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RURAL DEVELOPMENT RESEARCH
CONCEPTUALIZING AND MEASURING KEY CONCEPTS

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In a paper presented at these meetings two years ago, Back argued that "the unsatisfactory state--of rural development policy reflects in part either an inadequate or inaccessible knowledge base" (p. 1125). Basically, Back was arguing that research in rural development had not provided policy-makers with the information necessary to formulate a cohesive national rural development policy. In addition, he argued that the reason for the "knowledge gap" is the institutional arrangements for conducting rural development research.

Edwards suggests an alternative reason for the knowledge gap. He argues that the rural development researcher is faced with a host of partial theories of economic development but has no general theory to guide his empirical work. Although Edwards does not make the point explicitly, an implication is that the knowledge gap will remain until a comprehensive theory of rural development is forthcoming.

In this paper, we would like to suggest a third reason for the continued existence of a knowledge gap. We maintain that rural development researchers have not done a good job of operationalizing and measuring the relevant concepts in the rural development process. We believe that the institutional arrangements for conducting rural development research can be improved and that additional conceptual

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work is needed. However, significant progress can be made in bridging the knowledge gap given existing institutions and conceptual frameworks if more resources are devoted to operationalizing and measuring the relevant concepts. The objective of this paper is to present suggestions concerning how we might improve the operationalization and measurement of rural development research.

In his presidential address a year ago, Bonnen provided a useful framework for discussing these issues. He argued that a good information system must satisfy three conditions. First, it must have a good conceptual base. Second, special attention must be given to operationalizing the concepts. That is, the phenomena we are measuring in reality must be highly correlated with the concept. Third, we must measure accurately the real world phenomena involved. Each of these three conditions will be addressed below in the context of rural economic development.

Conceptualizing Rural Economic Development

In this section we discuss Bonnen's first criteria, namely, the conceptual basis for rural economic development. In an attempt to narrow and focus, rural economic development is assumed to be reflected by increases in employment and/or income. We would argue that the major determinants of income and employment in a given economic space (a rural community) are (1) the quantity of the goods and services sold to and inputs purchased from outside the community; and (2) the extent to which dollars entering the local area are "re-circulation" within the local economy. Thus, conceptually the economic development of an

area involves explaining (1) the economic forces affecting the geographical location of firms producing goods and services or sales outside the area and (2) the complexity of the local economy in terms of retail trade and service activities.

Edwards has surveyed and classified the theoretical literature that address these two questions and concludes that the suggested determinants of economic development are: (1) supply, (2) demand, (3) space, (4) institutions, or (5) technology.

The difficulty is that little if any of the literature explicitly addresses these five factors simultaneously; however we argue that the common theme in this literature is that private firms will locate at that point in space where they can maximize profits. That is, the concept of spatial profit maximization can be used to integrate the five types of variables used in location theory for explaining the action of individual firms.

Briefly, an example of this integration is as follows. In the context of rural communities, it is realistic to assume that firms are price-takers in the output market. Thus, the firms will be primarily concerned with the transportation cost to its market (spatial factors) because the market price net of transportation cost determines the demand curve faced by the firm (demand factors). On the other hand, the firms may be large enough to influence the price of the inputs the purchase in the rural communities. Thus, the supply of locally purchased inputs are of prime importance to a prospective firm (supply factors).

In addition, a prospective firm's profits can be sensitive to state or local laws (institutional factors) regulating permissible, productive processes (technological factors).

In addition to economic factors, issues such as informal contacts and community attitudes toward economic development may be important in the firm's location decision. Rural sociologists are trained to deal with these issues, and if our analysis of the rural development activities is to be complete we must have their input.

In essence, we argue that the underlying assumption of location theory, as detailed in the five types of factors suggested by Edwards, is spatial profit maximization. This, it seems to us, is a widely accepted theoretical framework that provides an adequate base for empirical work concerning the location of firms.

The second issue raised at the beginning of this section concerned the extent to which the income generated by the exporting firm is "re-circulated" through the local economy. The essence of this issue is what types of service and trade activities are located in the community. Conceptually, the location of these types of activity is similar to export activities. The issues are treated separately here because of the traditional separation in empirical and theoretical works. If asked the question "What will be the secondary income and employment effects of a new plant?", the typical response is "conduct an input-output or export base study." In many cases this may be appropriate; however, in rural communities a new plant may result in significant changes in the local economic structure and trade patterns. Since trade patterns and economic structure are assumed not to change

in the typical input-output and export base approaches these techniques are not directly applicable. Fortunately, Losch (and to some extent Christaller) has provided a solid conceptualization which explicitly addresses community economic structure and trade.

Thus, we would argue that there is an adequate theoretical model to explain the geographic location of economic activity. We believe this model, though in need of improvement, does satisfy Bonnen's first criterion.

Operationalizing Key Concepts

The general theoretical model outlined above has been of limited usefulness to policy-makers because the relationships in the model have been subjected to very limited empirical testing. One of the major reasons for this is that the concepts (or variables) in the model have not been carefully operationalized and measured (Bonnen's second and third criteria).

The general model suggests that the supply of labor at a potential plant site affects the profit function of a firm. Empirical information indicates that many of the firms that locate in rural areas are labor intensive. Thus, one can hypothesize that there should be a strong positive relationship, ceteris paribus, between available labor supply and the location of new firms. To test this relationship one must, among other things, operationalize and measure the concept of "labor supply." An example of how to operationalize and measure this part of the general theoretical model is discussed in the remainder of this paper.

How can the concept "supply of labor" be operationalized? The optimum would be to develop estimates of the "labor supply" function at alternative points in space. However, this is unwieldy if not impossible. An alternative is to employ an adaptation of the method used by firms to test the availability of labor at potential sites; namely, a "blind" advertisement soliciting job applications. The rule of thumb is that a firm should obtain three to four applications for each position. In terms of the general model, the firm is attempting to establish that they are facing a perfectly elastic supply of labor. If firms make decisions based on this operationalization of the concept of labor supply, then it can also serve as a starting point for our research.

In essence, the firm's blind advertisement is asking the question "If we create a specific number of jobs of a particular type at a point in space, how many additional people in the surrounding area will participate in the labor force and will commute to the new job?" The three central issues involved are: (1) commuting behavior, (2) labor force participation, and (3) the type of jobs being created.

The first of these issues, commuting behavior, has received some attention in urban areas but little if any in rural areas. However, there is a substantial amount of literature in the general area of economic and social interaction over space. The most popular methodology in this area is the gravity model which holds that the interaction between two points in space is positively related to the mass at the two points and negatively related to the distance between the points. Applying this general model to rural commuting behavior results in a regression model such as the following:

(1) $$V_{ij} = a + b_1 ELF_i + b_2 EMP_j - b_3 D_{ij}$$

Where:

V_{ij} = Volume of work trips from i to j.

ELF_i = Employed labor force at i.

EMP_j = Employment at j.

D_{ij} = Distance between i and j.

If such a model could be empirically implemented and the relationship was strong we would have a method to predict commuter flows in rural areas.

The second issue (labor force participation) has received some attention in urban areas but very little in rural areas. In general, labor force participation is believed to be a function of the social and economic characteristics of the population. However, in the rural setting, labor force participation is likely to depend on the geographic access to employment. A regression model of the following nature could be used to investigate labor force participation rates:

(2) $$LFPR_i = c_o + c_1 GAE_i + \sum_{k=2}^{m} c_k SEC_{ik}$$

Where:

$LFPR_i$ = Labor participation rate in area i.

GAE = Geographic access of people in i to employment opportunities.

SEC_{ik} = Social and economic characteristic of people in i.

Again, if such a model could be empirically implemented and the relationship was strong we could predict labor force participation rates.

These two regression models could be used in pursuing the original question of how to operationalize the concept of labor availability. For example, if a firm locates in area j, the geographic access to employment for area i will be increased by some amount, ΔGAE_i. From (2) the predicted change in labor force participation will be c_1 (ΔGAE_i). The change in employment in area i is the change in the labor force participation rate multiplied by the population in area i, that is, $c_1(\Delta GAE_i)$ $(Population_i) = \Delta ELF$. Substituting this estimate of ΔELF in (1) yields an estimate of the change in the number of people commuting from i to j, namely, $b_1 \Delta ELF_i$. If this procedure is repeated for all of the areas surrounding j and the results summed, we have an estimate of the change in the number of people commuting to area j as a result of the new firm.

The regression models (1) and (2) can be improved by using more detailed employment categories. For example, labor participation rates likely depend on an interaction between the social and economic characteristics of the people and the geographic access to <u>specific types</u> of employment--not employment in general. Likewise, commuting behavior is likely conditioned by occupational characteristics interacting with <u>specific types</u> of employment. Once the specific types of employment are incorporated into the model, the three issues mentioned above are included in the procedure for estimating labor availability. Namely, type of employment generated, labor force participation, and commuting behavior. We now consider methods of empirically implementing this procedure.

Measurement of the Labor Availability Concept

The operationalization of the concept of labor availability discussed above involves substantial data requirements. In general, data requirements are a major reason rural development researchers have done a poor job of operationalizing concepts. That is, we have been unwilling or unable to collect the data necessary to empirically implement good operationalizations of concepts. In previous sections we discussed conceptual issues and the operationalization of these concepts. In this section we will provide examples of how some of the measurement problems can be overcome.

The first issue involved in the operationalization of labor supply was commuting behavior. A study by Fink of the trip distribution process in two specific rural areas provides an important first step for analyzing the commuting question. His analysis provides insights into the factors underlying the trip making behavior of individuals in rural areas. The empirical model designed to measure the volume of trips between an origin and a destination was based on: (1) the employed labor force at the origin; (2) the level of employment at the destination; (3) the commuting distance; and (4) the presence of intervening or competing employment alternatives between the origin and the destination.

The study areas were two rural counties in Pennsylvania. The units of observation were the minor civil divisions (MCDs)--townships and boroughs--in these counties. Imaginary points of trip productions (population centroids) and trip attractions (employment centroids) were

established for each MCD (Figure 1). These centroids were derived in a manner analogous to that of determining center of mass. Trip volumes moving between MCD pairs were calculated from school census data obtained from school districts in each of the two counties.[1/] A 30 by 30 work trip distribution matrix was compiled for one county and a 26 by 26 matrix was prepared for the other. That is, there are 900 MCD origin-destination trip pairs in the first county and 676 trip pairs in the second county. Data on the employed labor force was obtained from the U. S. Census of Population. Employment data were obtained from Dun and Bradstreet Data files. The commuting distance used for each trip pair was the straight-line distance between the population and employment centroids.

The construction of the intervening (IO) and competing opportunity (CO) variables was as follows: If the employment centroid for a MCD fell within the intervening opportunity triangle (Figure 1) that MCD was taken to be an intervening opportunity. The IO variable was defined as the employment at the destination divided by the sum of the employment at all intervening opportunities plus the employment at the destination. Thus, the IO variable takes on a value of one when there are no intervening opportunities and approaches zero as the number of intervening opportunities increase. The competing opportunity variable was constructed in a similar manner using the remaining area in the circle in Figure 1.

The basic approach followed in developing the trip distribution model was to estimate various models utilizing the data from the first study area. After a final trip distribution model was developed,

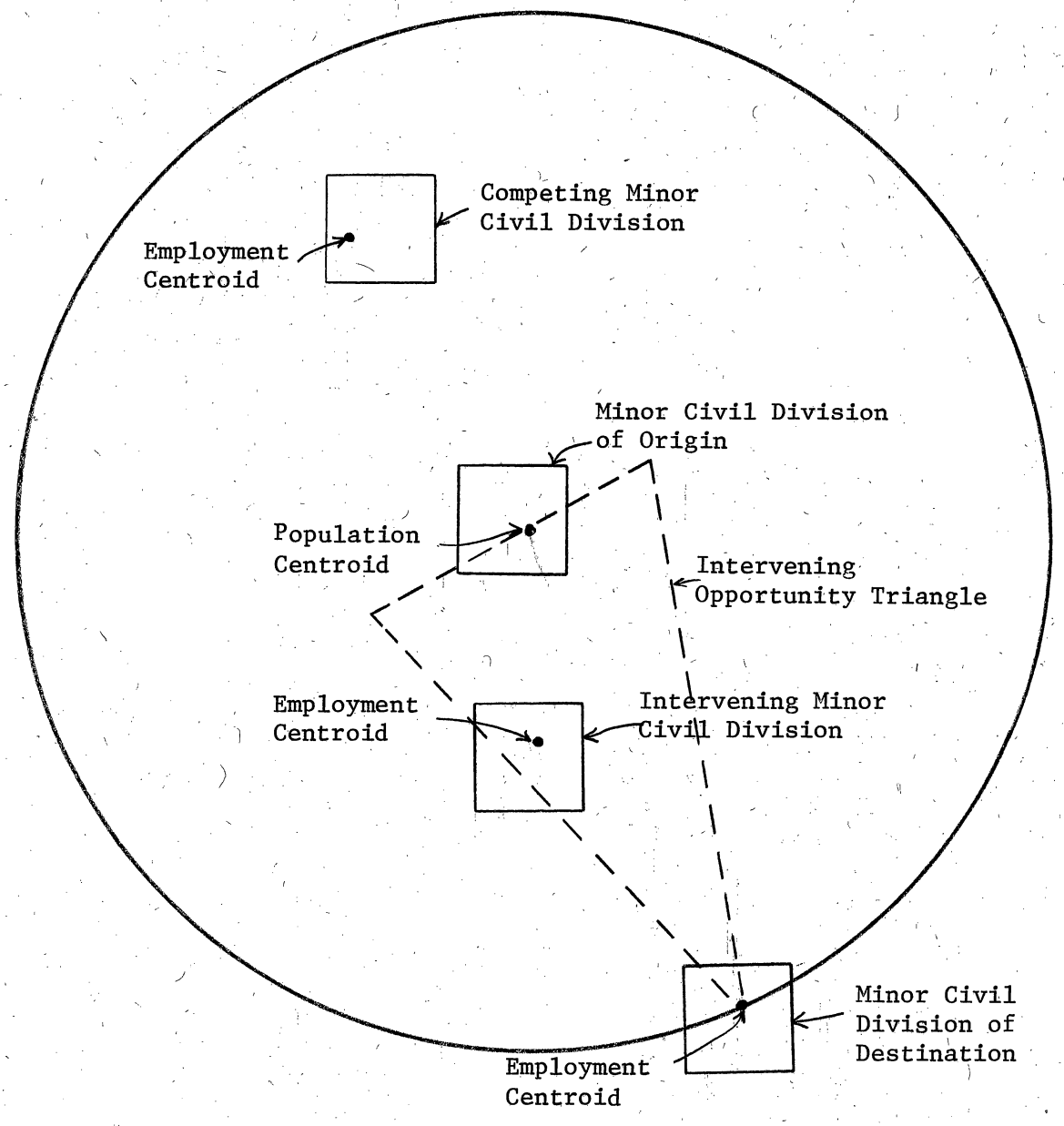

Figure 1. Spatial Arrangement of Population and Employment Centers.

it was tested with data from the second study area. The first model estimated was a crude three variable linear model which used commuting distance and aggregate measures for the activity systems of the origin and destination. The results in terms of the "signs" of the coefficients were consistent with those hypothesized. However, the low R^2 of the model indicated that a more complex model that takes account of the influence of alternative employment opportunities would be required to explain trip distribution. Thus, a new three variable model was developed in which the intervening and competing opportunity variables were entered into multiplicative interaction with the total available labor force at the origin and with the aggregate employment at the destination. Commuting distance was the third variable. The R^2 of this interaction model was .88. The results of this model when compared with those of the crude model suggest that trip distribution is conditioned by alternative employment opportunities.

Two additional sets of runs were made modifying the interaction model. In the first set of runs, the IO and CO components were selectively removed from interaction with the aggregate employment at the destination. The resulting model appeared to be just as adequate for determining the distribution of work trips, i.e., R^2 remained essentially unchanged. Thus, the variation in trip volume explained by destination system interaction is negligible.

In the final set of runs, the IO and CO components were selectively removed from interaction with the total available labor force at the origin but retained with the destination. This reduced the R^2 from .88 to .26. The results of these runs indicated that the interaction

between the origin activity system and the alternative employment opportunities was extremely important to determining work trip distribution. In fact, the results of all of the analysis indicate that the interaction of competing opportunities and intervening opportunity and the available labor force is the single most important factor determining the distribution of work trips.

From those runs we selected a three variable model as our final model. The variables include the available labor force at the origin in interaction with the IO and CO variables, the commuting distance, and the aggregate employment at the destination.

The final step of the analysis was to test this three variable model on a data set from the second study area. Substantial differences were found to exist in the distance and employment parameters of the models for the two areas. However, the interaction of the origin activity system and the IO and CO variables was even more pronounced in the second study area. Hence, it was concluded that the differences in the coefficients on the other variables for the two study areas were probably due to basic differences in the occupational structures in the origins or difference in the economic structure at the destination. Thus, two additional studies--one on the characteristics of the labor force at the origins and a second on the economic structure at the destination--are now being undertaken.

A study designed to develop more specific and accurate measures of the labor force available at the origins is based on primary data from a mail questionnaire. The first objective of the study is to empirically estimate the relationships between various factors in a specific MCD

and its labor force participation rate (LFPR). Further, the procedure is designed to permit comparisons of the LFPR for residents in various occupational categories. Implicit in this first objective is the determination of the relationship between the occupational structure and the trade-off between increases in income (wages) and commuting distance.

The second objective of this research is to integrate these results into the trip distribution model. Effectively this will permit us to determine with a great deal more confidence the specific factors which affect the spatial supply of labor in these rural communities. One would hypothesize, for example, that the blue collar service worker would probably have a quite different set of factors explaining the economic space in which his services are available than would the college professor who "wants to get away from it all and probably even pretend he's a farmer." Again, the emphasis in this study is on the supply of labor as one component in the spatial profit maximizing function.

The second follow-up study will emphasize certain aspects of the spatial demand for labor at the employment destination. The objective of this research will be determined by what occupational-employment combinations are most relevant in terms of labor force participation and commuting. The basic task will be to develop employment categories. The employment variable in the commuting and labor force participation models will be replaced with a set of variables reflecting employment levels in the various "disaggregated" categories. In addition, this study, using the tenants of central place theory, will help identify

basic trade patterns that are hypothesized to be related to trip making behavior.

These three studies represent our attempt to empirically implement the operationalization of the concept of labor availability. We are aware of several shortcomings of the procedure, but we believe our measure of labor availability to be superior to commonly used measures such as county unemployment rates. The latter are poor operationalizations and unemployment statistics in rural areas are poor measures.

Summary

The position taken in this paper is that rural development research should (and we would argue can) be compatible with the criteria outlined by Bonnen for good information systems--a satisfactory conceptual base, operationalized concepts and accurate measurement.

The location of economic activity, excluding location decisions by the public sector, is basically explained by a spatial profit maximization model. That is, traditional micro theory, with particular emphasis on spatial input and output prices, provides a less than desirable but adequate conceptual base.

Labor inputs as a spatial supply factor--including the determination of the labor force participation rate--was discussed as an example of the implementation of Bonnen's "operationalization and measurement criteria."

We do agree there is a knowledge gap that needs to be fulfilled in rural development research. But, we would argue that "matches and candles" are available so why curse the darkness.

Footnote

1. See the Fink study for complete description of the data sources referred to in this paper.

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J. Dean Jansma and Frank M. Goode are Professor and Associate Professor, respectively, of Agricultural Economics at The Pennsylvania State University. Paper number of the Pennsylvania State Agricultural Experiment Station. The authors wish to acknowledge the contribution of James Fink, now with Chilton Research Services (Philadelphia), for his contribution to the research work discussed in this paper.

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