Quantitative revolution

In the history of geography, the **quantitative revolution (QR)**[^1] was one of the four major turning-points of modern geography – the other three being environmental determinism, regional geography and critical geography. The main claim for the quantitative revolution is that it led to a shift from a descriptive (idiographic) geography to an empirical law-making (nomothetic) geography. The quantitative revolution occurred during the 1950s and 1960s and marked a rapid change in the method behind geographical research, from regional geography into a spatial science.[^1]

The quantitative revolution had occurred earlier in economics and psychology and contemporaneously in political science and other social sciences and to a lesser extent in history.

### Synopsis and Background

Many geography departments in the 1950s had recently separated from geology departments in the flux of postwar (World War II) enrollment. Because geologists of the time looked at geography as soft and unscientific, the feeling of many geographers was to persuade critics that geographers were not second-rate geologists. The changes during the 1950s through 1970s were not the introduction of mathematics into geography, but mathematics as a tool for explicit purposes and for statistical methodology and formal mathematical modeling.

In the early 1950s, there was a growing sense that the existing paradigm for geographical research was not adequate in explaining how physical, economic, social, and political processes are spatially organized, ecologically related, or how outcomes generated by them are evidence for a given time and place. A more abstract, theoretical approach to geographical research has emerged, evolving the analytical method of inquiry.

The analytical method of inquiry led to the development of generalizations that are logically valid about the spatial aspects of a small set of closely defined events embodied in a wide range of natural and cultural settings. Generalizations may take the form of tested hypotheses, models, or theories, and the research is judged on its scientific fit and its validity. Adoption of the analytical approach had helped geography become a more law-giving science, and the conception of the discipline as an idiographic field of study has become less acceptable starting in the 1980s.

### The 1950s Crisis in Geography

During the late 1940s and early 1950s, the crisis occurred for several reasons:

- The closing of many geography departments and courses in universities, e.g., the abolition of the geography program at Harvard University (a highly prestigious institution) in 1948.
- Continuing division between human and physical geography – general talk of human geography becoming an autonomous subject.
- Geography was seen (fairly or not) as overly descriptive and unscientific – there was, it was claimed, no explanation of why processes or phenomena occurred.
- Geography was seen as exclusively educational – there were few if any applications of contemporary geography.
- Continuing question of what geography is – science, art, humanity or social science?
- After World War II, technology became increasingly important in society, and as a result, nomothetic-based sciences gained popularity and prominence.

[^1]: https://en.wikipedia.org/wiki/Quantitative_revolution
Debate raged predominantly (although not exclusively) in the U.S., where regional geography was the major philosophical school (European geography had never been uncomfortable with analytical methods).

All of these events presented a great threat to geography’s position as an academic subject, and thus geographers began seeking new methods to counter critique. Under the (somewhat misleading) banner of the scientific method, the *quantitative revolution* began.

**The Revolution**

The Quantitative Revolution began in the universities of Europe with the support of geographers and statisticians in both Europe and the United States. First emerging in the late 1950s and early 1960s, the Quantitative Revolution responded to the rising regional geography paradigm. Under the loosely defined banner of bringing 'scientific thinking' to geography, the quantitative revolution led to an increased use of computerized statistical techniques, in particular multivariate analysis, in geographical research. The newly adopted methods reflected an array of mathematical techniques that improved precision.

Some of the techniques that epitomize the quantitative revolution include:[1]

- Descriptive statistics;
- Inferential statistics;
- Basic mathematical equations and models, such as gravity model of social physics, or the Coulomb equation;
- Stochastic models using concepts of probability, such as spatial diffusion processes;
- Deterministic models, e.g. Von Thünen’s and Weber’s location models.

The common factor, linking the above techniques, was a preference for numbers over words, plus a belief that numerical work had a superior scientific pedigree.[1]

Proponents of quantitative geography tended to present it as bringing science to geography. In fact, the particular contribution of the quantitative revolution was the huge faith placed in multivariate analysis and in particular methods associated with econometrics. It was also very strongly aligned with positive science,[1] and this would prove a major source of epistemological debate.

The overwhelming focus on statistical modelling would, eventually, be the undoing of the quantitative revolution. Many geographers became increasingly concerned that these techniques simply put a highly sophisticated technical gloss on an approach to study that was barren of fundamental theory. Other critics argued that it removed the ‘human dimension’ from a discipline that always prided itself on studying the human and natural world alike. As the 1970s dawned, the quantitative revolution came under direct challenge.[1]

**Post-revolution Geography**

The greatest impact of the quantitative revolution was not the revolution itself but the effects that came afterwards in a form of the spread of positivist (post-positivist) thinking and counter-positivist responses.

The rising interest in the study of distance as a critical factor in understanding the spatial arrangement of phenomena during the revolution led to formulation of the first law of geography by Waldo Tobler. The development of spatial analysis in geography led to more applications in planning process and the further development of theoretical geography offered to geographical research a necessary theoretical background.

The greater use of computers in geography also led to many new developments in geomatics, such as the creation and application of GIS and remote sensing. These new developments allowed geographers for the first time to assess complex models on a full-scale model and over space and time. The development of geomatics led to geography being reunited, as the complexities of the human and natural environments could be assessed on new computable models. Further advances also led to a greater role of spatial statistics and modelling within geography. Eventually the quantitative revolution had its greatest impacts on the fields of physical, economic and urban geography.

The counter-positivist response from human geography was created in a form of behavioral, radical and humanistic geography (see the article: Critical geography).
The quantitative revolution also changed the structure of geography departments in the United States, with many physical geographers being merged with geology departments or environmental science departments, leaving the geography departments to become solely human-geography oriented. Within the UK, there was a different response to the revolution, with an increase of specialisation within the subject, and ultimately the development of systematic geography with many subfields and branches.

Additional reading


See also

- Geostatistics
- History of geography
- Quantitative methods
- Scientific method
- Positivism
- Environmental determinism
- Regional geography
- Regional science

References

[n] *During the 1940s–1970s, it was customary to capitalize generalized concept names, especially in philosophy ("Truth, Kindness, Beauty"), plus using capital letters when naming ideologies, movements, or schools of thought. Example: "the Automobile" as a concept, versus "the automobile in a garage".*


External links


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