President Address

Some Comments on Our Theories of Factor Movements and Location*

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The recently published *Handbook of Regional and Urban Economics* (Nijkamp 1986; Mills 1987) is the most exhaustive review of our discipline since Isard's seminal volume on the methods of regional analysis (Isard 1960). The review articles in the handbook demonstrate clearly that regional science is in excellent shape and has developed essentially along the lines set down by Isard when he created the discipline. It remains then to consider the most fruitful direction for future research. In this vein, I want to raise questions about the treatment of expectations and imperfect knowledge in regional science. Specifically, I suggest that, on the one hand, we have failed to absorb adequately the rational expectations revolution. On the other hand, we have been slow to integrate search theory into our models. These deficiencies are particularly noticeable in our theories of factor movements and location.

Factor Movements and Rational Expectations

The current theory of factor movements, especially migration, is still far from adequate, particularly in view of its central importance to understanding regional and urban growth. The importance of this topic is well recognized, and members of our association have certainly not been lacking in advancing the state of our knowledge. The excellent

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Spring 1988 issue of the *Canadian Journal of Regional Science*, guest edited by Ledent and Liaw (1988), illustrates well the type of research needed in this area. Further, the examination of micro files by Vanderkamp and Grant (1988), Flowerdew and Amhrein (1989), and others is beginning to show results. Yet even good data cannot get us very far without corresponding developments in basic theory, and Rouwendal and Nijkamp are correct in noting that “after more than a century of intensive research, no generally accepted theory of migration has emerged” (Rouwendal and Nijkamp 1987: 100).

Of the improvements that must be made in our migration theory, perhaps the most fruitful will be the proper treatment of rational expectations. In its absence, the income variable in most migration equations will continue to be specified improperly. Consider the effect of the unrealistic but illustrative assumption of instantaneously clearing markets. In such a world and with rational expectations there could be no income variable in a migration equation since relative income differences (defined to include psychic incomes) would be eliminated instantaneously. There could be no individual gain from movement. This, in a different context, is nothing more than Schumpeter’s observation on the effect of the instantaneous spreading of innovations.

If the assumption of instantaneous equilibrium is replaced by an adjustment, then an income variable appears in the migration function, but this variable must be specified with the appropriate lag structure. Consider, for example, the implication of rational expectations for migration equations that include lagged migration and current income variables. Under the assumption of rational expectations the lagged value of migration will subsume all previously available information about expected incomes. The relevant income variable is then not the current one but only the change in expectations induced by the current observation. In the simplest case, if migration at time t were a linear function of the expected value, formed at time t - 1, of some income stream, then the change in migration would depend only on innovations in expectations, not directly on income itself.

More generally, the need for a rational expectations approach in migration is highlighted by the existing theoretical gap between the emerging equilibrium models of migration (see, for example, Schachter and Althaus 1989) and the traditional disequilibrium ones. This gap can be bridged only by the appropriate introduction of expectations. Empirically, this will require the application of error correction, or cointegration, techniques.

1 Other strand of research on migration may be equally fruitful, and that is the work that Yorgos Papageorgiou and Bill Anderson are doing in extending the observations reported in 1980 by Papageorgiou (1980).

**Location and Search**

Research in modelling search is also likely to be especially fruitful for regional science. As an illustration, consider the present state of location theory. Surely location theory should pervade virtually all aspects of regional science—in much the same way that the model of the firm and consumer pervades economics—but at present it clearly does not do so. This suggests that our models of location are neither flexible enough in their assumptions nor sufficiently rich in their implications. Perhaps an increased emphasis on the integration of search theory into location theory would greatly enrich the latter.

The papers on search theory in the recent book by Fischer and Nijkamp (1987) and research such as that reported by Amhrein (1987) and others suggest improvements that might be made in our models of the labour market. With respect to product markets, papers by Stahl and Varaiya (1978), Stuart (1979), Stahl (1982), and Gabszewicz and Garella (1987), among others, indicate the kinds of locational results obtained by relaxing the more restrictive assumptions of traditional models, including that of known prices. Although Stahl (1987) has been able to derive many similar results under the assumption of known prices, his certainty models lack the descriptive realism captured by those based on search. In fact, it is clear that models with known prices must be special cases of ones with search in which the frequency distributions of prices are degenerate.

Some work that Professor Guccione and I have done with Fetter’s (1923) model of location illustrates rather simply how search theory renders existing locational models more flexible and descriptive. Fetter’s law deals with the division of the market for one homogeneous good between two suppliers located at distinct points in the plane; their prices and transportation charges may differ. The law separates the total spatial market into two well-defined, mutually exclusive, exhaustive markets, one for each supplier. At least for retail outlets, purchasers are seldom so clearly and definitely segregated into exclusive areas; instead they frequently travel from one outlet to another before making a purchase. If one introduces into Fetter’s model the assumption, commonly used in search theory, that prior to search the consumer knows the probability distribution of prices but not those actually prevailing, then Fetter’s law gives way to a less neat but far more realistic division of the market. If one assumes that one homogeneous good is sold by two suppliers located at distinct points in the plane, that the cost of transportation (the travel cost per mile is constant) is identified with the cost of travel between a consumer’s residence and suppliers, and that the known frequency

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distribution of prices has a minimum and maximum possible price, then it can be shown that, excluding some special cases, the market separates into six areas instead of two. Two of these areas depend on the minimum and maximum prices and transportation costs and are Fetter-like insofar as each is served exclusively by one supplier. They do not, however, exhaust the total market. A third area—determined by transport costs, the actual price at location 1, and what search theorists call the consumer's reservation price—is served exclusively by seller 1. This area is independent of the price actually existing at location 2. A fourth area, served exclusively by seller 2, depends on transport costs, the actual price at location 2, and the reservation price, but not on the price at location 1. The fifth and sixth areas may be served by either supplier. In these areas purchasers visit both locations, starting at the closest, before deciding where to buy. This and similar models not only produce more realistic results but also seem to be rich in implications. Even in the simple case described above, it can be shown that profit maximization by suppliers can yield either a policy of in-store-price-information-only or one of advertised prices—that is, a return to Fetter's case—depending on the parameters of the model.

The introduction of search into location theory has some costs, however. First, the models become mathematically more complex. Second, the assumption that the probability distribution of prices is known is rather heroic, and attempts to replace it with one on learning do not appear promising. Nevertheless, as Stahl observed, “Research on urban business location and, indeed, on business location decisions at large is far from having achieved a mature state” (1987: 814). Perhaps a heroic assumption and a bit of complexity are not too high a price to pay for a little more maturity.

**Conclusion**

Regional scientists thus should do more research on the problem of how information is passed from model to practice and from practice to model. On the one hand, our theories, if they are useful, convey information (rational expectations) that must constrain the actions of those whom they describe. On the other hand, those whose actions we model must have techniques (search) by which information is obtained and which therefore should be an integral part of the theory. The two examples discussed above suggest that the introduction of rational expectations, search, or both has decidedly non-trivial implications for regional analyses. In the case of migration it implies a respecification of a variable that is standard in most investigations and provides a bridge (through the use of error correction models) between the competing theories of equilibrium and disequilibrium migration. In the case of location it improves the descriptive realism of the model and leads naturally to consideration of a wider choice of strategies.

Only time will tell whether the line of research proposed here will prove to be the most fruitful for regional science. I can, however, add an interesting postscript. Isard, who so clearly foresaw the course of development of regional science research, recently called for an increased effort to incorporate uncertainty and imperfect information into locational analysis: “Uncertainty and imperfect information characterize most if not all locational problems. . . . Despite the major effort in recent years in regional science, much progress remains to be made” (Asami and Isard 1989: 507).

**References**


