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# Effects of Manufacturing Growth on Employment Instability in a Rural Area: Experience During the Early 1980s in South-Central Kentucky

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Eldon D. Smith, David Freshwater, and David R. Peters

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### Effects of Manufacturing Growth

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Employment Instability in a Rural Area:

Experience During the Early 1980s in South-Central Kentucky

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### INTRODUCTION

Local, state and national policies affect the extent and types of manufacturing industry investment and job creation taking place in rural areas. How much should be invested by government in these job-creation efforts depends in part on the magnitude of the benefits to the communities from industries attracted to rural areas. One important concern is the stability of general employment in these industries, and in other affected employers. The study evaluates employment stability during the early 1980s of manufacturing industry growth in a 19-county rural region in south central and south-eastern Kentucky.

The primary objectives of the study are: (1) to evaluate the effects of manufacturing employment on the general stability of employment in the region during the economic recession of the early 1980s, which followed 15 years of rapid employment growth; and (2) to determine how the characteristics of individual manufacturing establishments, including the type of manufacturer, affect stability of employment.

Stability of employment for a community's citizens depends primarily on the stability of the types of firms and the diversity of firms that predominate as basic employers. In small rural communities with limited opportunities for diversification, the impact on aggregate employment stability of employment fluctuations at firms of significant size is relatively large. Hence, it is important to try to recruit firms that will provide stable and dependable sources of employment over the long run.

The report is based primarily on a survey of individual manufacturing firms. Data were collected by personal interview survey of all firms willing to supply data and having an estimated work force of five or more employees. Survey data were supplemented by a special tabulation of official monthly employment estimates for individual establishments. While a primary purpose of the survey was to analyze the effects of industrial growth on vulnerability of county employment to general economic recession, other elements of employment instability are also important and were separately analyzed. These other elements include (1) short-term, month-to-month variations in employment, and (2) general trends in employment. THE SURVEY REGION AND ITS BACKGROUND

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The report is part of a broader general analysis of the effects of manufacturing employment growth on employment stability and labor utilization in rural areas.<sup>1</sup> The present report is based on a survey conducted in a chronically-impoverished 19-county rural area in Kentucky (Figure 1).<sup>2</sup> The survey area contained approximately 400,000 inhabitants in 1980, having grown by about 80,000, or 20 percent, in the 1970-1980 period after experiencing a decline of 21,000 between 1960 and 1970.

A study by Stoll (p. 107-109) showed that the region was one with severe problems of under-utilization of labor and general poverty. Based on U.S. Census data, his calculations indicate that about one-third of the available labor supply of the area was not fully utilized. Discouraged workers who no longer actively searched for employment apparently comprised a very large proportion of these unutilized labor resources. Further, a study of nine of the counties in 1980 by the Economic Research Service of USDA suggests that the problem of poverty in the region remained relatively untouched by the recovery of the coal industry and growth of manufacturing (Daberkow, Larson, Coltrane and Carlin; Larson and White). Another part of the larger study on which this report is based suggests that under-utilization of labor did not materially diminish during the 1970s, and available labor may have increased.

<sup>&</sup>lt;sup>1</sup>A second report analyses the effects of personal characteristics on availability of employment in the same period and region.

<sup>&</sup>lt;sup>2</sup>Specific counties were: Adair, Bell, Casey, Clay\*, Clinton\*, Cumberland, Jackson, Knox\*, Laurel\*, Leslie, Lincoln, McCreary\*, Owsley, Perry, Rockcastle, Russell\*, Wayne\*, and Whitley\*. Those with an asterisk (\*) were surveyed in 1980 by the Economic Research Service of U.S.D.A., which cooperated in this study.



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Agriculture and forestry were the predominant sources of employment in the area a century ago but now are minor sectors relative to mining and, more recently, manufacturing. Less than 1.0 percent of all employment covered by Unemployment Insurance was in agriculture, while about 12 percent was in mining and 22 percent was in manufacturing in the 1980-84 period. Total 1980 employment in agriculture, both unpaid family laborers and wage workers, comprised about 6 percent of all employment in the region, including work not covered by Unemployment Insurance (Kentucky Economic Statistics). Agriculture was the source of employment of over 15 percent of the employed labor force in only four counties.

In the majority of counties manufacturing now rivals or exceeds the traditional economic base of coal mining.<sup>3</sup> Accordingly, the analysis focuses on the employment stability effects of growth in manufacturing. Neither the service sector nor local government provide significant opportunities for future expansion of employment in the region, although local government, particularly the school system, does provide a significant source of jobs and income.

The growth of manufacturing was facilitated by a number of improvements to the labor force and infrastructure of the area. These improvements did not erase disparities between this and other regions. However, they provided an improved base for job-creation programs. Consolidation and some improvement of rural schools, easier access to vocational and technical training and post-secondary education proceeded throughout the 1960s and 1970s in Appalachian Kentucky.

<sup>&</sup>lt;sup>3</sup>The term "economic base" refers to the sources of income available to local residents from either sales of goods and services to non-local residents or private and public sector transfer payments, including property and securities earnings. Basic employment, accordingly, is associated with external sales and earnings. It excludes employment associated with sales to or transfers from local residents and local units of government A very crude estimate based on 1970 Census data indicates that 70 jobs are created in the local economy per \$1,000,000 of transfers at 1970 price levels (Smith, Infanger and Stoll).

Major improvements in roads, including construction of the Interstate highway system, and other components of physical infrastructure had been initiated in the 1960s and continued through the 1970s. All counties within the survey area are now accessible by Interstate highway, federal or major state highway, or state toll road. Aggressive recruitment and economic incentives also contributed to employment growth in this and other regions of the state (Smith and Klindt).

The rapid growth in manufacturing and in the region's total economy is evident from data on Unemployment Insurance covered employment. Average employment in manufacturing increased from 9,700 in 1970 to 18,600 during the 1980-1984 period.<sup>4</sup> Total employment more than doubled, partly as a result of the resurgence of the coal industry in the 1970s.

### Trends and Variability in The Traditional Coal Industry Economic Base

Coal-mining has irregular patterns of employment (Figure 2). There is no apparent seasonal pattern, but large, unpredictable changes are common, making it an unstable and undependable source of employment. In addition to general volatility, coal-mining employment in Kentucky declined from 1950 when it reached 69,703 to 27,762 in 1970. (United States Census) After the OPEC oil crisis in 1973, mining employment within the survey region almost doubled, peaking in mid-1978. Subsequently it has declined, but in 1987 still remained at a level almost 50 percent above that of 1970. However, state and region-wide statistics mask greater relative variability of mining employment in small geographic areas, such as counties. The effects of unstable employment in the coal industry on

<sup>&</sup>lt;sup>4</sup>The comparison understates the growth in the basic, or export-oriented manufacturing sector, the sector which drives the local residentiary sector which services only local population. A significant but quantitatively unmeasured portion of manufacturing employment provides goods for local consumers only, or supplies goods for industries such as mines whose products are bonafide exports from the local economy. Automotive parts rebuilding, machine shops and foundries, local bakeries, sawmills supplying rough lumber to finished wood products manufacturers, etc., are examples. All are included in manufacturing employment estimates.

### FIGURE 2 QUARTERLY CHANGES IN INDEXES OF KENTUCKY MINING & TOTAL EMPLOYMENT 1970-87\*\*



**\*\*(1st guarter 1970 - 3rd guarter 1987)** 

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individual county economies and units of local government are much more severe than statistics on coal employment in the entire region would suggest. It is in this context that the study of the effects of the manufacturing industry on the region's general employment patterns during the 1980s recession period is analyzed.

### THE INTEREST IN EMPLOYMENT STABILITY

### The Problem in Brief

For an area with a highly unstable and relatively unpredictable economic base, and a severe and chronic underutilization of labor, several questions merit attention. They include the following:

- (1) Does manufacturing employment serve as an effective diversifying element to buffer the volatility of the mining sector?
- (2) Has manufacturing provided a more stable alternative employment base than coal mining?
- (3) Has the manufacturing employment growth of the area significantly reduced the under-utilization of labor of the region?
- (4) Among classes of manufacturing industry are there consistent differences that would provide a basis for recruiting industries that would provide more stable and secure employment opportunities, especially for those without regular sources of employment?

Answers to the questions depend upon the stability of the particular classes of manufacturing that develop in the region relative to the stability of its traditional economic base. A highly unstable traditional economic base will be somewhat stabilized by the addition of almost any type of manufacturing employer.

Employment among manufacturing establishments is not uniformly stable or unstable. Therefore, selective recruitment of more stable or diversified types of industry may offer opportunities for reducing general community employment instability. Hence, characteristics of employers are examined in the material which follows. The purpose is to determine whether there are systematic differences among types of industry that affect susceptibility to economic recessions, or are associated with general variability and secular changes in employment. How these firms will affect general employment stability, and the utilization of labor supplies in the community, is a legitimate concern of rural community citizens.

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### METHODS OF ANALYSIS

### Sources of Data

The main source of data for this report was an enumerative survey of all manufacturing plants with five or more employees as listed in the 1986 Kentucky Directory of Manufacturers (Kentucky Department of Commerce). It was supplemented by a special tabulation of monthly employment data provided by the Statistical Services Section, Department of Employment Services of the Kentucky Human Resources Cabinet. The survey involved all operating establishments with five or more employees listed in the Kentucky Directory of Manufacturers. It included all firms that were willing to supply data, and included quarterly estimates of employment for 1979-84, inclusive. While names of firms were not available with the Human Resources Cabinet data, a correspondence with the four-digit S.I.C. product class listed in the Kentucky Directory of Manufacturers, plus close correspondence between the average of monthly estimates and quarterly survey estimates for the same periods provided a basis for "splicing" the two sets of data.

### Concepts and Measures of Employment Stability

Because official monthly employment data were available for a large proportion of the surveyed firms, it was possible to measure monthly employment variation throughout the 1980-1984 months. Analysis of total Unemployment Insurance "covered" employment for each county, total covered manufacturing employment and employment for each reporting establishment was possible. The survey data provided less-detailed quarterly data for the year 1979, in addition

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to the 1980-1984 period.

With these data it was possible to separately analyze three measures of stability for the following four groups: (1) the 19-county survey region as a whole, (2) groups of counties within the region having similar economies as measured by employment, (3) establishments in specific S.I.C. product classes, and (4) among establishments with various organizational, ownership, work force and other characteristics that might affect employment stability.

Three measures of stability are employed in the analyses, each reflecting different aspects of the stability problem.

1. <u>Straight-line trends in employment</u> over the January 1980-December 1984 period estimated by least squares regression. Trends are interpreted as reflections of long-run structural change.

2. <u>An index of month-to-month variability of employment</u> measured as the coefficient of variation above and below the estimated trend. This measures both seasonal and irregular variations of employment.

3. <u>An index of recession sensitivity/insensitivity</u> measured by the proportionate gain or loss of estimated average employment in July 1980 through December 1984 relative to a base pre-recession period, January 1979-June 1980. This measure examines the effects of recession associated variability in employment.

### GENERAL EFFECTS OF MANUFACTURING GROWTH

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A major objective of the study is the assessment of the effects of manufacturing industry on employment during a recession. Aggregate estimates of covered monthly employment for the period 1980-1984 were used in analyzing recession performance of manufacturing and total employment in the region and in economic sub-regions. However, for analysis of performance of individual manufacturing establishments and product output classes (two digit S.I.C.), official monthly estimates were spliced with quarterly survey data for 1979. The recession performance indicator is an index number with the immediate prerecession period, January 1979-June 1980, as the base period. The index number expresses average monthly employment during the period July 1980-December 1984 relative to average employment in the base period.<sup>5</sup>

The period 1980-1984 includes all of the 1980s recession, plus six months before the official onset of the recession. In addition to the effects of the recession, monthly employment estimates reflect short-term variations and structural changes, such as the effect of foreign competition, firm relocation and other factors.

### The General Employment Pattern of the Region

The data provide a basis of comparison of counties with quite different

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<sup>&</sup>lt;sup>5</sup>Not all surveyed establishments supplied complete data for the 1979 months. Hence, the number of establishments included in analysis of recessionary stability was not identical to the numbers in the trend and month-to-month variation analyses.

economic bases. Prior to the recession, total employment in the survey area grew rapidly but unevenly. The counties most dependent on coal mining (3 counties) were in the eastern tier, while the northern counties had the most agriculture and forestry proportionally and a substantial dependence on commuting (31 percent of employed residents). Eight counties were primarily dependent on manufacturing and, except for Laurel, were in the southwestern part of the region. Four, with a combination of coal mining and manufacturing (Bell, Knox, McCreary and Whitley), were located mainly between the coal and manufacturing counties.

There was a noticeable seasonal pattern in total employment, partly reflecting the closing and opening of schools. But it is clear that manufacturing employment did not account for most of the seasonal changes and did not appear to be more affected by the recession than the region as a whole. The chronic problem of large variations in employment in coal mining is evident.

Figure 3 shows the pattern of changes in manufacturing employment, mining employment and total employment for the entire region over the five-year period, January 1980 through December 1984. It shows a pattern of quite variable total employment but one that trended upward slightly, despite a small and abbreviated sag in the 1982-83 period. Manufacturing employment dipped briefly in 1980, recovered, and then dropped again throughout most of 1982 and briefly again in late 1983 and early 1984. But there was an upward trend both in manufacturing and total employment for the region as a whole.

### Comparisons of Counties with Different Economic Bases

Table 1 compares four classes of counties, grouped according to the

### FIGURE 3 MONTHLY CHANGES IN MANUF/MINING/TOTAL EMPL. IN 19 SOUTH CENTRAL KY COUNTIES\*\*



County Type	No. of Counties	Average Total Employment 1980-84	Index of Recession Sensitivity	Index of Short-term Variation*	Total Empl. Trend** (% / yr.)
Coal	3	15,640	+4.27%	4.752	+0.10
Mixed	4	24,684	-2.06%	4.236	-0.59
Manufac.	8	39,837	+5.71%	2.673	+2.26
Other	4	5,152	+2.18%	4.812	+0.97

Table 1. Employment Statistics for South Central Kentucky by County Economy Types, 1980-1984.

\*Coefficient of variation about a linear trend. \*\*Linear form.

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Data Source: 1979 From Survey; 1980-1984 Special Tabulation, Kentucky Dept. of Employment Security, Human Resources Cabinet.

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proportions of total mining and manufacturing employment.<sup>6</sup> Several things stand out clearly from these comparisons.

(1) The coal counties had much more short-term, monthly variation in employment than the counties with a higher proportion of manufacturing employment. The mixed coal and manufacturing counties were only slightly more stable in this regard than the coal counties. The explanation of this small difference is not evident from available data. The remaining four counties with neither major coal mining nor manufacturing enterprises had about the same degree of employment instability as the coal mining counties. As a group these counties have small populations, limited local employment opportunities within the county, and a high dependence on transfer payments and commuting to other counties.

(2) Coal counties also had a less favorable employment trend than the counties with a dominant manufacturing industry base. The manufacturing counties actually had a significant upward trend in employment of more than 11 percent over the recession, despite temporary slumps noted earlier. By comparison, the coal counties experienced an upward trend of only about a half of one percent over five years. The mixed coal and manufacturing counties lost about 3.0 per cent. The remaining four counties experienced modest growth of 4.8 per cent.

(3) While all counties were affected, employment rose over the recession

<sup>&</sup>lt;sup>6</sup>The classification is as follows:

<sup>&</sup>lt;u>Coal</u>--25 percent or more covered employment in 1980-1984 in coal mining and less than 5 percent in manufacturing.

<sup>&</sup>lt;u>Manufacturing</u>-25 percent or more in manufacturing and less than 5 percent employment in coal mining.

<sup>&</sup>lt;u>Mixed Mining and manufacturing</u>-25 percent or more in combined manufacturing and coal and no less than 10 percent in either.

<sup>&</sup>lt;u>Other</u>—counties with less than 10 percent in either. These counties have mainly small-scale farming, forestry and government jobs as a local economic base, but a significantly high incidence of out-commuting to other counties. All statistics based on place of work.

period. In manufacturing counties employment gains exceeded losses by 3.08 percent of average pre-recession employment (January 1979-June 1980). Even coal counties had significant net gains during the recession years. While mining employment slumped badly beginning in mid-1982, the period of rapid gains from early 1980 to mid-1982 and a recovery in 1984 more than offset these losses. Obviously, with the very wide swings in employment from more than 125 percent of 1979 levels to as low as 82 percent of 1979 levels, the coal industry is sensitive to recession.

In the counties with both coal and significant manufacturing there is more apparent sensitivity to recession than in any other class. Possible explanations are: (i) that the types of manufacturing firms which have located in areas with significant coal mining enterprises are different and have been of classes more affected by recession, or (ii) that the mines in these counties have coal deposits which are more marginally profitable than in the counties with predominant coal sectors, or (iii) both. ELEMENTS OF A STRATEGY FOR EMPLOYMENT STABILIZATION

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Previous studies of employment stability have mainly concentrated on employment variability in fairly large geographic regions (Smith and Weber) or in major metropolitan areas with large numbers of employers (Kort, 1979 and 1981). They have been based on either portfolio variance analysis, which has received widespread application in the field of corporate investment and finance (Smith and Weber), or on the diversification index approach (Kort, 1979 and 1981). Portfolio variance analysis is based on presumably predictable timepatterns of co-variation in employment among particular classes of industries, including primary, manufacturing and tertiary (services-producing) industries. The objective is to predict the contribution of various changes in the proportions of total employment in various industries to the stability of total employment of the region.

The diversification index approach regresses measures of employment stability (usually coefficients of variation around trends) on an index of diversification (Kort). It implicitly assumes that employment variabilities within sectors are: (1) independent of each other, and of macro-movements of the general economy, and (2) that historical time-patterns are dependable indicators of future variabilities. Both measures provide useful information relevant to the broad aggregates to which they have been applied. However, a pertinent question is whether comparable analyses provide a reliable basis for policy for small, rural communities of as few as 2,500-15,000 employed persons.

Since coal-mining is an extremely volatile and unpredictable enterprise, adding almost any type of industry will contribute somewhat to total stability

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of the community. Any reduction in the proportion of basic employment in a relatively unstable industry through expansion of more stable ones will accomplish this. However, establishments that are relatively stable, recession-insensitive employers with good long-term growth prospects will contribute most to general economic stability and growth. Thus the idealized problem in a rural mining-dominated area becomes one of determining the types of enterprise that will contribute the most stable and dependable long-term employment. The limiting factor in the task is the predictability of the employment stability of manufacturing firms or other supplementary sources of employment (Smith and Infanger).

Employment size of the rural counties in this survey is quite small, averaging about 4,500 Employment Insurance covered employees over the 1980-1984 period. In recruiting new manufacturing industries, an important consideration is whether to devote a large proportion of the recruiting budget to attract either: a single large-scale employer, a small number of fairly large employers, or several small ones. If a small number of large-scale employers is recruited, it would be beneficial if the community attracted those having limited short-term variations in employment, little sensitivity to economic recessions, and good long-term prospects for maintaining or increasing employment.

## Employment Size Among Classes of Manufacturing Establishments:

### Possibilities of Diversification in Small Communities

In recruiting new manufacturing industries, a community may use a large amount of its economic development budget to attract a single large-scale employer, or try to recruit several smaller ones. The number of employees per plant may vary widely, even among plants producing similar products. This is illustrated in Table 2 by the large coefficients of variation in each S.I.C. product group; most exceed 1.0. It is also illustrated by the very large size of the largest establishment relative to the average for the S.I.C..

The implication of this information is that even within product classes communities may have some latitude in attracting manufacturing establishments. They may focus on recruiting a small set of large employers, or a larger set of smaller ones. If individual plants in the same S.I.C. do not follow closely similar employment patterns, then recruiting several smaller plants in the same S.I.C. product class may reduce instability.

Within this rural region the textile and apparel plants tend to have large numbers of employees, mainly females with limited requirements for training and formal education. By contrast, wood products companies, printing and publishing establishments, concrete products firms and machine shops (included in Machinery Except Electrical in Table 2) tend to be quite small and have somewhat greater skill requirements. In a small community the presence of several plants from S.I.C.s with few employees per plant may tend to smooth out fluctuations in total employment more than having a dominant larger plant, or remaining dependent on the volatile coal industry.

For the large population counties, such as Laurel, Whitley or Pulaski, the presence of large employers with considerable employment variation will not have serious adverse effects on total county employment stability. Individually, large plants comprise a small proportion of total manufacturing employment, and of basic employment, in all sectors. Several larger employers can be accommodated and have offsetting employment changes, which result in fairly stable total employment. For small counties, such as those with total employment of less than 3,000, employment fluctuations of a single large employer may impose

Major Product Class	NO. of Plants	Av. Employees Per Plant (All Plants)	Coefficient of Variation	General Size Range of Largest Plant
Food and Kindred Products	46	38	1.94	300-400
Textile Mill Products	6	179	1.25	500-600
Apparel and Other Fabric Products	32	194	1.08	900-1,000
Lumber and Wood Products	134	13	1.74	150-200
Furniture and Fixtures	10	46	0.87	200-300
Printing and Publishing	45	13	1.98	100-150
Chemicals and Allied Prod	. 13	42	1.37	150-200
Rubber and Misc. Plastics Products	8	28	0.89	50-100
Stone, Clay, Glass and Concrete Products	38	21	2.40	200-300
Fabricated Metal Products	13	28	2.25	200-300
Machinery- Not Electric**	43	43	2.77	700-800
Electrical and Electroni Machinery and Supplies	.c 11	38	1.77	200-300
Transportation Equipment	14	15	1.32	50-100

Table 2. Average Number of Employees per Plant and Largest Plant for Major Product Classes, 1980-1984.

\*Averages are for all months of 1980-1984, inclusive, for firms which were estimated to have a normal work force of five or more employees.

\*\*One plant accounts for almost 40 per cent of total employment.

Data Source: Kentucky Cabinet for Human Resources.

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major shocks on total county employment.

Diversification, presents a means of reducing vulnerability to the income instabilities of the traditional basic industry. The situation of Russell County where a single employer, Union Underwear, accounts for over one third of total employment in the county provides an example of the vulnerability of small counties to the instability of a single dominant employer. While this is an extreme case, it suggests the importance to a community of considering the size of individual employers and what this implies with respect to diversification of the employment base. A dominant large manufacturing plant, or a few dominant plants with highly correlated employment patterns, pose the same problem as dominance by a single industry such as coal-mining. Similarly, specialized farming areas, such as in the corn and soybean producing areas and the wheat belt, face this problem.

### Stable and Unstable Classes of Manufacturing Industry

Patterns of total employment within and across industry types are quite different. Employment in some establishments in the same S.I.C. code is much more variable than in others. Some follow fairly regular seasonal patterns, such as fruit and vegetable processing and automotive assembly, while others are highly irregular. If variations are systematic in both the existing economic base and sectors from which new industries are to be recruited, portfolio variance techniques become applicable, and dependable projections of community employment stability can be constructed. For example, the tourism industry usually requires hiring additional workers at the time when public school personnel are off-duty for the summer months, and when college and university students seek summer jobs. However, tourism and farming are an unfavorable combination if the objective is to fill in seasonal gaps in agricultural employment (Smith and Infanger).

In only a few cases, for large firms, can the stability characteristics of individual firms be predicted reliably from aggregate regional employment data. Therefore, conventional modes of stability analysis, specifically, diversification index and portfolio variance approaches, are potentially misleading. Assumptions derived from aggregate patterns of employment change do not consistently relate to the individual firm or to a small group of firms.

If products within two digit S.I.C. categories were relatively homogeneous, individual establishment employment variations would correspond to patterns within the manufacturing S.I.C. product classes.<sup>7</sup> In the case of relatively undifferentiated consumer goods, like textiles, it is possible to base individual plant behavior on industry trends. As product differentiation increases, variability in plant behavior increases.

### Averages and Variability of Individual Plant Stability

In general, individual plant stability measures are not well correlated with the measures for the total industry, nor are they uniform among S.I.C. product classes. Data on averages of trends, recession sensitivity and month-tomonth variability for all firms with complete data are shown in column 3 of Tables 3, 4 and 5. The probable range for individual plants (one standard deviation unit above and below the average) is shown in column 4.

<sup>&</sup>lt;sup>7</sup>However, this is not the case; but in public domain data there is no better general-purpose classification of product outputs than the SIC's. Nevertheless, it is important to recognize that these data have limited utility for stability analyses.

Product Class (Two-Digit S.I.C.) <sup>1</sup>	(1) No. of Plants	(2) Average Employees Per Plant (All Plants)	(3) Trend: Average Plant Employment Increase or Decrease	Prob of (% I Dec	(4) able Range Trends <sup>3</sup> ncrease or rease Per Year)
			Per Year <sup>2</sup>	Low	High
s.i.c.					
20 Food & Kindred Prod.	38	46	-1.8%	-3.31%	+6.89%*
23 Apparel	23	195	-0.5%	-2.33%	+1.41%
24 Lumber & Wood Prod.	96	13	-0.5%	-4.69%	+3.69%
25 Furniture & Fixtures	19	46	-1.9%	-7.50%	+3.54%
27 Printing & Publishing	33	13	-1.0%	-4.83%	+2.75%
28 Chemical & Allied Prod.	11	42	+0.3%	-1.50%	+2.11%
30 Rubber & Plastics Prod.	5	28	+28.9%	-47.71%	+107.69%
38 Stone Clay & Glass Prod.	31	21	-0.5%	-4.61%	+3.54%
34 Fabricated Metal Prod.	6	28	-1.7%	-6.69%	+3.37%
35 Machinery Except					
Electrical	30	43	-0.2%	-5.06%	+5.06%
36 Electrical Machinery	5	38	+0.1%	-2.28%	+2.56%
37 Transportation Equip.	9	15	-0.6%	-1.69%	+2.83%

Table 3. Statistical Trends in Employment of Various Classes of Manufacturing Plants 1980-1984.

\*Exceeds absolute maximum owing to non-normal distribution of data.

<sup>1</sup>Omitted are Standard Industrial Classes with insufficient number of firms to preserve confidentiality. <sup>2</sup>Plants established by January 1, 1980. Others omitted in trend computations.

<sup>2</sup>Plants established by January 1, 1980. Others omitted in trend computations. <sup>3</sup>Estimated range which includes 68% of all plants, i.e., 1.0 standard deviation units below and above the average.

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July 1980 - Dec.	1984.			
Product Class (Two Digit S.I.C.) <sup>1</sup>	No. of Plants <sup>1</sup> (All Plants)	Average Employees Per Plant	Average Plant Recession Sensitivity	Probable Range of Plant Index <sup>3</sup>

Table 4.	Recession	Sensitivity	Indexes	of	Various	Classes	of	Manufacturing	Firms
	July 1980	- Dec. 1984.	,					-	

•			Index <sup>2</sup>	Low	High
Food and Kindred Prod.	32	46	-2.1%	-17.6%	+14.6%
Apparel	23	195	-2.6%	-7.7%	+5.2%
Lumber & Wood Prod.	96	13	+0.8%	-35.0%	+33.4%
Furniture & Fixtures	9	46	+5.0%	-3.0%	+13.0%
Printing and Publishing	33	13	-1.5%	-13.5%	+12.4%
Chemicals and Allied					
Products	11	42	-4.4%	-29.6%	+20.3%
Rubber and Plastic Prod.	5	28	+328.4%	-397.4%*	+1083.8%
Stone Clay and Glass					
Products	31	21	+6.8%	-19.6%	+33.2%
Fabricated Metal Products	6	28	+6.3%	-11.3%	+23.0%
Machinery Except Electrical	30	43	-20.0%	-85.7%	+149.5%
Electrical Machinery	5	38	-25.3%	-63.8%	+114.4%
Transportation Equipment	9	15	+2.2%	-22.2%	+28.6%

<sup>1</sup>Omitted are Standard Industrial Classes with insufficient data to preserve confidentiality.

<sup>2</sup>Proportion Gain (+) or Loss (-) in Average Employment July 1980-December 1984 compared to January 1979-June 1980.

<sup>3</sup>Estimated range which includes 1.0 standard deviation unit below and above the average.

Data Sources: Survey Data for 1979; Special Tabulation from Statistical Services Section, Kentucky Human Resources Cabinet for 1980-84.

\* Truncated at 100%.

Table 5.	Month-To-Month Employment Instability Indexes <sup>1</sup> of Various Classes	
	of Manufacturing Firms, 1980-1984.	

Pro (T	oduct Class wo-Digit S.I.C.) <sup>2</sup>	No. of Plants	Average Employees Per Plant	Average Instability Index <sup>1</sup>	Probab of Plant	le Range Indexes <sup>3</sup>
_			(All Plant	s)	Low	<u>High</u>
20	Food and Kindred Prod.	38	46	29.8	_*	84.6
22	Textiles and Related Prod.	6	179	17.6	1.4	33.8
23	Apparel	32	195	31.1		70.0
24	Lumber & Wood Prod.	131	13	48.0	12.7	83.3
25	Furniture & Fixtures	10	46	31.4	4.1	58.7
27	Printing & Publishing	41	13	39.4	0.5	78.8
28	Chemicals & Allies Prod.	13	42	23.8	11.5	36.1
30	Rubber & Plastics Prod.	7	28	66.6	-*	151.1
32	Stone, Clay & Glass Prod.	38	21	36.5	1.0	72.0
34	Fabricated Metals Prod.	12	28	40.4	0.6	80.2
35	Machinery Except Electrical	43	43	35.9	5.9	65.9
36	Electrical Machinery	11	38	32.0	17.5	47.5
37	Transportation Equipment	13	15	41.3	12.4	70.2

<sup>1</sup>Technically, the coefficient of variation around the linear trend for each firm (averaged).

<sup>2</sup>Omitted are Standard Industrial Classes with insufficient data to preserve confidentiality.

 $^{3}\mbox{Estimated}$  range which includes 68% of all plants, i.e., 1.0 standard deviation units below and above average.

Data Sources: Survey data for 1979; Special Tabulation from Statistical Services Section, Kentucky Human Resources Cabinet for 1980-1984.

\* Truncated at zero.

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### <u>Trends</u>

Employment trends, taken to indicate structural change among firms, in most S.I.C.s were slightly downward during the period, in part reflecting the fact that new plants, established after 1980, were not included in the data. Even so, average plant trends were only slightly downward except in Furniture and Fixtures, Food and Kindred Products and Fabricated Metal Products. Firms in the small Rubber and Plastics category had spectacular upward average trends.

Consistency of individual trends within the product classes are indicated by small deviations about the industry mean, or a low probable range. As noted earlier, Apparel Manufacturers followed industry trends fairly closely and were fairly consistent within the S.I.C.. This was also true of Chemicals and Allied Products and Transportation Equipment. These are the only product categories for which average industry trends provide a reasonably good indication of individual plant trends. Firms producing Rubber and Plastics, a high growth industry, had very inconsistent trends.

These indications of the effects of structural changes on the establishments in particular product classes during the January 1980-December 1984 period reflect economic conditions during that period. However, they may or may not indicate future trends. Relatively high interest rates and an overvalued dollar in the period exacerbated the effect of the recession, particularly for import-sensitive sectors like textiles.

### Month-to-Month Instability

Data in Table 5 show that month-to-month variations around the trend were high in all but three S.I.C.s, averaging more than 30 percent above or below the trend value. This suggests considerable seasonal effects on employment and/or irregular patterns of product demand. Apparel employment, and that of Chemicals and Allied Products, experienced lower average levels of instability than any other class of product. Not only was the average plant variability lowest for these two S.I.C.s, there was a smaller range among plants.

Rubber and Plastics Products and the numerous, mostly small Lumber and Wood Products plants had by far the greatest month-to-month instability of the product classes reported here. The range of month-to-month variation among plants was also very high for both classes of establishments.

### Recession Sensitivity

Like the employment trends, the aggregate measures of S.I.C. employment response caused by the recession, and the average index of individual plant indexes of recession sensitivity provide very unreliable indicators of individual plant responses. On average, only Machinery, Except Electrical, and Electrical Machinery firms suffered severe reverses during the recession years. The small Rubber and Plastics Products category had a highly positive but extremely varied experience during the recession. Half of the product classes registered no adverse average effects of the recession, and four others only small adverse effects relative to the base period January 1979-June 1980.

While the general responses to recession were small in most S.I.C.s, individual firms in most product classes had quite diverse responses. Evidently differences in markets, part of them attributable to the differing characteristics of the products in these broad two-digit categories, account for some of this diversity. In addition, differences in organizational characteristics and differences in the effectiveness of management strategies for coping with recession, contribute to the differences.

Finally, responses to the 1980s recession may or may not be repeated in the future. In some respects the recession was unique, involving a combination of

increased unemployment and an inflation requiring drastic controls over money supplies and associated interest rates. The competitive position of United States' products in international markets worsened, and that of foreign producers competing in United States' markets eroded. But the experience of the 1980s does provide some evidence of the moderate impact of recession of this particular kind on rural communities that are able to industrialize.

### Other Characteristics of Manufacturing Plants

### Which May Affect Employment Stability

Some of the heterogeneity of employment patterns among firms in the same product class is a result of the small geographic area and small number of firms surveyed, necessitating the use of broad, two-digit S.I.C. product classes. If we had, for example, 50 utility male undergarment manufacturers, responses of these firms to overseas competition, recessions, and technological changes might be more uniform than for the broad class of Apparel and Related Products. However, in addition to these product-associated characteristics, there is a broad range of other product demand, organizational, ownership, management strategy, and other factors that are potentially important in determining employment responses to recessions, short-term fluctuations and long-term structural changes. Listed below are several of the factors that were statistically evaluated.

1. Whether the plant was owned locally, within the state or outside the state.

2. Whether the plant was relatively new, hence modernized, or old and possibly obsolete technologically.

3. How much the plant invests in training its personnel for their particular job.

4. Whether the plant operates under labor union contract, which may limit adjustments designed to cope with changing competitive conditions.

5. Whether the plant is a part of a firm which has an integrated system of production, procurement and distribution. Such firms usually have other units at other locations engaged in either production of a closely related product (horizontal integration), or another stage in the production of a single product or set of products (vertical integration), or both.

6. Whether the plant has regular seasonal layoffs reflecting changes in demand or re-tooling for model changes.

7. Whether the plant is organized as a public corporation, a closely held or family corporation, a partnership or individual proprietorship.

8. Whether the management follows policies of inventory buildup, or reducing hours or days of work per week to avoid layoffs and possible losses of trained and experienced personnel.

9. Whether the manufacturing operation involves a high proportion of workers in production lines and other integrated work groups which would be laid off in groups.

10. Whether the plant has a high or low wage scale.

To control for any characteristics common to all firms in the respective S.I.C.s, aggregate employment trends in the respective S.I.C.s in the survey region were entered in the regressions used to evaluate these factors. The data were evaluated by least-squares regression using a system of dummy variables to identify discrete characteristics which could not be quantified.8

Regression results are presented in Tables 6, 7 and 8. As might be expected, there was wide variability in these factors among industries. Wood products firms, for example, were mostly small, usually locally and privately owned, and seldom under union contract. Electrical machinery firms were predominantly parts of integrated, corporate organizations. Therefore, the data did not permit precise separation of the effects of other factors from the effects of unique demand changes for the sometimes highly differentiated products produced by some of these firms. In the statistical analysis of these possible determinants of employment stability there was very little indication that most of the factors have important effects.

Indeed, there is some indication that the experience in this region supports conclusions opposite from some conventional hypotheses. For example, there is some indication that higher-wage, unionized industries are less sensitive to recessions than lower-wage, non-unionized industries. More favorable trends in employment over the five-year period were associated with unionized and higher-wage industries, as well.

These results suggest at least the possibility that during a recession period one of our popular beliefs is in error. The view that employment inflexibilities of union wage contracts and higher wage scales cause plants to close or reduce their work force more than those with low wages and no contracts did not appear to be true in this region during the 1980-82 recession. Indeed, the regression statistics suggest the opposite, and the same appeared to be true

<sup>&</sup>lt;sup>8</sup>The operational definition of each independent variable is included in APPENDIX I. The individual observations are manufacturing establishments that supplied complete survey data on all characteristics included in the analysis. Dependent variables have been previously defined as have aggregate employment statistics for each SIC.

<u>N=73  $R^2$ =0.29 F=1.4 P=0.18\*</u>

VARIABLE	<u>REGRESSION</u> COEFFICIENT	ST'D ERROR	<u>t for h<sub>0</sub>&gt;0</u>	PROB.>0
Intercept	-0.00410	0.01254	-0.327	0.7448
Wage Index	0.01498	0.00792	1.892	0.0637
Vertical Integration	-0.00005	0.00221	-0.025	0.9805
Horizontal Integr	-0.00271	0.00400	-0.677	0.5013
Age of Plant Operation	-0.00120	0.00011	-1.057	0.2949
Training Cost Per Employee	-0.00000	0.00000	-0.487	0.6280
Headquarters Co. in:				
Other KY County	-0.00476	0.00698	-0.683	0.4975
Other State	-0.00419	0.00534	-0.784	0.4365
Pct. Workers in Coordinated				
Groups	0.00762	0.00465	1.636	0.1073
Product Changed During				
Period	-0.00234	0.00353	-0.662	0.5109
Seasonal Layoffs?	-0.00205	0.00334	-0.616	0.5406
Unionized Plant?	-0.01005	0.00460	-2.162	0.0334
Ownership:				
Single Proprietorship	0.00274	0.00798	0.345	0.7317
Public Corporation	0.00789	0.00820	0.961	0.3405
Closely Held (Family)				
Corporation	0.00694	0.00650	1.068	0.2902
Use of Means to Avoid				
Personnel layoffs:				
Inventory Buildup	0.00016	0.00358	0.945	0.9643
Reduced hours/week				
(% total layoff avoided)	-0.00506	0.00357	-1.417	0.1621
Aggregate SIC Trend	-0.27947	0.36985	-0.756	0.4534

\*Statistics identical to Table 8 to third decimal.

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		<u>N=73 R<sup>2</sup>=0.29</u>	F=1.4 P=0.18	
	REGRESSION			
VARIABLE	COEFFICIENT	ST'D ERROR	<u>t for H<sub>0</sub>&gt;0</u>	PROB.>0
Intercept	-24.25684	29.78051	-0.815	0.4188
Wage Index	37.60636	18.31793	2.053	0.0448
Vertical Integration	-0.81036	5.02192	-0.161	0.8724
Horizontal Integration	-3.89219	9.08008	-0.429	0.6698
Age of Plant Operation	-0.23604	0.26740	-0.883	0.3812
Training Cost Per				
Employee (\$)	-0.00209	0.00751	-0.278	0.7819
Headquarters Co. in:				
Other KY County	-11.84571	15.96252	-0.742	0.4611
Other State	-4.83612	12.54851	-0.385	0.7014
Pct. Workers in Coordinated				
Groups	21.13296	10.87291	1.944	0.0570
Product Changed During				
Period	0.15977	8.14550	0.020	0.9844
Seasonal Layoffs?	-9.06300	7.85867	-1.153	0.2537
Unionized Plant?	-29.38687	10.77623	-2.727	0.0085
Ownership:				
Single Proprietorship	8.21612	18.65047	0.441	0.6612
Public Corporation	24.64331	19.16323	1.286	0.2037
Closely Held (Family)				
Corporation	17.01531	15.23244	1.117	0.2687
Use of Means to Avoid				
Personnel layoffs:				
Inventory Buildup	1.87606	8.33822	0.225	0.8228
Reduced hours/week				
(% total layoff avoided)	-2.86425	8.37717	-0.342	0.7337
Aggregate SIC Recession				
Sensitivity	-0.25399	0.58198	-0.436	0.6642

Tab]	le '	7.	Regressio	on Analys	sis of	Recessio	n Sensitiv	vity of	Individual	Manufacturi	ng P	lants.*

\*Average Employment July 1980-December 1984 as a proportion of average employment January 1979-June 1980.

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		<u>N=79 R<sup>2</sup>=0.19</u>	F=0.8 P=0.62	
	REGRESSION			
VARIABLE	COEFFICIENT	ST'D ERROR	<u>t for h<sub>0</sub>&gt;0</u>	PROB.>0
Intercept	32.90164	13.67785	2.405	0.0191
Wage Index	-11.26185	8.17019	-1.378	0.1730
Vertical Integration	0.78643	2.98534	0.263	0.7931
Horizontal Integration	-2.63522	4.98116	-0.529	0.5987
Age of Plant Operation	0.00355	0.14675	0.024	0.9808
Training Cost Per				
Employee (\$)	-0.00767	0.00430	-1.784	0.0794
Headquarters Co. in:				
Other KY County	5.89089	8.94828	0.658	0.5128
Other State	8.01331	7.22525	1.109	0.2717
Pct. Workers in Coordinated				
Groups	8.77686	5.87606	1.494	0.1403
Product Changed During				
Period	0.67129	5.10271	0.132	0.8958
Seasonal Layoffs?	3.62565	4.37850	0.828	0.4108
Unionized Plant?	-0.81922	5.73100	-0.143	0.8868
Ownership:				
Single Proprietorship	-0.07999	10.44725	-0.008	0.9939
Public Corporation	2.99774	10.75991	0.279	0.7815
Closely Held (Family)				
Corporation	-0.25900	8.51899	-0.030	0.9758
Use of Means to Avoid				
Personnel layoffs:				
Inventory Buildup	0.92351	4.59652	0.201	0.8414
Reduced hours/week				
(% total layoff avoided)	1.47902	1.45747	1.015	0.3142
Aggregate SIC Coef. of Var.	0.18584	0.59303	0.313	0.7550

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Table 8. Regression Analysis of Coefficients of Variation About Trends of IndividualManufacturing Plants.

of the trends which tended to be favorably associated with union organization The regression results for aggregate employment stability measures were not replicated in the results for individual firms. Thus the regression statistics further erode confidence in the use of statistics of S.I.C. aggregates as a basis for predicting stability characteristics of individual firms and for small regions. Since the portfolio variance and diversification index approaches depend on predictions from aggregate data their use appears to be unjustified for small rural areas.

In view of the limitations of the data, the possibility of invalid rejection of hypotheses cannot be completely discounted. However, in general there is no positive support for the view that the home-grown, locally-owned, free-standing, non-integrated private proprietary firm is more stable during recessions, has better long-run prospects for growth, or has less short-term variability of employment than the stereotypic plants associated with national or international conglomerates. Neither is there any significant support for the view that those who have engaged in inventory control or reductions of hours per week to avoid layoffs have been successful in avoiding recessionary reductions or short-term reductions in numbers of employees on the payroll.

### SUMMARY AND CONCLUSIONS

In regions of chronic under-utilization of labor, such as the southeastern Kentucky survey region, job creation has been a primary component of local and state economic development strategy. Increasing job opportunities in such a region is obviously important, but inducing employment subject to large month-to-month and seasonal employment fluctuations or sags during recessions is undesirable. Hence, the long-run dependability of new employment opportunities is important, especially if public investments are made to attract and support the new industries.

Until 30 years ago the major components of the economic base of the area were coal mining, a small agriculture sector and a limited forest products industry. All three sectors were shrinking steadily, diminishing employment opportunities. While coal mining recovered somewhat following the OPEC oil crisis in the seventies it continued to be unstable. In the late 1960s and early 1970s manufacturing became a significant source of employment.

Declines and instability in employment in the three primary products sectors has led to a focus on manufacturing employment as the primary hope for both expanded and more stable income and employment opportunities in the region. Evaluation of the effectiveness of the manufacturing job-creation emphasis in state and local development strategies involves more than counting the number of jobs created to offset losses of jobs in the traditional primary industries. It also involves assessment of the effectiveness of these new sources of employment in offsetting chronic instability in farming, forestry and, especially, the highly volatile coal-mining industry.

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### VI

The study shows that manufacturing has provided a more stable employment base than coal mining. Moreover, manufacturing has offset much of the long-term decline of employment in coal, farming and forestry. This is especially true where a large and diverse number of industries supply jobs. Counties with the greatest proportion of manufacturing jobs had the least fluctuation in total employment, the most favorable employment trends, and suffered least from the 1980s recession. In fact, except for a short period, growth in employment continued in those counties with heavy manufacturing bases throughout the recession period. Fear of community or region-wide instability resulting from manufacturing employment growth appears to be largely unfounded. Contrary to popular views, vulnerability to recession and to short-run instability is reduced in most cases if manufacturing displaces coal and farming as the primary sources of income and employment. The main exception appears to be communities where a small number of manufacturing employers dominate a small job market.

This exception is illustrated by four counties with limited coal mining and few manufacturing jobs: Jackson, Lincoln, Owsley and Rockcastle. Their trends were favorable, but their dependence on only a few major manufacturing employers was associated with high month-to-month instability, and they were severely affected by the recession. This suggests that if similar communities concentrate on recruitment of a small number of relatively large industries, it is prudent to be selective. For these communities it is important to seek employers that will provide stable and preferably growing employment opportunities. If this is not feasible, it may be better to recruit or develop a more diverse set of smaller-scale employers.

Fortunately, it is precisely the larger-size individual employers which follow most closely the aggregate employment patterns of their class of industry.

For industries in the region characterized by a few larger firms, data on aggregate employment in the industry provide some general indication of the relative stability and growth characteristics of the individual firms. However, employment shifts in plants averaging under 45 employees cannot be predicted from industry trends. Such plants are the dominant source of employment in the region. Diversification of the employment base then becomes the primary buffer against instability in all its forms, when employment patterns of individual firms cannot be adequately predicted.

Although industry trends provide better information about individual firm behavior for large firms there is reason to be cautious about the use of industry trend statistics to predict performance of large-scale employers. Trends are not reliable indicators of the important changes in conditions in international markets, possible effects of changes in fiscal and monetary policy and major changes in technology, all of which affect employment in individual industries and firms. Nevertheless, they have some value in suggesting industries which have the most favorable prospects.

It is evident that coal-mining dominated communities continue to have severe problems of instability despite an important recovery during the middle and late 1970s. The limited manufacturing base of counties with a combination of coal and manufacturing has provided only a partial buffer against the volatile changes in employment in the coal industry. A dominant manufacturing sector is far preferable in this regard.

Among the major classes of firms which had favorable trends in employment were those manufacturing (1) Chemicals and Allied Products, (2) Rubber and Plastics products and (3) Electrical Machinery, although no major class of manufacturing found in the region had severely adverse average trends The categories of firms most severely affected by the recession were (1) Furniture and Fixtures, (2) Printing and Publishing and (3) Electrical Machinery.

The categories most subject to short-term, month-to-month employment instability were: (1)Rubber and Plastics Products, (2) Fabricated Metals Products and (3) Lumber and Wood Products. Firms producing all categories of products except Textiles and Related Products had high average month-to-month employment instability. However, by comparison with the traditional employment base of small farm agriculture and, especially, coal-mining, they are quite stable. Generally, all classes of manufactures offset employment instability in the traditional basic industries of small communities in rural areas.

A large set of organizational, management policy and ownership characteristics was analyzed to determine whether for similar general classes of products these other characteristics affect employment stability. Among those analyzed was whether the firm was locally or non-locally owned, whether the work force was organized by a labor union, whether it was a public corporation, private proprietorship, or closely held corporation, and whether a branch plant of a larger company. The results provide no support for the widely-held view that the small, free-standing, locally-owned manufacturing industry without union organization is more stable than the unionized branch plant of an integrated national corporation.

The analysis was based entirely on data for a small region and a necessarily limited set of characteristics. Thus, doubt has been expressed about two things: (1) whether national statistics on employment for product classes would better predict individual firm performance than data for the region, and (2) whether other characteristics would be better predictors of performance.

The answer to the first question is clear. Costs and other factors are not

necessarily uniform among producing areas. Hence performance of plants in a specific small region may be quite different from the total national industry. The apparel industry is an example. The large apparel industry in the region (31 plants; 6,100 employees) had an insignificant downward trend and a positive general response to the 1980s recession, while the national apparel industry lost 12 percent of its employment over the 1980-84 period.

The answer to the second question is more elusive. A basic problem is that S.I.C. product classes do not differentiate among products that have similar characteristics, but may have very different specific uses and markets. For example, firms producing similar products on government contract for military uses are likely to have different time-patterns of labor demand than firms producing virtually identical privately merchandized branded goods.

Differentiated, branded products even in the same four-digit classification may confront very dissimilar markets, with associated differences in time-patterns of employment, reflecting differences in sales and promotion strategies. Such factors make systematic general analysis of determinants of employment stability very difficult using available data, since employment data are mainly based on S.I.C., political unit, demographic characteristics and occupational classes. Data based on standard industrial classifications are especially weak in these respects. For these reasons, intensive case-by-case analysis of past performance of individual firms and firm specific determinants of employment patterns may be more fruitful than generalization about large classes of establishments.

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### APPENDIX I Definitions of Independent Variables

Wage Index - Weighted average wage for the plant expressed as a percent of weighted average wages of all plants.

Vertical Integration - Dummy variable indicating whether plant received materials or allocated output to another unit of the same firm. Coded 0 if plant purchased all inputs from independent establishments and sold output to independent establishments.

Horizontal Integration - Dummy variable indicating whether there were other plants under the same ownership making the same or similar products (1) or only the designated plant, itself (0).

Age of Plant Operation - Years manufacturing the same class(es) of product at the same location.

Training Cost Per Employee - Direct costs of formal training programs, including work time of supervisors plus foregone productivity during the period from hiring to normal productivity levels. Data from surveys. Represents non-recoverable costs in event of resignation or discharge of the average fully trained employee.

Headquarters in Other Kentucky County - Dummy variable where headquarters in the same county = 0 or in another Kentucky county = 1.

Headquarters in Other State - Dummy variable where headquarters in the same county = 0 or in another state = 1.

Percent Workers in Coordinated Groups - Mainly refers to assembly operations or other operations in which the productivity of the individual worker is almost totally dependent on operations conducted by other workers Piecework operations represent the opposite extreme.

Product Changed During Period – Dummy variable to denote instances where disruptions of production operations and employment may have been occasioned by changes in type of product manufactured, e.g., remodelling and/or re-tooling and retraining workers.

Seasonal layoffs - Dummy variable to denote whether seasonal changes in input supplies or product sales required temporary adjustments in work force.

Unionized Plant - Dummy variable where labor union organized work force = 1 or nonunion plant = 0.

Ownership-Single Proprietorship – Dummy variable where 0 = Partnership or 1 = Single Proprietorship.

Ownership-Public Corporation -0 = Partnership; 1 = Joint stock corporation with no restrictions on sale of stock.

Ownership-Closely-Held Corporation -0 = Partnership; 1 = Corporation owned by a restricted set of shareholders.

Inventory Buildup - Dummy variable where 0 = layoffs in response to changes in demand or 1 = inventory management used to avoid layoffs owing to changes in demand

Reduced hours per week - Reported proportion of total work force which was not laid off which would have been laid off if hours or days of work per week had not been adjusted to compensate for changes in demand and shipments of products.

Aggregate S.I.C. Coefficient of Variation, Recession Sensitivity Index and Trend -The value of the respective stability measures when computed for all firms producing products in the same S.I.C. in the region.

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