7	95.5	22.8	
8			49.4		47.7	11.3	2.0	33.3	25.4	27.2
9					24.3	-13.6	99.0	4.8	3.6	
1970 Total	110.7	67.4	55.7	46.0	31.3	42.5	23.6	69.9	25.4	43.4



* Researchers typically refer to Beale codes by the year in which they were released (e.g., 1974, 2003). For the sake of clarity, we reference the codes by the Census year upon which they are based (1970, 2000).

How to Read the Table

- Shaded cells indicate average growth (in terms of percentage change) for counties that did not change Beale code classification over the 1970-2000 time period.
- Cells to the southwest of the shaded diagonal represent averages for counties that acquired higher Beale code classifications. Cells to the northeast of the shaded diagonal represent averages for counties that acquired lower Beale code classifications.
- Bolded numbers indicate that the average for the cell is significantly different, in a statistical sense, than the average for counties of the same type in 1970 that did not change classification.

Key Observations

- The average population growth for all counties was 43.4 percent from 1970 to 2000. In general, counties that acquired lower Beale code classifications experienced faster population growth and counties that acquired higher Beale code classifications experienced slower population growth when compared to counties whose classification did not change.
- For six of the nine county types, choosing the 2000 classification instead of the 1970 classification understates population growth for the county type. For example using the 2000 codes, one would conclude that the

average population growth for rural, non-adjacent counties (type 9) was 4 percent when, in fact, average population growth in these counties was more than six times that rate, 25.4 percent, over the 1970-2000 period. Using the 2000 codes not only excludes those type 9 counties which grew enough to be re-classified between 1970 and 2000, but it also includes those counties that shifted to type 9 from lower codes, in many cases because they suffered population losses.

- The population growth rate for rural adjacent counties (type 8) was more than twice as large (70 percent) using 1970 codes than would be reported using the 2000 codes (27 percent).
- For three of the nine county types (2, 4, and 5), population growth is overstated rather than understated when the 2000 codes are applied. Population in the largest non-metropolitan, non-adjacent counties (type 5) grew on average 31 percent from 1970 to 2000. When the 2000 codes are used, however, the implied growth rate was 41 percent, because fast-growing, formerly rural counties are added to the type 5 group.
- Population more than doubled in 390 counties between 1970 and 2000. Over half of these (231) were designated non-metropolitan or rural in 1970, with about one-fourth (103) classified as rural. Of this set of fastest growing counties, two-thirds changed Beale code classification, acquiring lower codes. Proportionately more of the non-metropolitan (84 percent) and rural (80 percent) counties in this set acquired lower codes. More than half of the rural counties in this group (55 of 103) lost their rural status by 2000. Likewise, 69 of the 128 non-metropolitan counties had become metropolitan by 2000.

**Exhibit 3:
Average Employment Growth (in Percentage Change) by Beale Code, 1970 vs. 2000***

		1970 codes									2000 Total
2000 codes		1	2	3	4	5	6	7	8	9	
1	Most Metro	236.9	193.8	135.7	108.9	119.5	93.9	160.2	103.0	192.0	
2		332.8	104.6	175.9	186.6	206.2	80.8	160.0	68.9	122.3	
3		94.9	94.9	73.4	110.0	117.1	102.8	118.1	72.1	117.5	95.3
4		498.6	104.3	53.6	49.5	45.9	129.5	107.5	475.7	427.2	88.9
5					14.5	54.5	134.8	798.0	97.4		
6			67.7	50.3	22.5	32.0	52.5	58.2	106.6	125.4	61.8
7						-2.9	82.0	51.3	198.1	67.5	
8				83.8		32.6	24.6	64.8	60.6		
9	Most Rural					84.2	11.6	65.8	38.1	36.2	
1970 Total		238.8	133.6	109.4	84.7	73.6	74.6	61.0	102.4	65.6	89.2

* Researchers typically refer to Beale codes by the year in which they were released (e.g., 1974, 2003). For the sake of clarity, we reference the codes by the Census year upon which they are based (1970, 2000).

How to Read the Table

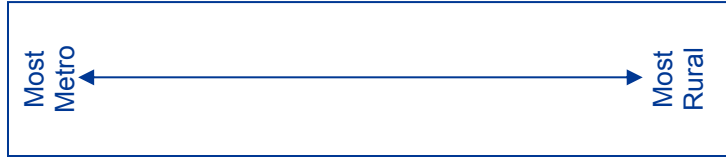
- Shaded cells indicate average employment growth (in terms of percentage change) for counties that did not change Beale code classification over the 1970-2000 time period.
- Cells to the southwest of the shaded diagonal represent averages for counties that acquired higher Beale code classifications. Cells to the northeast of the shaded diagonal represent averages for counties that acquired lower Beale code classifications.
- Bolded numbers indicate that the average for the cell is significantly different, in a statistical sense, than the average for counties of the same type in 1970 that did not change classification.

Key Observations

- We measure employment growth as the percent change in total full-time and part-time employment from 1970 to 2000 using data from the Bureau of Economic Analysis' (BEA) Regional Economic Information System.
- These data display a pattern similar to that in Exhibit 2. Counties that acquired a lower Beale code experienced faster average employment growth relative to counties that did not change type. Counties that acquired a higher Beale code grew relatively slower.
- Employment growth averaged 89.2 percent for all U.S. counties over the 1970 -2000 period. When the 2000 codes are used to classify the counties, it appears that metropolitan (types 1-3) and the largest non-metropolitan counties (types 4 and 5) all experienced employment growth at or above the national average. In contrast, employment growth in the smaller non-metropolitan and rural counties lagged behind the national average. When the 1970 codes are used, however, a somewhat different picture emerges. Non-adjacent non-metropolitan counties with an urban population of 20,000 or more (type 5) had below-average employment growth over the period. Rural counties adjacent to a metropolitan area (type 8) grew considerably faster than the national average. Employment growth in rural non-adjacent counties (type 9), while still below average, was substantially larger (65.6 percent versus 36.2 percent) when the 1970 codes are used.

**Exhibit 4:
Average Real Income Growth (in Percentage Change) by Beale Code, 1970 vs. 2000***

		1970 codes									2000	
		1	2	3	4	5	6	7	8	9	Total	Total
2000 codes	1	307.2	284.8	190.9	217.8	231.8	159.4	300.8	195.7	282.3		
	2	377.7	148.0	276.9	316.0	382.0	141.8	296.3	156.9	197.7		
	3	129.8	115.4	164.8	156.6	173.8	167.4	156.0	233.4	150.9		
	4	895.4	161.2	106.3	90.6	84.4	211.5	162.3	294.3	771.3	144.8	
	5		31.5	82.3	165.8	944.9	128.4					
	6		97.5	90.3	73.6	100.1	114.7	167.7	199.3	114.4		
	7			28.4	122.8	81.8	251.3	100.7				
	8			101.5	77.3	77.8	115.7	114.9	112.0			
	9			118.0	38.9	155.0	74.1	71.6				
1970 Total		310.8	192.9	171.6	140.8	113.0	138.7	101.0	181.8	112.4	143.7	



* Researchers typically refer to Beale codes by the year in which they were released (e.g., 1974, 2003). For the sake of clarity, we reference the codes by the Census year upon which they are based (1970, 2000).

How to Read the Table

- Shaded cells indicate average inflation-adjusted income growth (in terms of percentage change) for counties that did not change Beale code classification over the 1970-2000 time period.
- Cells to the southwest of the shaded diagonal represent averages for counties that acquired higher Beale code classifications. Cells to the northeast of the shaded diagonal represent averages for counties that acquired lower Beale code classifications.
- Bolded numbers indicate that the average for the cell is significantly different, in a statistical sense, than the average for counties of the same type in 1970 that did not change classification.

Key Observations

- County aggregate personal income data are obtained from the BEA. These data were adjusted for inflation using the Consumer Price Index – Urban Wage Earners and Clerical Workers from the Bureau of Labor Statistics. The percent change in real total personal income was calculated from 1970 to 2000.
- Real county personal income grew 144 percent on average over the time period. Counties that acquired lower Beale codes between 1970 and 2000 experienced significantly larger increases in real personal income than did counties whose designation did not change. Use of the 2000 codes rather than the 1970 codes overstates income growth for four of the nine categories (types 1, 2, 4 and 5) and understates growth for the remaining five (types 3, 6, 7, 8, and 9).
- Income growth for counties designated as rural (types 8 and 9) in 1970, but classified as non-metropolitan or metropolitan in 2000, experienced average income growth well above the national average. The omission of these counties from the “rural” category results in a significant understatement of rural county income growth over the time period. Based on the 2000 codes, income growth in type 8 and 9 counties was 112 percent and 72 percent, respectively. When the 1970 codes are applied, income growth in these rural counties is shown instead to be 182 percent and 112 percent.

IV. ENDNOTES

1. Quoting the web site of Senator Byron L. Dorgan (D-ND). The news release supporting the New Homestead Act (S. 602) contends that “nearly 70 percent of rural counties on the Great Plains have seen their populations shrink by an average of about a third.” That statistic should more accurately be stated as: “70 percent of counties remaining rural ...have experienced population decline.” See <http://dorgan.senate.gov/legislation/homestead/homesteadbrochure.pdf>.
2. They have been dubbed Beale codes in honor of Calvin Beale, a senior demographer at ERS. Some have attributed the development of the codes to Beale. However, the 1993 update of the classification authored by Beale and Margaret Butler cited F. K. Hines, D. L. Brown, and J. M. Zimmer’s 1975 ERS publication, *Social and Economic Characteristics of the Population in Metro and Nonmetro Counties: 1970* for originating the codes
3. For a literature review, see Georgeanne M. Artz and Peter F. Orazem, “Re-examining Rural Decline: How Changing Rural Classifications and Short Time Frames Affect Perceived Growth,” ISU Economics Working Paper 5001, December 2004, pp. 5-7. The working paper also has an extended discussion about Beale code selection and its implication for the econometric analysis of county economic growth determinants, a topic beyond the scope of this report. It can be accessed at http://www.econ.iastate.edu/research/webpapers/paper_12224_05001.pdf

V. FURTHER READING

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