Variables used in spatial and regional models

Introduction

In Geography scale principally concerns space. Scale relates to other ideas, only can we understand scale when it is applied inrespectto the totality of the landscape element. In this thesis, I plan to examine how spatial scale problems have been manipulated and resolved. I will assess examples of variables used in spatial and regional models at various scales and the methodological dilemmas within spatial analysis and solutions to this. I will also scrutinize the way in which we select scales and some of the trade offs needed in the future to consider continental and global scales. Finally, I argue for a better amalgamation of space and spatial scales into hierarchy supposition.

Addressing scale unswervingly, the most frequent form is cartographic scale. Watson (1978) argues; "… scale is a ' geographic' variable almost as sacred as distance" and " well developed policy has been created to balance the scale versus resolution-information content of a map" (Board 1967). Maps depict the earth's surface; this raises the concern of how flat maps disfigure spatial relations on the earth's surface. In turn, the use of ' analysis' scale, includes the use of units to measure phenomena, for data analysis and mapping. Essentially this being the scale for observing and acknowledging geographic phenomena. We can argue that this form of ' occurrence' scale is the ' true' scale of geography, analysing how geographic processes function across the World. It is accepted that a variety of scales of geographic phenomena interrelate; local economies are enclosed with regional economies and rivers are contained within larger hydrological systems for example. Therefore, conceptualizing such hierarchies can be complex for geographers, the traditional method of focusing on a single scale largely continues.

Generalization has arisen as a result. This is the view that the world that surrounds us can never be studied or modelled, or represented in all of its full detail and complexity. Perceptibly, scale is of great importance due its consequences for the degree to which geographic ideas are generalized. Generalization is in effect a process of simplification; it includes aspects of collection and development of characteristics and evidence that interest us as geographers. It demonstrates the way in which a study can represent smaller pieces of earth; it tends to be more focused on fine geographic details. For example, if we were to consider the way in which a large scale map will demonstrate more features of the earth’s surface in greater detail than a small-scale map.

Geography has often been held under disparagement due to its “ wide nature of topics and deviating points of view” (Hart 1982). Harvey argues that “ Inconvenience arising from the search for causality between human and physicalenvironmentideas and the predictions of spatial patterns” are often discussed (Harvey 1969.) However, Clarke argues that there is a “ widespread connection in terms of the spatial point of view, which cements the study of geography” (Clarke et al 1987). Examples of spatial variables include; “ area, direction, range distance, spatial geometries and patterns, isolation, diffusion, spatial connectivity, spatial associations and scale” (Abler et al. 1971). Mitchelson has described these variables as “ geographic primitives” (Mitchelson, unpublished).

Geographical spatial thinking tends to oscillate between two poles as there is no clearly defined geographical or landscape space this had let to the emergence of the concepts of absolute and relative space. The shaping of geographical space is under the influence of both these poles.

Harvey argues that absolute space is a synonym of emptiness, Kant supports this by saying that “ space may exist for its own sake independent of matter. Space just ‘ is’ and should be viewed as a ‘ container for elements of the earth’s surface” (Harvey 1969). In other words, the job of Geography is to fill this ‘ container’ with information and ideas. This sums up the Euclidian point of view of absolute scale, usually based on a defined grid system, common in conventional cartography, remote sensing and the mapping sciences. It is relatively easy to view ‘ sub containers’ within a ‘ container’ and to devise suitable categorization schemes. For example a CBD area may have several districts, areas, or neighbourhoods, all of which may show ever-smaller areal units. With the idea of absolute space, the conception of spatial hierarchies is comparatively uncomplicated.

The relativistic point of view, involves two considerations. Initially, space exists only with reference to spatial elements and processes. The ‘ relevant’ space is clear by spatial processes taking place, e. g. migration and commuting patterns, dispersion of pollutants and even the diffusion of ideas and information. Scales and regions are defined relatively by the relationship between or amongst spatial patterns forms and functions, processes and rates. This means space is defined in non-Euclidean terms, even “ distance may be relative” (Harvey 1969). Two areas of landscape separated by a barrier may be close in absolute space but very distant in relative space when time, rates, and interactions are considered. Hence, how a functional spatial process region is difficult to map in terms of absolute space.

Calls for a more broad-scale study are evident with demand for advanced techniques and applications of geographic information systems (GIS). Broad scale problems can realistically be solved by these techniques, which use absolute space almost exclusively. It has been argued that most modern work in geography involves a " relative view of space" (Harvey 1969; Abler et al. 1971) due to the spatial processes and mechanisms involved.

There have been a lot of recent debates as to the " appropriate scale of analysis for various processes" (Nir 1987). However, there is an agreement between geographic scholars that changes in scale change the important relevant variables. Furthermore, Mitchelson argues that the " value of a phenomenon at a particular place is usually driven by causal processes which operate at differing scales" (Mitchelson, unpublished). We can analyse the study of human migration as an example. Often included are variables in relation to labour demand, investment and business climate, and income, i. e. these are group and structural contextual variables. In comparison, intra-urban migration models often involve the age, educationand income of individuals.

Similarly, looking at how water supply networks are planned in third-world countries, investigations at a national scale often involve urban and regional water demands. In contrast, at a village scale, walking time and the distance to a spout may be unsurpassed concerns. This leads on to behavioural geography, examining the use of space by individuals and the timing of this use. This approach has been termed “ activity space and time space geography” (Carlstein and Thrift 1978). The most routine human activities involve the shortest spaces and time. This is reflected by the view that the “ most frequent movements are of the shortest distance and demonstrate effort-minimization principles” (Zipf 1949). Thus how different spatial activities have radically different time and space scales.

Spatial analysis has shown methodological problems. Tobler stated the problem of spatial correlation in his first law of geography: “ near things are more related than distant things” (Tobler, 1969). This is the idea that every spatial element may be correlated. Without Tobler’s idea it could be said that the surface of the earth would appear entirely random. Spatial autocorrelation is the basis for the recognition of spatial variability e. g. ground versus water, field versus woodland, high density versus low density etc. Harvey has further argued that it is often “ useful to search for the level of resolution which maximizes the spatial variability of a phenomenon”. (Harvey 1969). It has also been argued that there is inference of spatial process from spatial form and that most processes are discovered under spatial form, however, empirical results are usually scale specific. In other words “ patterns which appear to be ordered at one scale may appear random at other scales” (Miller 1978). However, recently, rules have been developed for optimal spatial sampling and data grouping to reduce the loss of such inference, this can be found in work by Clark and Avery 1976.

Watson (1978) argues that a solution to poor spatial data coverage is the “ development of a model of spatial relationships that couples to hierarchical levels”. In other words, not a lot of studies in geography have combined macrospatial and mircospatial levels of analysis because of the incredibly large amount of data needed, producing very complex models.

However, we already have many of the data rich variables at near global scales which can then in turn be used as the driving variables in predicting spatial patterns at much broader scales. It may be appropriate to find the appropriate constraints for the spatial hierarchies of concern in order to improve the spatial modelling aspect of Geography. Steyn argues that " disciplines concerned primarily with processes such as meteorology are able to switch scales very easily" (Steyn, 1981). In comparison, disciplines dealing with phenomenon are often restricted by the size of the actual phenomenon. For example, larger regions tend to incorporate more potential interactions and have a greater degree of centrality bias.

In conclusion, the thesis reviews space and time scales from a geographers point of view. It can be found that spatial phenomena comes in a vast variety of different size classes, much work has been conducted across many orders of spatial magnitude. Despite many appeals for multiscaler research e. g. Abler 1987; Miller 1970; and Stone 1968. This is practiced very little, despite evidence that good multiscale work apparently meets data handling thresholds accurately and quickly.

As various disciplines under what can be called the umbrella of environmental sciences begin to incorporate diverse spatial dimensions into their research agendas, problems with spatial scale are expected to be encountered. Many of these problems have already been recognized if not solved. Even so, it is still worth noting Clarke's (1985) admonition, " No simple rules can automatically select the ‘ proper’ scale; for attention.” Essentially, scale is the foundations upon which the home of Geography is built upon. Its various rooms are the arguments and theories behind scale, the floors are the advancements into hierarchical theory. The roof is the final piece solving the spatial dimension scale that places a shelter over Geographers heads and covers us from the elements of inferences in scale.

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