ECONOMIC STRUCTURE AND ECONOMIC PERFORMANCE: SOME EVIDENCE*
FOR STATES

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Introduction

The economic structure of a region is its distribution of employment (or income) among industries. That relationships exist between economic structure and economic performance has been demonstrated in a number of studies, going back to the work of Clark [5] and Fisher [7]; through the major studies by Perloff, et al [15] and Borts and Stein [4], and perhaps finding its most sophisticated expression in the interindustry models of Leontief [11].

The theoretical content of various hypotheses relating economic structure to economic performance has been the subject of considerable criticism, however. For example, Miernyk has pointed out that the level of detail of the data required to develop an adequate theoretical structural model is so minute that only an interregional input-output model is adequate to the task [12, p. 36].

If a theory requires that one begin with a set of propositions about the economic behavior of decision making units, then most hypotheses about the relationship of economic structure and economic performance do in fact have little theoretical content. If, on the other hand, one merely wishes to examine the historical economic performance of regions, and statistically "explain" variation in performance with structural variables--and perhaps predict future performance based upon structural variables--then several hypotheses have sufficient merit for empirical analysis.

The purpose of this paper is to explore the relationships between the economic structures and performances of the 48 contiguous states. The state was chosen as the geographic unit because state governments attempt to influence economic performance, because there are structural and performance data available for states, and because 48 observations are sufficient to establish statistically significant relationships.

Research Design

Data on economic structure and economic performance were obtained for the

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48 contiguous states for three historical periods, and multiple linear regression equations were estimated in order to test several hypotheses about the relationship between structure and performance.

Economic Performance. Economic performance can be conceived as a level of attainment, measured by per capita income or some other stock variable; or as a rate of progress, measured by a flow variable such as the rate of growth of employment or income.

Per capita income was selected as the level of attainment variable, because of its availability on an annual basis for all states [18]. It is, of course, recognized that per capita income is an imperfect measure, chiefly because it says nothing about the distribution of income.

The rate of growth of total employment was selected as the rate of progress measure, because it is a measure widely used by state government officials to evaluate their economic development programs. Annual employment data for states are also readily available [17, 19].

The Clark-Fisher Hypothesis. Allen G. B. Fisher [7], of Great Britain and Colin Clark [5], then of Australia, independently developed the proposition that has come to be known as the Clark-Fisher hypothesis: if economic activities are classified as "primary" (agricultural, forestry, fishing and hunting); . "secondary" (mining, manufacturing, electric power production, and construction); and "tertiary" (finance, trade, services and government), then the level of per capita income will rise as the major sources of an economy's employment or income move from primary through secondary to tertiary activities. The Clark-Fisher hypothesis relates economic structure to a level of attainment but not to a rate of progress. It says nothing about the stages in the progression from primary activity domination to tertiary activity domination in which economic growth will be more or less rapid. Further, Clark and Fisher applied their hypothesis only to national economies; it was extended to regional economies by Bean [3].

The Clark-Fisher hypothesis has been criticized on several grounds.[1] Perloff, et al felt that it is only partial in scope and too aggregated for analysis in depth, although useful for understanding important aspects of regional growth [15, p. 60]. Seymour Harris argued that a region could become too dependent on tertiary industries; that a rising proportion of tertiary employment may reflect a deterioration in manufacturing, or the loss of comparative advantage [9, p. 286]. Harry Richardson has stated that the Clark-Fisher hypothesis "offers no insight into the causes of growth itself [16, p. 341].

Despite the criticisms, Miernyk concludes that the Clark-Fisher hypothesis, when tested at a sufficient level of industrial detail, provides useful infor-

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[1]The following discussion was adapted from Miernyk [12, pp. 38-39] to whom the reader is referred for a more detailed critique of the Clark-Fisher hypothesis.

mation [12, p. 39]. We might further argue that if differences in concentrations of employment in primary, secondary, and tertiary industries do statistically account for differences in levels of per capita income, then the Clark-Fisher hypothesis may be valuable in both explaining and predicting the per capita incomes of states.

The dependent variable for the Clark-Fisher hypothesis was defined as Y, where Y is per capita income, and the years estimated were 1960, 1965, 1970, and all three combined. The independent variables were:

> AG = the percentage of total employment in agriculture (the primary sector).
>
> MFG = the percentage of total employment in manufacturing (a secondary industry).
>
> TDE = the percentage of total employment in wholesale and retail trade (a tertiary industry).
>
> SVC = the percentage of total employment in services and finance, insurance and real estate (a tertiary industry).
>
> GV = the percentage of total employment in state and local government, including education (a tertiary industry).
>
> T = a trend variable used only for the combined equation (equal to 1 in 1960, 2 in 1965, and 3 in 1970).

All industries were classified according to the 1967 Standard Industrial Classification (SIC) scheme. Alternative industries in the tertiary sector were used to see which best represented the tertiary sector.

The Shift-Share Hypotheses. Shift-share analysis is essentially a technique for classifying regional growth into three components: growth attributable to the U. S. rate of growth for all industries (the national share component), growth attributable to the U. S. rate of growth for the same industry (the industry-mix component), and growth attributable to a higher rate of growth for a given industry in the region than in the nation (the competitive shift component). The technique was developed by Creamer [6], and has been widely used by a number of researchers. One major study was the application of shift-share analysis to states in a well-known article by Ashby [2]. Shift-share analysis has been criticized by Houston [10], on the grounds that it is not a theory—merely a measurement technique—and that the level of disaggregation has a marked effect on the magnitudes of the components.

The hypotheses to be tested are: (1) that states with high proportions of employment in industries which are rapidly-growing at the national level will have high overall employment growth rates (the industry-mix hypothesis); (2) that a competitive shift of employment growth from the northeast and midwest to the south and west has occurred.

The first hypothesis appears at first glance to be self-evident. But the hypothesis being tested does not simply assign a component of growth to industry-

mix, as does shift-share analysis; rather it tests whether or not a favorable initial industry-mix does in fact lead to subsequent rapid growth. When it is noted that: (1) the industrialized states of the northeast and midwest have relatively high proportions of trade and service employment; (2) trade and service industries have been fastest-growing at the national level; and (3) the northeast and midwest have exhibited the slowest overall employment growth rates in recent years, then it can readily be seen that the industry-mix hypothesis could be rejected by the statistical test. This could occur if most of the employment growth in trade and service industries were occurring in states with low proportions of employment in these industries--a catching-up process, perhaps.

While the industry-mix hypothesis is wholly demand-centered, the competitive shift hypothesis is partially supply-oriented. (An interesting theoretical model of the interactions of supply and demand in regional growth is given in [1]). Ashby argued that the competitive shift was the most important component of shift-share analysis, because it "may be related to a region's access to markets on the selling side, and its access to raw materials, labor and other inputs on the buying side..." [2, p.19]. The present study attempts to capture the supply-side influences on competitive shifts via a set of regional dummy variables for the northeast, midwest and south (resource constraints precluded more direct measurement of location factors). If location factors in the south and west are attracting industrial shifts, and if these shifts are independent of other structural variables, then the coefficients of the regional dummy variables will be statistically significant and have appropriate signs. It is the indep-endence of the regional shifts from other structural variables which is critical. It is obvious that shifts have been occurring, but can the shifts be explained simply in terms of other structural variables, or are they due to changes in regional factor prices (such as energy prices, as Miernyk has suggested [13]) and/or an increased desire for amenities?

The dependent variables for the shift-share hypotheses were defined as GRO, the rate of growth of total employment for the five years after a structure was defined, that is 1960-65, 1965-70, and 1970-75; and RG, the rate of employment growth for a state divided by the U. S. rate of growth. This latter variable was used for the combined equation, to eliminate the cyclical effect present in the data (U. S. employment grew by 8.3 percent from 1960-65, by 13.5 percent from 1965-70, and by 7.5 percent from 1970-75 [17, 20]. The independent variables for the industry-mix hypothesis were:

> MAC = the percentage of employment in machinery and equipment (nonelectrical and electrical) plus instruments (SIC 35 + 36 + 38). These were the only durable goods manufacturing industries in which the percentage employed in the U. S. did not decline between 1960 and 1970. Thus, they are fast-growing, relative to other durable manufacturing industries.

> CHE = the percentage of employment in chemicals, petroleum, coal, rubber and plastic products (SIC 28 + 29 + 30). These were the only nondurable goods manufacturing industries in which the percentage employed in the U. S. did not decline between 1960 and 1970.

MN = the percentage of employment in mining (SIC 10-14), an industry which grew slowly until the early 1970s, then very rapidly.

Other = any of the Clark-Fisher variables, when used to explain growth rather than per capita income, may reflect the industry-mix hypothesis to the extent that they grew faster (trade, services, government) or slower (agriculture, manufacturing) than average at the national level.

For the competitive shift hypothesis, only the dummy variables N, M, and S, equal to unity if a state were in the northeast, midwest or south regions, otherwise equal to zero, were employed.

The Diversity Hypothesis. The third hypothesis tested is that economic "diversity" is associated (either positively or negatively) with economic attainment and economic progress. A regional economy is considered diverse to the degree that its structure mirrors the structure of the national economy. Wasylenko and Erickson, in a recent study of various indices of industrial diversity, concluded that the "national average" measure was "the most appropriate norm to measure diversity" [21]. This measure is computed by the formula:

$$(1) \quad DIV = 100 \sum_{i=1}^{n} \frac{(P_i - M_i)^2}{M_i}$$

where

P_i = the proportion of total employment in the ith industry in a state.

M_i = the proportion of total employment in the ith industry in the U. S.

Perfect diversity is indicated by an index value of zero: proportions employed in all industries are identical in the region and the nation, so the economic structures are identical. The index was computed for each state for 1960, 1965 and 1970, using groups of two-digit SIC industries except within manufacturing, where single two-digit industries were used.

While no one has yet claimed that a higher index of diversity per se is negatively (or positively) associated with economic growth or per capita income [8], it has been suggested that a low index of diversity would make a regional economy perform like the U. S. economy in recessions and expansions, while a high index would tend to make a regional economy fluctuate more than the U. S. (i.e., be less stable), [14, p.176]. The inclusion of the diversity variable in our equations, holding other structural variables constant, will reveal any relationship which might exist between diversity and economic performance.

Procedure. Multiple linear regression equations were first estimated for all independent variables (except T) to explain GRO and Y in each of the three study periods, to determine which independent variables were statistically significant in each period, and whether the relationships were constant over all three periods.

In the second step, statistically insignificant variables were omitted and the equations reestimated for each period. Both steps were repeated with the

data combined for all three time periods. The trend variable was included in the Y equation, and RG was used instead of GRO as a dependent variable to eliminate cyclical effects.

Results

Economic Growth. As Table 1 shows, economic growth was consistently explained by the percentage of employment in services and finance, and by location. That is, in every period estimated, services employment was positively related to economic growth, while location in the northeast or midwest was negatively related to economic growth. This provides strong support for the shift-share hypotheses: services and finance were among the fastest growing industries in the U. S. over the period tested, and states with high percentages of employment in services and finance grew fastest, holding other factors constant (the industry-mix hypothesis). On the other hand, states in the northeast and midwest experienced a negative competitive shift of sufficient magnitude to offset the gains they might have made due to industry-mix (i.e., their high proportions of trade and service employment).

The effect of the percent of employment in services and finance diminished during the three periods, however. The coefficient for 1960-65 was about 1.5, compared to 0.4 for 1970-75. This suggests that the ability of state economies to grow via services and finance industries may be limited; some minimum level of growth in goods-producing industries may be necessary to sustain overall economic growth.

The effect on economic growth of location in the northeast jumped dramatically in the 1970-75 period, confirming the well-known fact that the northeast suffered most in the severe national recession of 1974-75. Even in the other periods, however, location in the northeast or midwest was associated with a loss of 6 to 9 percentage points in employment growth.

Other values which were statistically significant in only a single period and lent partial support to the industry-mix hypothesis were MN in 1960-65, and MAC and TDE in 1965-70.

The negative, significant coefficient for location in the south for 1970-75 may reflect the sharp impact of the 1974-75 recession on the construction and related manufacturing industries in the southeast--particularly Florida, Georgia and the Carolinas.

The coefficient of diversity was statistically significant only for the 1970-75 period. Its positive sign indicates that the less like the U. S. structure a given state's economic structure was, the more rapidly it grew.

R^2 values indicate that well over half of the variation in growth rates was accounted for by structural and locational variables for each of the three periods considered separately. For the combined period, explained variation was only about 40 percent. The fact that the standard error grew, and R^2 declined, from period to period indicates that some variable or variables not included in the equation had an increasingly important effect on economic growth.

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TABLE 1: Economic Growth vs Economic Structure 1960-65, 1965-70, 1970-75 and Combined

Variable		Constant	DIV	MN	MAC	TDE	SVC	N	M	S
1960-65 R^2 = .79 σ = 3.78	GRO =	-8.703		-.966 (.229)			+1.477 (.135)	-9.625 (1.583)	-6.185 (1.394)	
1965-70 R^2 = .60 σ = 4.44	GRO =	-14.851			+7.62 (.256)	+1.011 (.362)	+.562 (.171)	-8.138 (2.248)	-8.309 (1.830)	
1970-75 R^2 = .61 σ = 5.39	GRO =	10.073	.044 (.018)				+.413 (.205)	-17.489 (2.315)	-9.046 (2.452)	-8.016 (2.254)
Combined R^2 = .42 σ = .71	RG =	-.2738					+.1046 (.013)	-1.014 (.157)	-.535 (.145)	

Notes: 1. Numbers in parentheses are standard errors of coefficients.
2. All variables are statistically significant at the .05 level.

Per Capita Income. Services was the principal variable explaining per capita income, as Table 2 indicates. However, variables for fast growing manufacturing industries were also important in all periods estimated, and a southern location was negatively related to per capita income in two of the periods. TDE was statistically significant in two of the periods, but was somewhat intercorrelated with SVC ($r^2 \leq .25$).

For the combined period the results were similar, except that the trend variable entered with a positive sign, an additional tertiary industry (GV) entered with a positive sign, and a secondary industry (MN) entered with a negative sign.

These results offer support for the Clark-Fisher hypothesis, since concentration of employment in the tertiary sector consistently led to higher per capita income. Of interest, too, is the fact that the negative effect of location in the south existed only in the first two periods. Apparently, the shortfall of southern per capita incomes which persists today is accounted for by structural differences such as a low percentage of tertiary employment. The indication is that for 1970-75 and the combined periods, the Clark-Fisher hypothesis did an adequate job of accounting for different levels of per capita income.

However, the statistical significance and positive signs of the percentage of employment in machinery and equipment and chemicals and related industries provides interesting evidence for the industry-mix hypothesis. Interesting because industry-mix is a component of shift-share analysis and relates only to economic growth, not per capita income. Moreover, economic growth and per capita income were not highly correlated—indeed, the correlation was negative for one of the three periods. Since machinery and equipment and chemicals and related industries pay high wages relative to other manufacturing industries, these findings suggest a variation on the industry-mix hypothesis, relating economic structures dominated by high-wage industries to high per capita income. On the other hand, neither services nor government pay particularly high wages—and concentration in them was also related to high per capita income. Perhaps what is needed is a hybrid of the Clark-Fisher and industry-mix hypotheses: regions in which the economic structure is concentrated in high-wage secondary industries and/or tertiary industries will tend to have high per capita incomes.

R^2 values were higher for the per capita income equations than for the growth equations, ranging from .71 to .87 (compared to .42 to .79 for the growth equations). Thus, structural variables do a better job of explaining per capita income than economic growth.

Conclusions

Economic structure accounts for a large share of the variation in both rates of economic growth and per capita income levels for states. The shift-share hypotheses explain over 60 percent of employment growth on a period-by-period basis, but when the periods are combined, these variables account for only about 40 percent of variation in employment growth. The Clark-Fisher and a hybrid Clark-Fisher/industry-mix hypothesis explain over 70 percent of state-to-state variation in per capita income on a period-by-period basis, and 87 percent of the

TABLE 2: Per Capita Income vs Economic Structure 1960, 1965, 1970, and Combined

Variable		Constant	T	MAC	CHE	TDE	SVC	GV	MN	S
1960 R² = .80 σ = 203.71	Y =	1185.58		+27.25 (10.28)	+73.85 (14.00)		+49.38 (7.37)			-372.12 (79.31)
1965 R² = .79 σ = 219.35	Y =	908.49		+43.28 (11.07)	+63.99 (14.39)	+45.26 (17.99)	+37.16 (8.12)			-349.16 (85.62)
1970 R² = .71 σ = 301.66	Y =	509.67		+65.66 (13.88)	+50.72 (17.96)	+85.27 (24.94)	+57.70 (10.59)			
Combined R² = .87 σ = 309.31	Y =	-309.74	+566.07 (46.16)	+67.26 (10.05)	+52.00 (11.03)		+60.54 (5.93)	+47.41 (16.92)	-27.01 (13.24)	

Notes: 1. Numbers in parentheses are standard errors of coefficients.
2. All variables are statistically significant at the .05 level.

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variation when the periods are combined. Thus, states with large percentages of employment in tertiary industries, or in secondary industries which pay high wages, tend to have high per capita incomes.

While location in the south or west was positively associated with growth, location was not consistently associated with per capita income, when structural variables were held constant. Economic diversity--similarity or dissimilarity of a state's economic structure to the U. S. structure--was unrelated to either employment growth or per capita income. Thus broad measures of diversity seem to be of doubtful usefulness as measures of economic structure.

The policy implications of these findings are limited. In terms of federal policy toward regional economic development, they indicate that only public invest- ments massive enough to influence the fundamental economic structure of a state or region will have much effect, on either economic growth or per capita income. Thus changes in federal funds allocation formula which redirect expenditures toward declining regions may only serve to delay inevitable shifts of resources. From the perspective of state government policies, the results indicate that development efforts should be concentrated on service industries, and to some extent on high-wage manufacturing industries--and states are already doing this.

The estimated regression equations generate confidence intervals which are too wide to make precise numerical predictions practicable. However, predictions of relative magnitudes of economic growth and per capita income are possible. Thus, this paper has shown that measures of economic structure are useful in both explaining and predicting economic performance, despite their limited theoretical basis.

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