USING QUANTITATIVE METHODS TO STUDY COVARIATION

Charles Ragin: Constructing Social Research, chapter 6

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1. Introduction

Quantitative researches construct images by showing the covariation between two or more features or attributes (variables) across many cases. Images that are constructed from extensive patterns of covariation are considered general because they compress evidence on many cases. The greater the number of cases is, the more general pattern is. Quantitative researchers do not care so much about detailed and specific images as do qualitative researcher. They care more about general picture, because their attempt is to achieve an understanding of broad patterns of covariation across many cases.

Quantitative researches often use the term *correlation* to describe a pattern of covariation between two measurable variables.

There are different kinds of cases; there are cases with high values of a variable; cases with moderate values and cases with low values. Some variables may be defined as causes (independent variable), while some can be defined as effects in a given analysis (dependent variable). The last one is the phenomena that researcher tries to explain; independent variables are the factors that are used to check the variation in the dependent variable. A dependent variable in one analysis can appear as independent in other.

2. The Goals of Quantitative Research
a) Identifying General Patterns and Relationships

One of the primary goals of social research is to identify general relationships. I order to achieve that, relationship must be observed across many cases. In quantitative research this is observing an association between two or more phenomena across many cases.

Identifying general patterns and relationships is important because they offer significant clues about causation. If two variables are related across many cases, it does not necessarily mean that one causes the other. But when variables are systematically related, it is important to consider that it is possible that one causes the other. However, the two correlated variables can be the effects of some third variable.

Quantitative researchers identify causation with explanation. The usual succession is:
1. a pattern of covariation is identified and the strength of the correlation is assessed,
2. causation may be inferred from the correlation, and, if so,
3. an explanation is built up from the inferred causal relationship.

b) Testing Theories

Among other ways of quantitative research, researcher can also test ideas directly from social theories. There is a difference between testing and using an idea. When idea is tested, it is first used to construct an image that is based on the ideas themselves, not the evidence. The researchers construct a theoretical image. Researchers use these theoretically based images to derive hypotheses about evidence that has not yet been examined. Once they are examined, the evidence either support or refuses the hypotheses.

c) Making Predictions

It is very important that researcher has as many cases as possible which varies, if he/she wants to make a prediction. This is important because a researcher is capable of making the most precise predictions only if he/she has the largest possible data on disposal. Having a lot of evidence makes it easier to predict future behaviour and knowledge of general patterns also helps. Knowledge of general patterns helps researchers to sharpen their predictions by providing important clues about how to weight factors accurately, even if there is many unknowns and great uncertainty.

3. Contrasts with Qualitative and Comparative Research
a) Qualitative vs. Quantitative Research

	Qualitative	**Quantitative**
Number of cases	Small number	Large number
Constructed images	Detailed and in depth	Based on general patterns of variation across many cases
Strategy	Subjects must be studied in depth	Generality and parsimony*

* using as few variables as possible to explain as much as possible

b) Comparative vs. Quantitative Research

	Comparative	**Quantitative**
Number of cases	Moderate number	Large number
Strategy	Focus on diversity, on configurations of similarities and differences with a specific set of cases	Generality and parsimony*

* using as few variables as possible to explain as much as possible

4.) The Process of Quantitative Research
a) Analytic Frames in Quantitative Research

Researches use analytic frames to articulate theoretical ideas about social life. The importance of frames to quantitative research can be seen most clearly in research that seeks to test theories. Once a theory has been translated into an analytic frame, testable hypotheses about how variables are thought to be related to each other can be stated. Researches can then develop measures of the relevant variables, collect data, and use correlational techniques to assess the links among relevant variables. Relationships among variables either refute or support theoretically based images.

Before testing an idea it is necessary to elaborate the frame in advance data collection. Researchers should not remain ignorant of their research subjects before testing a theory. They should learn all they can. The data used to test a theory is not the same as the evidence the researcher uses in developing or refining the hypothesis to be tested.

The frame becomes more or less fixed once theory testing is initiated. When a frame is fixed, the images that can be constructed from evidence are constrained. When the goal is to test theory, the images that can be constructed are further constrained by the hypothesis.

Even when researchers are not testing theories, the images they can construct from evidence are still constrained by their frames.

b) From Analytic Frame to Data Matrix

In quantitative research the collection of evidence is seen as a process of filling in the data table (data matrix) defined by analytic frame. Data matrix actually mirrors the analytic frame.

Quantitative researches exercise considerable care when selecting the cases to be used for testing a particular theory. The cases must be relevant to the theory, and they must vary in ways that allow the theory to be tested. When a theory is relevant to very large numbers, the

quantitative researchers use a random sample of such cases. Very important for the sample is that it is representative of the population as a whole.

c) Measuring Variables

Researchers also take great care in developing the way to measure their variables. There is a lot of literature on the measurement of most of the many variables that interest social scientists.

An issue of using appropriate measures is known as the problem if validity. One way to assess validity is to check the correlations among alternative measures that should covary.

Researchers are also concerned about the reliability of their measures. Reliability generally concerns how much randomness there is in a particular measure (random error). Researchers have developed a variety of ways to counteract unreliability.

Measurement is one of the most difficult and most important tasks facing the quantitative researcher because so much depends on accurate measurement.

d) Examining Correlations and Testing Theories

The core of quantitative research is the examination of correlations among variables. First researchers must translate their theoretical ideas into analytic frames. They must choose appropriate cases. They must develop valid, reliable measures of all their variables. And they must fill in the data matrix defined by their analytic frames, the cases they selected and the measures they have devised. In quantitative research investigators must know a lot in advance of data collection.

When quantitative researchers test theories, the key question is whether or not the correlations follow patterns consistent with the idea that motivated the research. Sometimes this involves the correlation between a single independent and a single dependent variable. Sometimes testing involves comparing correlations of several independent and on or more dependent variables.

If the correlations does not support researcher's theories, they report that they attempted to construct an evidence-based image consistent with theory, but were unable to do so, suggesting that the theory is wrong. If their initial test of a hypothesis fails, researchers examine their evidence closely to see if there is support for their theory under specific conditions.

Researchers try to use their general knowledge of their cases and their theoretical understanding to anticipate refinements like these before they collect their data. They may also specify additional hypotheses in advance as a way to anticipate such failures.

5.) Using Quantitative Methods
a) An Introduction to Quantitative Methods

Quantitative methods focus directly on relationships among variables, especially the effects of independent variables on outcome or dependent variables. The strength of the correlation between the independent and dependent variables provides evidence in favour of or against the idea that two variables are causally connected or linked in some other way.

The exact degree to which two variables correlate can be determined by computing a correlation coefficient (Pearson's coefficient). If the correlation is substantial and the implied cause-effect sequence makes sense, then the cause (the independent variable) is said to explain variation in the effect (the dependent variable).

b) Computing Correlation Coefficients

In the past researchers calculated the coefficients on hand, but now days they use computers to do that.

Goal of the computation is to assess the degree to which the values of two variables covary across many cases, in either positive or negative direction.

The key to calculating a correlation coefficient is to convert the scores on two variables to Z scores. Z scores standardize variables so that they have all the same mean or average values and the same degree of variation. When the products of pairs of Z scores for two variables are averaged over all cases, the number that results is Pearson's coefficient, a number which varies between -1.00 (perfect negative correlation) and +1.00 (perfect positive correlation). The calculation of the correlation coefficients provides a direct, quantitative assessment of the degree to which the two measures covary.

c) Using Correlation Coefficients

The most basic use of correlation coefficients is to assess the strength of the relation between two variables. But there are many other ways of correlation use. Most of them involve the comparison of competing causes. Some quantitative studies examine many independent and dependent variables. Quantitative researchers use advanced statistical techniques such as multiple regression analysis to disentangle correlations among independent variables and assess their separate effects on dependent variables.

6. Conclusion

Quantitative methods are best suited for addressing differences across a large number of cases. These methods focus especially on covariation between attributes that vary by level, usually across many cases. If two features of cases vary together is a systematic way, they are said to correlate. Correlation is important because it may suggest that a casual or some other kind of important relation exists between the two features that are linked. Quantitative methods provide a direct way to implement a researcher's interest in general patterns and quantitative researchers believe that these patterns of covariation provide important clues about social life.

Bibliography:
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