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Industrialization, Factor Markets and
Agricultural Development: Comment*

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Professor Nicholls has presented, in his paper, a concise summary of the research on economic development in the Upper East Tennessee Valley and the South Carolina-Georgia Piedmont under the Vanderbilt project on Southern Economic Development. In this research Professor Nicholls and his colleague Professor Tang have placed particular emphasis on the differential impact of variations in resource endowments and rates of industrial-urban development on local agricultural development. They have taken as their point of departure, Professor Schultz's seminal observations on the association between industrial-urban development and geographic differentials in factor returns within a national economy.

In this discussion I will direct my comments first to the empirical findings of the Nicholls-Tang research, then to the theoretical foundations of Professor Schultz's empirical generalizations, and finally to some suggestions for historical research on area development policy.

* Comment on W. H. Nicholls, "Industrialization, Factor Markets, and Agricultural Development" presented at the Conference on the Role of Agriculture in Economic Growth, sponsored by the Social Science Research Council's Committee on Economic Growth, Stanford University, November 11 and 12, 1960.

I. Empirical findings of the Vanderbilt Project

Nicholls and Tang found that in both the Tennessee Valley and the Piedmont differences in income per farm worker narrowed during the period 1860-1900 and widened during the period 1900-1950. In both areas the initial convergence corresponded roughly with a period of relative stagnation in non-farm development and the subsequent divergence with a period of relatively rapid growth in the non-farm sectors.

Variations in gross farm income per worker among counties in 1860, 80 to 100 years after initial settlement, are attributed primarily to differences in "original" land resources and the introduction of new cash crops resulting in windfall gains and higher rates of capital formation in counties with superior land resources.

By 1900 the impact of "original" differences in factor endowments on intra-area differences in income per farm worker had largely disappeared. Convergence of income differentials among counties between 1860 and 1900 is attributed to lagging industrial-urban development relative to population growth and to intra-area factor adjustments - primarily labor mobility.

After 1900 differentials in income per farm worker among counties again widened. By 1950 income per farm worker in those counties which had achieved substantial industrial-urban development had forged far ahead of the levels achieved in neighboring counties which had not enjoyed comparable non-farm development after 1900.

The differential impact of industrial-urban development on farm income during the period 1900-1950 is explained in terms of the functioning of factor and product markets. According to Nicholls,

" . . . the dynamic nature of industrial-urban development had a disequilibrating effect on farm incomes per worker which more than offset the equilibrating effect of continued factor transfers . . . Presumably, . . . local industrial-urban development transmits its effects on local agricultural productivity and incomes through its impact on local factor and product markets, which function more efficiently the greater the level of nearby industrial-urban development".

Of the several product and factor markets the major impact was apparently exerted through the labor market.

I have no quarrel with the empirical generalizations concerning the impact of industrial-urban development on agriculture in the Tennessee Valley and the Piedmont. They are consistent with my own less detailed analysis of the impact of industrial-urban development on agriculture in the Tennessee Valley and the Southeast where it was found (a) that most of the 80-100 counties in the Southeast which achieved farm income and living levels comparable to the national average between 1930 and 1950 were located in close proximity to growing industrial-urban centers^{1/} and (b) that the impact of industrial-urban development was exerted primarily through the labor market.^{2/} They are also consistent with Sisler's recent analysis which indicates that the impact of local industrial-urban development on the incomes of both farm and non-farm families is greatest in eastern and southern economic regions of the United States, where capital accumulation and population growth have had sufficient time to blur the effects of variations in original resource endowments and weakest in the more newly settled western economic regions where differential resource endowments continue to play an important role in the location of economic activity^{3/}.

Nicholls recognition of the role of resources as a factor explaining the wide variations in income among counties that existed in 1860 is also consistent with Professor North's comment on the Schultz industrial impact hypothesis.

^{1/} Vernon W. Ruttan, "Economic Development and Adjustments of Southern Low-Income Agriculture: Discussion" Journal of Farm Economics, Vol. 36, No. 5, December 1954, pp. 1158-1160.

^{2/} Vernon W. Ruttan, "The Impact of Urban-Industrial Development on Agriculture in the Tennessee Valley and the Southeast" Journal of Farm Economics, Vol. 37, No. 1, February 1955, pp. 38-56.

^{3/} Daniel G. Sisler, "Regional Differences in the Impact of Urban-Industrial Development on Farm and Non-Farm Income" Journal of Farm Economics, Vol. 41, No. 5, December 1959, pp 1100-1112.

North insists that while the hypothesis may be valid for the contemporary American scene, it is certainly not correct to argue that economic history strongly supports the hypothesis that economic development has taken place primarily in areas dominated by industrial-urban centers.^{1/} North cites Denmark between 1865-1900; Canada between 1900-1913; the Pacific Northwest between 1880-1920; the Midwest between 1815-1860 and California between 1848-1900 as areas where rapid development of the extractive industries has been the prime influence inducing economic growth. The question which has eluded the grasp of both North and Nicholls is why other areas, such as the Piedmont and the Tennessee Valley, which achieved an initial rapid economic development based on a favorable demand for resource based products did not provide fertile ground for the emergence of the expanding industrial-urban centers that are essential to the long term growth of population and per capita income levels.

There is some temptation to quibble about the rigor of Nicholls statistical analysis which is based on the massed support of an impressive number of simple correlation coefficients between operational variables which have only a loose logical connection with the nominal variables implied in the industrial impact hypothesis. Compared, however, with the casual empiricism one frequently finds in articles in the field of both economic history and economic development the Nicholls-Tang work represents a model of sophistication.^{2/}

^{1/} Douglass C. North, "Agriculture in Regional Economic Growth" Journal of Farm Economics, Vol. 41, No. 5, December 1959, pp. 943-951. See also North's article "Location Theory and Regional Economic Growth" Journal of Political Economy, Vol. 63, June 1955, pp. 243-258.

^{2/} It may also be worth while pointing out that the coefficient of variation, the parameter used to indicate the magnitude of intra-area convergence or dispersion is sensitive to change in both the standard deviation and the mean. One would like to be sure that the rise in intra-area dispersion of per capita value added by manufacture in Table 1 not simply a statistical by-product of changes in the mean value.

II. The Schultz Industrial Impact Hypothesis

Attention will now be shifted to the Schultz industrial impact hypothesis which has proven so fruitful as a generator of empirical investigations of the impact of general economic growth on geographic differentials in factor returns in recent years. The hypothesis is presented by Schultz in the form of three statements:

- (1) "Economic development occurs in a specific locational matrix ..
- (2) These locational matrices are primarily industrial-urban in composition . . .
- (3) The existing economic organization works best at or near the center of a particular matrix of economic development and it also works best in those parts of agriculture which are situated favorably in relation to such a center . . . ^{1/} "

The rationale for the industrial impact hypothesis is presented in terms of more efficient functioning of factor and product markets in areas dominated by developing industrial-urban centers. As a result most serious efforts to test the industrial impact hypothesis have included attempts to test not only the validity of the empirical generalizations but also the validity of the factor and product market rationale. The result has generally been to sustain the validity of Schultz's empirical generalizations with respect to the impact of industrial-urban growth on geographic differentials in factor returns. The tests of the factor and product market rationale, however, have been much less conclusive. Only in the case of the labor market is the evidence clear cut and here the impact appears to be traced almost entirely to the non-farm earnings of part-

^{1/} T. W. Schultz "The Economic Organization of Agriculture" (New York, McGraw-Hill, 1953), p. 147. See also "A Framework for Land Economics - The Long View" Journal of Farm Economics, Vol. 33, May 1951, pp. 204-15.

time farmers.^{1/}

Part of the difficulty in obtaining convincing results stem from the problem of specifying the operational variables to be used in testing the market performance hypotheses. This is precisely the problem which forced Nicholls to depend so heavily upon the mass support of simple correlation coefficients.

It will be argued here, however, that the major difficulty stems from an attempt to force imperfections in the factor and product markets to bear a heavier analytical burden than they can logically stand. In other words, even if policies and institutional arrangements could be developed to remove market performance differentials among regions factor returns would remain highest in both the farm and non-farm sectors of those regions which contain the largest industrial-urban concentrations.

Market imperfections represent institutional restraints which are revealed in the failure to achieve comparable returns to comparable resources in production and/or comparable prices for identical products in distribution. The terms comparable and identical imply the existence of a host of "technical" restraints among which those associated with location and time are most frequently overlooked. Given the existence of such technical restraints it becomes necessary to supplement the market performance rationale to explain the demonstrated association between local industrial-urban development and geographic differentials in factor returns.

No attempt will be made in this discussion to adequately fill the gap left by the failure of the market performance rationale to carry the entire analytical burden. It is suggested, however, that one element in a more complete explanation was provided when Allyn Young, in his famous article in the 1928 Economic

^{1/} Nicholls, op. cit., p. 34, Ruttan, op. cit., pp. 48-56.

Journal^{1/} widened the scope of Adam Smith's dictum that "the division of labor depends upon the extent of the market" by arguing that increasing returns to all resources are possible as long as the market has not expanded sufficiently for all productive activities to be carried out in operations of sufficient size to permit full achievement of internal scale economies. Within any restricted market area or region, therefore, a substantial share of economic activity must be conducted at less than the technically optimum level of operations or goods must be imported from other areas at some positive level of transportation cost.

Given a geographic dispersion in the demand for an industries product most firms will tend to substitute higher operating costs for transportation costs and operate to the left of the lowest point on their long run cost curve.^{2/} Expansion of regional markets tends to reduce the incentive to substitute operating costs for transport costs and to push firm output toward the least cost point on the firms long run average cost curve. Under these conditions factor returns in regions which experience the most rapid growth in demand can be expected to be higher than factor returns in regions with relatively slow growth in demand.

Young, of course, focused his attention on national rather than regional economies. Today's perspective would, however, emphasize the role of industrial-urban centers or regions containing such centers as the only potential areas which can provide the concentration of both industrial and commercial facilities and product demand sufficient to permit anywhere near full exploitation of potential scale economies.

^{1/} Allyn Young "Increasing Returns and Economic Progress", Economic Journal, Vol. 37, December 1928, pp. 527-542.

^{2/} Arthur F. Smithies, "Optimum Location in Spatial Competition" Journal of Political Economy, Vol. 49, June 1941, pp. 423-439. Also George H. Borts, "The Equalization of Returns and Regional Economic Growth" American Economic Review, Vol. 50, No. 3, June 1960, pp. 319-347. Borts points out that either (a) regional differences in production functions, or (b) transport costs which prevent commodities from having the same relative prices in each region can prevent factor prices equilization from occurring (p. 322).

A second element in a more complete explanation must be introduced to take into account the effect of the uneven distribution of "strategic" resources. Vining^{1/} has suggested that the dispersion of such "strategic" resources over very large geographic areas resembles the pattern that would prevail if such resources were randomly distributed. Any small geographic region would typically be characterized by a unique combination of "strategic" resources. Only a few such areas would contain any quantities of the relatively scarce "strategic" resources; many areas would contain at least some of the more plentiful "strategic" resources; and some regions would contain none or at best limited quantities of any of the "strategic" resources.

In Vining's system the dispersion of "strategic" resources within a region results in only a minimal dispersion of the population during the more advanced stages of development. The scale economies emphasized above have the effect of (a) concentrating most of the activities which are not directly associated with the extraction, initial processing, and provision of local services for persons and firms engaged in extraction and initial processing in the larger central places and (b) concentrating the largest central places in those regions which possess superior combinations of "strategic" and "ubiquitous" resources.

A third element, which contributes to an understanding of the tendency of factor returns in the agricultural sector to vary in relation to the level of industrial-urban development is provided in recent articles by Johnson^{2/} and Edwards^{3/}. Johnson and Edwards emphasize the difficulty of achieving optimal adjustments in resource inputs, particularly labor inputs and capital equipment, in situations characterized by wide differences in factor and product acquisition

^{1/} Rutledge Vining "On Describing the Structure and Development of A Human Population System" Journal of Farm Economics, Vol. 41, No. 5, December 1959, pp. 922-942, Also "A Description of Certain Spatial Aspects of an Economic System" Economic Development and Cultural Change, Vol. 3, No. 2, January, 1955, pp. 147-195, and "Statistical Conceptions in the Study of the Spatial Structure of an Economic System" Journal of the American Statistical Association, Vol. 48, No. 1, March 1953, pp. 44-66.

^{2/} Glenn L. Johnson, "The State of Agricultural Supply Analysis" Journal of Farm Economics, Vol. 42, No. 2, May 1960, pp. 435-452.

^{3/} Clark Edwards, "Resource Fixity and Farm Organization" Journal of Farm Economics, Vol. 41, No. 4, November 1959, pp. 747-759.

and salvage costs. As a result of such differences firms are faced with two sets of iso-marginal value product functions for each input. This implies the possibility of multiple factor combination and output optima depending on the relationship between acquisition and salvage values for individual factors.

Part of the differences between factor and product acquisition and salvage costs, particularly in the case of products which are used as current inputs at a later stage in production are due to the space or transport cost effect identified above. Such differences, reflected in wide discrepancies in the sale and purchase prices of intermediate production goods at specific locations, is responsible for much of the vertical integration that occurs within many agricultural and non-agricultural firms. Shifts in technology and demand over time, often classified under the heading of dynamics, are particularly important in bringing about differences in the acquisition and salvage costs of capital equipment and labor. This gap helps account for the persistent use of obsolete technology in the presence of rapid technological advance and the ability of firms in declining industries or regions to retain their labor force in spite of lagging wage rates.

In the Johnson-Edwards model the more rapid the growth in product demand or the closer the market value of the inputs in alternative uses the greater the possibility that salvage values will approximate market acquisition costs. These conditions are more likely to be met for both agricultural and non-agricultural firms located in a region characterized by expanding industrial-urban development than in regions characterized by limited development.

Evidence indicating the importance of each of the suggested supplements to the market performance rationale can be mustered. With respect to the importance of scale economies Stigler has estimated that economies of scale have been of roughly the same order of magnitude as technological change in bringing about

productivity increases in the American economy over the last six decades.^{1/} Chenery estimates that an even larger share of growth rate differentials among countries can be attributed to scale economies and that realization of significant additional scale economies are possible from development of the less industrialized regions within national economies.^{2/} And the results of industrial complex analysis by Isard and his associates has emphasized the scale economies resulting from the location of complementary industries within a given urban center or region.^{3/}

Evidence regarding Vining's thesis on the locational dominance of central places in relationship to "strategic" resource sites can be found in the failure of the less industrialized regions of the United States economy (excepting the Pacific Region) to increase their share of total industrial employment to any significant extent in recent years and the continuing concentration of industrial employment and population in existing standard metropolitan areas even in the less industrialized regions of the United States.^{4/}

The contribution of the Johnson-Edwards analysis is illustrated by the relationship between age and income levels in the rural and urban sectors of the American economy. In the urban and rural nonfarm sectors maximum median family incomes are typically achieved in the 45-54 year age group. In the rural farm sector maximum median family incomes occur in the 35-44 year age group. In the Johnson-Edwards terminology the salvage value (or opportunity costs) of labor

^{1/} George J. Stigler, "Economic Problems in Measuring Changes in Productivity" in Output, Input and Productivity Measurement, Princeton, forthcoming 1960 (National Bureau of Economic Research Studies in Income and Wealth, 25).

^{2/} Hollis B. Chenery, "Patterns of Industrial Growth" American Economic Review, Vol. 50, No. 4, September 1960, pp. 643, 644, 651.

^{3/} Walter Isard, Methods of Regional Analysis, John Wiley, New York, 1960 pp. 375-412.

^{4/} Vernon W. Ruttan, "The Potential in Rural Industrialization and Local Economic Development", in E. O. Heady, et. al. (eds), Agricultural Adjustment Problems in a Growing Economy, Iowa State College Press, Ames, 1958, pp. 185-197.

begins to decline sooner in the farm sector than in the non-farm sectors. This earlier decline is presumably related to a combination of declining farm labor requirements in agriculture and lack of sufficient local nonfarm employment opportunities in rural areas which require skills similar to those used in operating a farm enterprise in contrast to more ready employment alternatives for workers who are forced into involuntary job mobility in urban areas.^{1/}

It is not argued that these three additional elements represent a completely adequate or consistent model for analyzing the empirical association between local industrial-urban development and geographic differentials in factor returns. It is argued they do represent essential elements in any such complete model.

^{1/} A recent study at Purdue of job migration and mobility in a high income farming area indicates that farm operators and workers who shifted to local non farm employment did not, on balance, achieve a higher income than they had been earning in agriculture and tended to occupy a lower social status in the community after the shift in employment than before, see P. G. Olson, Job Mobility and Migration in a High Income Rural Community, Purdue Agricultural Experiment Station Bulletin, RB 708, Lafayette, November 1960.

III. Area Development Policy Research

The development policy implications of such an expanded model are considerably different than the policy implications based on the market imperfection rationale. If a complete explanation could be obtained in terms of market performance the obvious implication would be to implement economic policies and design institutions which would permit, or force, the several product and factor markets to perform more nearly as they might be expected to perform under conditions of perfect competition. If, however, the differentials in factor returns reflect the impact of the scale, location, and dynamic elements suggested above market policies may be relatively ineffective in removing geographic differentials in factor returns.

There would seem to be some point in two final comments with respect to the conduct of historical research on regional economic growth where the objective is to provide guides for current decisions in the area of regional development policy.

The first comment deals with the observation that very little attention is typically given to a clear-cut separation of those variables which are subject to social control and those which be outside the impact of policy decision, in analyzing the factors which have brought about differential factor returns within an area or among areas. If policy uses of the investigation are an important objective it would appear that a satisfactory model would involve the following components: For any small geographic area and time period the model would include a large number of exogenous variables over which the population living in the area and the time period is not capable, either publicly or privately, of exerting any real control. It would also include a limited number endogenous variables subject to collective control. The wider the geographic area within the sphere of a public decision making unit and the longer the time period involved the more extensive would be the number

of variables over which public control could be exercised, and the smaller the number of variables outside of the impact of public policy. At each level of analyses those variables which were subject to public control during the historical period under study, or which are currently or potentially subject to public control, should be clearly distinguished from those variables which are not subject to such public control and the impact of variations in the two sets of variables carefully distinguished.^{1/}

The second comment deals with the potential contribution of economic theory in guiding economic development policy. One frequently hears, though apparently not in the papers being presented at this conference, a plea for a "general" or an "integrated" theory of economic development and the parallel assertion that when such a theory does become available it will be possible to resolve many of the current difficulties and confusions in the area of development policy. I would like to register disagreement with both the plea and the assertion.

Disagreement with the plea stems from a conviction that a theory of economic development is not possible. Those theories which have proven of permanent value in our profession are those which predict particular patterns of association among a limited number of variables under conditions of general stability in both the level of other variables and the structural relationships among the system of variables. Economic development destroys this stability.

Disagreement with the assertion stems from an alternative position on the most effective method of arriving at policy proposals in the area of economic development. It is possible to construct national and regional growth models, based on the approach outlined above, which do indicate in particular regions and time periods - South-

^{1/} For an elaboration see J. K. McDermott, "A Framework for Rural Development" Journal of Farm Economics, Vol. 40, No. 3, August 1960, pp. 567-575.

eastern United States or (not and) West Africa in 1960 public activities which hold out a favorable prospect for relatively high social returns. By 1970 the models will have to be rebuilt and the policies varied.

Historical studies of economic development conceived in the framework suggested by these two comments can contribute to more effective theorizing about the specific immediate determinants of economic development in a specific location and time. A basic requirement of such studies is that the authors devote the time and effort to become deeply familiar with the functioning of the specific economy and region. I can only admire the thoroughness with which Professor Nicholls has approached this task.