Rural Employment Growth in the 'New Economy:' A Test of the Spatial Division of Labor Hypothesis

ABSTRACT

Decomposing the occupational structure of rural and urban labor markets allows assessing whether these structures became more alike or more dissimilar between 1970 and 1990. A shift-share method is used to compute 'predicted' and 'specialized' shares for 9 inclusive occupations. A SUR model is used to estimate the convergence process.

Paper presented at the Annual Meeting of the American Agricultural Economics Association, August 2-5, 1998, Salt Lake City, Utah.

Timothy R. Wojan
Department of Agricultural Economics and TVA Rural Studies
University of Kentucky
400 Ag. Engineering
Lexington, KY 40546-0276
PH: (606) 257-9068 Fax: 257-7268 email: tim@rural.org

I. Introduction

Commentators on rural development have had a difficult time explaining the continued shedding of manufacturing employment in urban areas and modest increases in rural manufacturing employment in the late 1980s and early 1990s (Bernat 1995). The rural manufacturing crisis of the 1980s had many convinced that the sector would atrophy: complex manufacturing was presumed reliant on urban production advantages while even greater cost advantages to low-skill production were available by locating offshore. There is little evidence suggesting that these forces have declined in the last few years. And yet the empirical data is seemingly at odds with this view of rural manufacturing being squeezed on both sides.

The response in the literature has been the conjecture that rural manufacturing has become increasingly specialized in the low-skill functions of industry (Barkley 1995). That is, complex design and production will take place in urban areas with the low-skill assembly work--or other idiosyncratic work which cannot be integrated into more complex production processes--locating in rural areas. Since the value-added of these activities is relatively low, there may be substantial low-skill employment demand. Conversely, the high value-added activities in urban areas may be performed by a relatively smaller contingent of workers--urban job loss is explained by the shift of the low-skill functions to peripheral regions within the U.S. In this perspective, it is the continued necessity of some low-skill tasks locating relatively near complex manufacturing that provides a brief respite from the cost competition imposed by low-wage countries in traditional rural manufacturing sectors.

The explanation relies on justifications for a more disarticulated spatial division of labor (SDL). That is, evidence that production is most efficiently organized by the physical separation of high-skill and low-skill tasks must be provided. This in turn requires a detailed understanding of the technical and social divisions of labor which are necessary prerequisites to an SDL (Scott 1986). While a burgeoning theoretical literature discusses the rationales and implications of a more disarticulated technical division of labor in an economy characterized by increasing returns,[1] the empirical literature is relatively silent on the issue. Geographers have been the most aggressive in empirically analyzing the phenomenon (Ettlinger & Clay 1991; Glasmeier 1986). However, direct tests of the SDL hypothesis are largely exploratory.

---

[1] Studies which relate theoretical results on the division of labor to the rapidly growing literature on economic growth as a function of endogenous accumulation include Becker & Murphy 1992, Yang & Borland 1991, Francois 1990, and Rodriguez-Clare 1996.

Rather, the argument has been supported mainly on the basis of corroboratory evidence. The nexus between this corroborating evidence and arguments for a more disarticulated SDL can be criticized on three counts. First, using characteristics in levels is invalid evidence to confirm an increasing divergence of the occupational structures of urban and rural areas as required by a ***more*** disarticulated SDL. A valid assessment requires examining initial conditions and rates of relative growth. Second, significant differences in the share of occupational groups across regions is necessary but not sufficient for the existence of a SDL. Given variability in the staffing requirements across industries, different industrial structures across regions may provide a simpler explanation for the observed pattern. And third, a more disarticulated division of labor is not an inevitable outcome of an evolving economy. It is a function of changes in the contracting structure of production. The contracting structure will change through time and will differ sectorally due to changes in technology, consumer preferences, corporate governance structures and macro variables such as market volatility. The conclusion is that a more disarticulated SDL cannot be adduced from theoretical arguments combined with tentative corroborative evidence. Rather, confirmation of the hypothesis is inherently an empirical question.

The discussion starts by summarizing the theoretical arguments supporting the contingent nature of any SDL--i.e., reasonable ranges of parameter values governing the division of labor may promote either integration or disintegration of production (Scott 1986). Arguments suggesting a shift in these parameters leading to a more disarticulated SDL will be presented before developing the empirical tools needed to assess this claim. The implications of the empirical results for policy are addressed in the conclusion.

II. Theoretical Background

The purpose of this section is to briefly summarize those factors in production and contracting that are regarded as determinative of the level of the division of labor. It is important to note that while there are important relations between the technical, social and spatial divisions of labor, it is impossible to derive a causal path between them. Rather, the potential technical division defines the upper bound for the social division of labor. Similarly, the potential social division defines the upper bound of the SDL.

The decision facing the firm is whether to produce the good using an integrated process or one which separates production into a number of different labor tasks. The parameters governing this decision include the increases in productivity of specialized versus generalist work-

ers and the internal coordination costs incurred by separating labor processes. The maintained assumption of gains from labor specialization characterizes many of the theoretical analyses (Becker & Murphy, Rodriguez-Clare, Francois). The result that the division of labor is limited by the extent of the market proceeds directly from this assumption. It is in moving away from the representation of the firm as a black box to one of the firm as a strategic actor that the implications for the technical division of labor become much more contingent. The approach a firm takes to the final goods market will determine the appropriate production strategy to follow. These strategies may range from artisanal production to batch production to assembly line production, each with very different implications for the optimal technical division of labor. Scott (1986 p. 129) cautions that **"**the internal organization of firms does not invariably evolve down the simple one-way street of endlessly defragmented work tasks."

The social division of labor provides the intermediate step between the technical and spatial division of labor. The transactional structure of production lies at the heart of the social division of labor (Coase 1937). The firm can thus be thought of as a complex network of transactions. Given the desirability of a technical division of labor suggested above, the firm has the choice of directing these separated tasks internally or contracting for these tasks in an external market. That is, the technical division of labor can be constituted as a set of internalized transactions ruled over by a managerial hierarchy. The development of administrative rules for monitoring and coordination are critical to this option. Or, within a social division of labor the firm can transact business with other firms across external markets. Markets have the advantage of transferring information accurately through price signals but suffer with respect to coordination problems. "The line that divides the internal hierarchy from the external market is fixed at the point where the relative efficiencies of managements and markets are equal" (Scott 1986, p. 219).

Since a social division of labor is required for the emergence of an SDL it is informative to discuss the factors promoting this process. When internal transactions costs exceed external transactions costs, production is prone to disintegration. This happens because there is an upper limit on the information processing and managerial control a firm can exert. When it becomes overextended some of these functions will be shed. A parallel shedding process will take place if market transactions become more efficient. The principle empirical argument supporting a more disarticulated social division of labor include the increased volatility of

market demand and the differentiation of consumer tastes. Both have tended to overtax the information processing capabilities of management hierarchies.

Conversely, vertical integration is much more likely in circumstances where there are strong technological complementarities that involve firm-specific know-how. Assembly operations may or may not be integrated depending on the kind and amount of information that needs to be exchanged between transacting parties. Technical complementarities in a firm thus form the foundations for understanding the SDL. If labor tasks are routinized then there is little reason for these tasks to be integrated. Consistent with the conjectures in the literature, the data might be explained by complex manufacturing forming integrated production complexes in cities while routine manufacturing disperses to rural areas (Scott 1986).

The relationship between information structure, the division of labor and the firm's choice of organization is examined by Carter (1995). The particular model separates the firm into a marketing unit and a production unit with each unit having different knowledge of the marginal revenue and marginal cost conditions facing the firm. The marketing unit can observe the true value of the stochastic marginal revenue term but only the expected value of the marginal cost term. Conversely, the production unit has limited information on the marginal revenue term but full information of the marginal cost term. This information structure occurs because of irregular events observed only by the unit in which the event occurs (e.g., unexpected entry into the market by competitors or incremental process innovations).

Production-led, market-led and centrally managed structures allow separation of these processes. In the first two structures the firm acquires both types of specialist information but the non-leading unit's information is communicated as a report with some error. The centrally managed firm has a central decision node that makes decisions based on specialist reports from both units. The pooled information structure requires a spatial integration of units as marketing and production jointly determine the quantity to produce based on full information. The central implication of the analysis is that in the presence of organization costs the optimal information structure will depend on the variability of each of the expected value terms for revenue and cost. It is reasonable to assume that the variability of the revenue and cost terms will differ across industries. Thus, it is not possible to derive a general prediction of the direction of spatial integration or separation of economic activities in the economy as a whole.

The purpose of this review is to point out that the forces promoting a more disarticulated SDL are both conceptually and empirically difficult to fix. The empirical literature re-

viewed below provides some insight to the phenomenon but is insufficient to support the latest conjectures on the SDL as an explanation of rural employment growth.

III. Empirical Findings and Conjectures on the Spatial Division of Labor

Barkley (1995) combines empirical evidence with the SDL concept to reconcile rural manufacturing employment growth in a reputed era of declining rural comparative advantage. He offers the conjecture that

> a more disarticulated spatial division of labor is evolving where rural areas are the recipients of the less skill-intensive, low-wage jobs, which contribute to persistent rural-urban differences. (p. 1252)

However, the strongest evidence provided is not one of a more disarticulated SDL but that of rural industrial development that is concentrated in declining or slow-growth industries (Bernat 1995). In fact, most of the arguments provided suggest that rural areas will be unable to attract employment in new industries or those undergoing the most dramatic restructuring due to changes in technology and production organization. Barkley summarizes, stating that

> [r]apidly growing, skilled-labor-intensive activities continue to favor metropolitan locations while the lower-cost rural areas remain attractive locations for declining and low-skill intensive manufacturers. (p. 1255).

If anything, the arguments Barkley provides directly related to the SDL suggest that the environment has become less conducive to the location of this employment in rural areas. Given that former rural manufacturing employment was strongly dependent on the decentralization of branch plant operations, the statements regarding "industrial restructuring" suggest that this type of employment will atrophy. The argument is that a shift in production organization "from large-scale, multi-plant, vertically integrated operations to smaller, more specialized firms" (Barkley p. 1255) would be biased against rural manufacturers. The vertical disintegration referred to would seem to support much greater agglomeration of economic activity (Scott 1986). That is, the process referred to would support a more disarticulated ***social division of labor*** amid a ***spatial reintegration of production*** to those areas possessing the requisite localization or agglomeration economies.

The conjecture which is most strongly supported by the article is that the rural/urban differentiation in occupations is being reinforced. This differentiation is largely the result of declining or slow-growing industries adding lower-skill, low-wage employment in rural areas.

This is a testable hypothesis and will be addressed in the empirical analysis below along with tests of a more disarticulated SDL.

IV. An Occupational Decomposition of Industrial Employment

The data needed to empirically examine conjectures regarding the SDL include local employment by detailed industry category, the occupational employment in the local area and national occupational requirements by industry. A shift-share method is developed which uses this information to decompose occupational change into an industrial shift component and an occupational specialization (share) component. The finest disaggregation available over the study period is 9 broad occupational groups across 144 industries. The decomposition is derived from the matrix product of the Industry-Occupation Staffing Requirements at the national level and the industrial employment structure at the local level, plus the residual, or occupational specialization, term:

Equation 1

$$\mathbf{LOS}_t = \mathbf{NOS}_t \cdot \mathbf{LIS}_t + \varepsilon_t$$

where $\mathbf{LOS_t}$ = local occupational structure (9 x 1) in year ***t***,
$\mathbf{NOS_t}$ = Industry-Occupation matrix at the national level (9 x 144) in year ***t***,
$\mathbf{LIS_t}$ = local industrial structure (144 x 1) in year ***t***,
$\boldsymbol{\varepsilon_t}$ = divergence of the predicted occupational structure from the observed occupational structure (9 x 1) in year ***t***.

Conceptually, $\boldsymbol{\varepsilon_t}$ represents the degree of specialization of the community in a particular occupation relative to an identical set of industries organized at the national level. Empirically, $\boldsymbol{\varepsilon_t}$ also contains measurement error owing to the occupational requirements matrix, $\mathbf{NOS_t}$, and the observed industrial structure, $\mathbf{LIS_t}$. However, ***Equation 1*** is not a stochastic specification and so $\boldsymbol{\varepsilon_t}$ should not be interpreted as a disturbance term.

The first component is the local occupational structure which would be predicted if the staffing requirements of local industry were identical to the same national set of industries. It is labeled the Predicted Occupational (OP) component. In matrix notation it is computed for an individual commuting zone as

Equation 2

$$\begin{bmatrix} OP_1 \\ OP_2 \\ \dots \\ OP_9 \end{bmatrix} = \mathbf{NOS}_t \cdot \mathbf{LIS}_t = \begin{bmatrix} io_{11} & io_{12} & \dots & io_{1144} \\ io_{21} & io_{22} & \dots & \\ \dots & & \dots & \dots \\ io_{91} & & \dots & io_{9144} \end{bmatrix} \begin{bmatrix} ES-202_1 \\ ES-202_2 \\ \dots \\ ES-202_{144} \end{bmatrix}$$

where io_{ij} = the staffing requirement of the i^{th} occupation in the j^{th} industry;
$ES\text{-}202_j$ = total industry employment in the commuting zone in the j^{th} industry.

The second component is the residual not explained by the predicted occupational structure. The component represents the extent to which the community is specializing in a given occupation relative to a local economy with an identical industrial structure organized at the national level. It is labeled the Occupational Specialization (SP) component.

The method provides a control for the industrial structure to provide a better indication of the ***relative*** increases or decreases in a particular occupation in a county. Such a measure is central to arguments of the SDL or other explanations of why execution may locate away from conception in frameworks such as the product cycle. Despite wide application of these theories, there has been little attempt to verify their empirical foundations related to the relative specialization in high and low skill occupations.

To aid in the interpretation of the specialization (SP) component, a measure analogous to a location quotient (LQ) is computed. The occupation specialization quotient (OSQ) developed here compares the employment in a given occupation to the employment that would result if local industry had the same staffing requirements as industry at the national level. Here, an OSQ above one suggests that the community is more specialized in an occupation than the nation as a whole.

An important drawback of the data used in the analysis is the combination of place-of-work data pertaining to industrial employment (ES-202) and place-of-residence data pertaining to occupation (Bureau of the Census). The differences between these two measures can be great in a county, especially in smaller communities or in those near metropolitan areas. The detailed commuting patterns available in Census years provide a

consistent--if not wholly accurate--solution to the problem. The assumption is that adjustments to the occupational and industry employment data are scaled equally for all occupational and industry categories. The scaling factor used is to equate industrial and occupational employment to the Live-and-Work employment total for commuting zones as defined by the ERS for 1980 and 1990

V. Estimation Methods

The data used in the analysis is the share of employment in each occupation group predicted from the industry structure and the OSQ variable discussed above indicating the degree of specialization for each occupation for 1970, 1980 and 1990. In addition, the rate of employment growth in the region over the decennial years is included in the analysis. What one is led to is a regression system in which there are a series of employment shares to be estimated. The shares are clearly not independent but neither are they endogenous in estimating the other shares. The structure of the problem suggests the appropriateness of a seemingly unrelated regression framework with the error terms being the link between each of the equations. The system to be estimated (e.g., for the 1980-1990 period) is:

Equation 2

$$\ln OP_{190i} - \ln OP_{18090i} = \beta_0(\ln TOTEMP_{90i} - \ln TOTEMP_{80i}) + \beta_{1P} \ln OP_{18090i} + \varepsilon_{1Pi}$$
$$\ln OSQ_{190i} - \ln OSQ_{18090i} = \beta_0(\ln TOTEMP_{90i} - \ln TOTEMP_{80i}) + \beta_{1S} \ln OSQ_{18090i} + \varepsilon_{1Si}$$
$$\ldots$$
$$\ln OP_{990i} - \ln OP_{98090i} = \beta_0(\ln TOTEMP_{90i} - \ln TOTEMP_{80i}) + \beta_{9P} \ln OP_{98090i} + \varepsilon_{9Pi}$$
$$\ln OSQ_{990i} - \ln OSQ_{98090i} = \beta_0(\ln TOTEMP_{90i} - \ln TOTEMP_{80i}) + \beta_{9S} \ln OSQ_{98090i} + \varepsilon_{9Si}$$

where
- OP_{k90i} = the predicted occupational employment in occupation k as a share of total employment in 1990 for the i^{th} 1990 commuting zone;
- OP_{k8090i} = the predicted occupational employment in occupation k as a share of total employment in 1980 for the i^{th} 1990 commuting zone;
- OSQ_{k90i} = the specialized occupational employment in occupation k represented by the quotient of actual occupational employment divided by predicted occupational employment in 1990 for the i^{th} 1990 commuting zone.
- OSQ_{k8090i} = the specialized occupational employment in occupation k represented by the quotient of actual occupational employment divided by predicted occupational employment in 1980 for the i^{th} 1990 commuting zone.

VI. Results

In the interest of space the only descriptive statistics presented are the mean occupational specialization quotients by commuting zone type (***Table 1***) (a full set of descriptive statistics is available from the author). The statistics suggest that from 1970 to 1980 the Southern economy became less specialized in Managerial and Professional/Technical workers. At the same time the South became more specialized in production workers (Craft and Operatives). The South rebounded with respect to more highly skilled occupations in 1990 but became increasingly specialized in production occupations. Perhaps the most distressing statistic is that suggesting a much greater specialization in low-skilled laborer occupations in 1990. Across settlement types in the South, the descriptive statistics verify the existence of a SDL with metropolitan commuting zones being more specialized in high-skill occupations and nonmetropolitan areas being more specialized in low-skill occupations. The statistics thus confirm what appeared evident to casual observers of the rural economy. The more challenging question is whether employment change over the last decade has served to reinforce this SDL.

To answer this question we turn to the regression system results. Interpreting the results is very straightforward. If the estimates of the initial occupation shares (e.g., $ß_{kp} \ln OP_{k8090i}$ & $ß_{ks} \ln OSQ_{k8090i}$ for all k) are positive then the conjecture of the more disarticulated SDL is confirmed. In fact, the strong case of the more disarticulated SDL would require the 'P' estimates to be negative with the 'S' estimates positive. However, both 'P' and 'S' being negative would suggest that regions were catching up with one another with respect to their occupational structures refuting the hypothesis. A test of the implicit hypothesis supported by the Barkley (1995) article would require that the 'P' estimates were positive with no prediction for the sign of the 'S' estimates.

There are a number of very striking results presented in ***Table 2***. Most fundamentally, the strong convergence in occupational structure observed between 1970 and 1980 weakens substantially in the second decade. In the first period, all of the Specialization categories are characterized by a statistically significant negative coefficient for the 1970 Occupational Group variable. The magnitude of these estimates is also quite large relative to the 1980-1990 results. In contrast, 4 of the 8 specialization estimates in the 1980-1990 regressions are not negative and significant in the latter period with the Operatives coefficient demonstrating a process of divergence.

Table 1
Occupational Specialization Quotient by Commuting Zone Type

		Smallest Beale Code of Any County in the Commuting Zone								
		0	1	2	3	4	5	6	7	All
Managerial	OSQ 1970	0.92229	0.91335	0.77821	0.80731	0.78626	0.76748	0.83000	0.82234	0.80188
	OSQ 1980	0.71738	0.54729	0.59316	0.55194	0.47303	0.52675	0.47056	0.42875	0.51628
	OSQ 1990	0.67866	0.52287	0.60398	0.55370	0.48853	0.54133	0.48694	0.45136	0.52609
Prof/Tech	OSQ 1970	1.25589	1.20611	1.27494	1.03223	1.09918	1.21941	0.97815	1.03556	1.09989
	OSQ 1980	1.02106	1.07467	1.04587	0.96639	1.01452	0.95684	0.85922	0.95941	0.96886
	OSQ 1990	1.14613	1.11027	1.04723	0.99775	1.03734	0.97189	0.87062	0.95009	0.98364
Sales	OSQ 1970	1.12306	1.19930	2.41664	1.48042	2.12582	3.27445	1.70482	3.60725	2.45435
	OSQ 1980	1.76292	2.05195	1.90025	1.97805	2.11521	1.95037	1.94625	2.06882	1.97536
	OSQ 1990	2.74685	2.63434	1.74470	1.95237	2.23327	1.88271	1.85856	1.95852	1.97109
Clerical	OSQ 1970	0.95238	0.77954	0.79829	0.71426	0.66442	0.68283	0.60056	0.55264	0.66995
	OSQ 1980	0.93123	0.82149	0.81408	0.75114	0.71397	0.70584	0.65315	0.65134	0.72553
	OSQ 1990	0.81494	0.70939	0.75182	0.68954	0.65685	0.67415	0.61165	0.60859	0.66987
Craft	OSQ 1970	0.99291	1.08637	1.08757	1.12685	1.11371	1.13219	1.07097	1.28859	1.13788
	OSQ 1980	1.01703	1.17240	1.14179	1.15620	1.12094	1.17517	1.13871	1.30566	1.17510
	OSQ 1990	1.08679	1.25505	1.17021	1.20441	1.15009	1.20498	1.12594	1.35699	1.20823
Operatives	OSQ 1970	0.87380	0.91111	0.92084	0.91794	1.15210	0.84058	0.88130	1.06223	0.93062
	OSQ 1980	0.97295	1.08176	1.10974	1.10242	1.16806	1.14810	1.15533	1.15603	1.12995
	OSQ 1990	1.05521	1.25914	1.24300	1.22773	1.24611	1.27032	1.24253	1.33978	1.26036
Service Occs	OSQ 1970	1.10750	1.09836	1.03990	1.08966	0.97900	1.02091	1.04353	0.86979	1.01548
	OSQ 1980	0.92147	0.90023	0.90890	0.93378	1.03749	0.98056	0.89150	0.90099	0.92067
	OSQ 1990	0.85044	0.78084	0.83831	0.84077	0.92018	0.83716	0.83804	0.78457	0.82953
Laborers	OSQ 1970	0.91326	0.98986	0.93618	0.95308	1.02550	0.86484	1.02222	1.18780	1.02382
	OSQ 1980	1.20709	1.23206	1.14127	1.17545	1.20026	1.11662	1.23187	1.21820	1.19443
	OSQ 1990	1.47032	1.50036	1.31057	1.34788	1.42059	1.29346	1.41719	1.39802	1.38730

Beale 0: Central Counties Metro Area Pop. > 1,000,000
Beale 1: Fringe Counties Metro Area Pop. > 1,000,000
Beale 2: Counties in Metro Area 250k< Pop. < 1,000,000
Beale 3: Counties in Metro Area Population < 250,000
Beale 4: Nonmetro Adjacent, 20k < Urban Pop. < 50k
Beale 5: Nonmetro Nonadj., 20k < Urban Pop. < 50k
Beale 6: Nonmetro Adjacent, 2.5k < Urban Pop. < 20k
Beale 7: Nonmetro Nonadj., 2.5k < Urban Pop. < 20k

Table 2
Seemingly Unrelated Regression Results
1970 - 1980 & 1980 - 1990 Change in Occupational Group Categories Explained by Employment Growth and Initial Occupational Group Level

	1970 - 1980			1980 - 1990		
• Occupational Group	Intercept	Employment Growth	1970 Occupational Group	Intercept	Employment Growth	1980 Occupational Group
Pred. Managerial	0.438***	0.774<1***	0.013	-0.052**	1.127>1**	0.002
Spec. Managerial	-0.659***	0.412***	-0.359***	-0.002	-0.083	-0.052***
Pred. Professional/Technical	0.282***	0.933=1	-0.022***	0.016	0.962=1	-0.003***
Spec. Professional/Technical	-0.095***	-0.032	-0.361***	0.006	0.050	-0.0002
Pred. Sales	2.278***	1.392=1	-0.297***	0.206***	0.912=1	-0.019***
Spec. Sales	0.659***	-0.022	-0.983***	0.077	0.147	-0.208***
Pred. Clerical	0.039	0.821<1***	0.004	0.053***	1.145>1***	0.0008
Spec. Clerical	-0.135***	0.133**	-0.414***	-0.081***	-0.118**	-0.050***
Pred. Craft/Precision Production	0.201***	1.449>1***	-0.044***	0.018	0.994=1	-0.004***
Spec. Craft/Precision Prod.	0.140***	-0.186***	-0.339***	0.018	0.024	0.001
Pred. Operatives	-0.356***	1.476>1***	-0.013	-0.105***	0.932=1	0.001***
Spec. Operatives	0.171***	-0.095	-0.761***	0.095***	0.065	0.007***
Pred. Service Occupations	-0.114	0.668<1***	0.038***	0.165	0.779<1***	-0.004
Spec. Service Occupations	0.087***	-0.031	-0.586***	-0.137***	0.179**	-0.159***
Pred. Laborers	0.095	1.031=1	-0.034***	-0.122***	0.928=1	-0.002***
Spec. Laborers	0.247***	-0.247**	-0.557***	0.136***	0.079	-0.002
System Statistics	DF	Wghtd MSE	Wghtd R^2	DF	Wghtd MSE	Wghtd R^2
	2304	0.9729	0.7990	2144	0.63316	0.9977

*, **, ***, indicates that the estimate is different from zero at the 0.10, 0.05, and 0.01 levels, respectively.

=1 indicates that the null hypothesis ß = 1 was not rejected at the 0.10 level.

<1 or >1 indicates that the null hypothesis ß = 1 was rejected at the significance level corresponding to the number of asterisks above.

This is the one result supporting the more disarticulated SDL hypothesis--i.e., commuting zones more specialized in the occupation in 1980 tended to become increasingly specialized through the decade. However, the other half of the SDL hypothesis--i.e., skilled occupations becoming more concentrated in some regions--is not supported by the data.

VII. Policy Implications and Concluding Comments

Caution should be exercised before concluding that the results from the 1980-1990 period imply that the latest round of rural employment growth is not the result of a reinforced SDL. This paper has argued that the SDL is fundamentally an empirical question. Empirical verification of the 1990s experience using the methods developed in this paper will not be possible for at least another 3 to 4 years. But there are also two conceptual concerns related to differences in the economic environment in the last two decades.

The 1980s was characterized by a violent economic downturn in the early part of the decade and rates of recovery that differed substantially across sectors and regions of the country. In contrast, the economy in the 1990s has been characterized for the most part by stable, balanced growth. The industrial restructuring described in the literature may have been much more pronounced and biased toward the modernization of industry in the 1980s. Caballero & Hammour (1996) provide a theoretical framework supporting the notion that innovation and industrial evolution may be most pronounced during periods of recession.

Conversely, periods of expansion may exhibit more rapid growth in contingent firms and labor markets (Berger & Piore 1981). In this framework, each industry is made up of a mixture of primary and secondary (or contingent) firms. These primary and secondary sectors differ with respect to the level of wages, wage determination mechanisms, security of employment, working conditions, and methods of worker supervision. Firms which can capture the largest share of the market will enjoy the most specialized division of labor, and with it, the most efficient mode of production. This division allows the most efficient mode of production to fill the stable portion of demand by a firm (or small number of firms) with declining average cost curves. The unstable portion of demand is filled by a fringe of much smaller firms which have U-shaped cost structures which characterize competitive markets. If demand growth is being met by a higher proportion of production from contingent firms, then the 1990s experience may directly contradict the results from the previous decade.

Clearly, the availability of the 2000 data is eagerly awaited. Analysis of the 1990s will shed considerable light on the process of industrial restructuring for both its policy implica-

tions and theoretical insight. However, putting too much emphasis on the short- to medium-term effects of macroeconomic events may be erroneous. The word "restructuring" denotes a fundamental change in the technological foundations of industry and how this technology responds to the uncertainty which adheres in the economic system. In contrast to past eras dominated by Fordist mass production practice, firms are aggressively pursuing strategies to increase their flexibility and ability to adapt to market volatility. This restructuring will almost certainly require a more highly skilled, competent workforce. If the data examined in this study are representative of this process, then the available evidence suggests that less skilled labor markets have not been disadvantaged in their response to this challenge. The available evidence reinforces arguments for a proactive strategy for human resource development and industrial modernization policies in rural areas.

References

Barkley, David. 1995. "The Economics of Change in Rural America," ***American Journal of Agricultural Economics*** **77(5)**: 1252-1258.

Berger, Suzanne & Michael J. Piore. 1980. ***Dualism and Discontinuity in Industrial Societies***. Cambridge: Cambridge University Press.

Bernat, G. A., Jr. 1995. "Manufacturing Decentralization: Continuing Filtering-Down to Smaller Rural Counties," Paper presented at the Southern Regional Science Association Meeting, San Antonio, TX.

Becker, Gary S. & Kevin M. Murphy. 1992. "The Division of Labor, Coordination Costs, and Knowledge," ***Quarterly Journal of Economics*** **108(4)**: 1138-1160.

Bureau of Labor Statistics. 1981. ***The National Industry-Occupation Employment Matrix, 1970, 1978 and Projected 1990.*** Washington, D.C.: U.S. Government Printing Office.

Bureau of Labor Statistics. 1994. ***The National Industry-Occupation Employment Matrix: 1983-1993 Time Series.*** Mimeo and Electronic Media, Office of Employment Projections.

Caballero, Ricardo J. & Mohamad L. Hammour. 1996. "On the Timing and Efficiency of Creative Destruction," ***Quarterly Journal of Economics*** 805-852.

Carter, Martin J. 1995. "Information and the Division of Labour: Implications for the Firm's Choice of Organisation," ***The Economic Journal*** **105** (March): 385-397.

Coase, R. H. 1937. "The Nature of the Firm." ***Economica*** 386-405.

Ettlinger, Nancy & Bradley Clay. 1991. "Spatial Divisions of Corporate Services Occupations in the United States, 1983-1988," ***Growth and Change*** **22(1)**: 36-53.

Francois, Joseph F. 1990. "Producer Services, Scale, and the Division of Labor," ***Oxford Economic Papers*** **42**: 715-729.

Glasmeier, Amy K. 1986. "High-Tech Industries and the Regional Division of Labor," ***Industrial Relations*** **25(2)**: 197-211.

Johnson, Merrill L. 1985. "Postwar Industrial Development in the Southeast and the Pioneer Role of Labor-Intensive Industry," ***Economic Geography*** **61**(1): 46-66.

Lonsdale, Richard E. & Clyde E. Browning. 1971. "Rural-Urban Locational Preferences of Southern Manufacturers," ***Annals, Association of American Geographers*** **61**: 255-68.

McGranahan, David A. & Linda M. Ghelfi. 1991. "The Education Crisis and Rural Stagnation in the 1980s." In ***Education and Rural Economic Development: Strategies for the 1990s.*** Agriculture and Rural Economy Division, Economic Research Service, U.S. Department of Agriculture. ERS Staff Report No. AGES 9153.

Piore, Michael J. & Charles F. Sabel. 1984. ***The Second Industrial Divide: Possibilities for Prosperity.*** New York: BasicBooks

Rodriguez-Clare, Andres. 1996. "The Division of Labor and Economic Development," ***Journal of Development Economics*** **49**: 3-32.

Sabel, Charles F. 1991. "Constitutional Ordering in Historical Context," in Jennifer Frances, Rosalind Levacic, Jeremy Mitchell & Graham Thompson, eds. ***Markets, Hierarchies and Networks: The Coordination of Social Life.*** London: Sage Publishers.

Scott, Allen J. 1986. "Industrial Organization and Location: Division of Labor, the Firm, and Spatial Process," ***Economic Geography*** **62**: 215-231.

Williamson, Oliver E. 1975. ***Markets and Hierarchies: Analysis and Antitrust Implications.*** New York: The Free Press.

Wojan, Timothy R. 1996. ***Structural and Macroeconomic Explanations of Rural/Urban Income Divergence.*** Unpublished Ph.D. Dissertation, University of Wisconsin.

Yang, Xiaokai & Jeff Borland. 1991. "A Microeconomic Mechanism for Economic Growth," ***Journal of Political Economy*** **99**(**3**): 460-482.