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Research Integration in Social Science using Meta-analysis

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Abstract

As a rigorous literature review meta-analysis allows researchers to look for relationships between the results of studies and the characteristics of those studies. This article examines some advantages of meta-analysis for social science such as the identification of: interactions, treatment effects, and the effect of research design as well as the problem of poor accumulation of evidence. A policies study example and a hypothetical voting study are used to highlight the value of meta-analysis to social scientists.

Poor accumulation of evidence is one of the major problems facing political science and the other social sciences. The American Political Science Association (APSA) has made an attempt to assess the state of political science through the books The State of the Discipline and The State of the Discipline II. The APSA was answering the question: Where are we? In this work many reviewers assessed the current state of research in each of the sub-fields of political science. The authors examined the research emphasis of each of the sub-fields, but they did not address the problem of poor accumulation of evidence within the sub-fields.

The technique of meta-analysis is an attempt to address the problem of poor accumulation of evidence. Meta-analysis strives to be an objective and statistically rigorous review of the literature.

Meta-analysis is a quantative literature review, and as such it is an improvement. Meta-analysis is a powerful tool, which allows researchers greater ability to study interactions, the effects of treatments, and the effects of research design to name but a few of its strengths.

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The idea of data synthesis is not new. In agricultural studies researchers have been using certain types of synthesis techniques since the mid 1920's (Glass et al 1981, Wolf 1986, Rosenthal 1984). In 1976 Gene Glass introduced the techniques of "Meta-Analysis" as the culmination of this tradition of research synthesis (Glass 1976).

Meta-analysis offers the researcher many advantages in the analysis of data, which would not be present in a single study. This section will examine three of these advantages: First, meta-analysis allows the researcher to identify interactions. Next, meta-analysis can explain conflicting results. And finally, meta-analysis can assess the importance of research design (Glass et al 1981, Wolf 1986, Rosenthal 1984, Light 1984). As an example, these three advantages of meta-analysis can be employed to better understand general political phenomenon and specific questions concerning the role of party identification.

Identification of Interaction:

There are generally two ways to identify interaction in a single study: 1- build tests of interaction into the research design, or 2- test for interaction using post hoc procedures. In the first case, the researcher who is able to set up an experiment has control over treatment and can use random assignment to test for any interaction. In the second case, the advantages and disadvantages of using post hoc procedures such as regression and other applications of the general liner model procedures are well known (Light, 1984). Meta-analysis is able to examine a large number of studies that are conducted in different areas, and with different populations. It allows a meta-analyst to make general statements about interactions as well as main effects (Glass et al 1981, Wolf 1986, Rosenthal 1984, Light 1984).

Explanation of Conflicting Results

In Political Science research often provides conflicting results, and a technique that will help us understand why the results from two good studies are in conflict would certainly be useful. By examining the characteristics of studies, meta-analysis can come to a greater understanding of why the results of different studies are often

in conflict. Meta-analysis allows researchers to better pinpoint where conflict originates among studies, and therefore it allows the researcher to come to a better understanding of the conflict. Meta-analysis allows researchers to make an assessment of studies that is more focused than simply stating that study A is somehow superior to study B (Light 1979, Glass 1979, Glass et al 1981, Wolf 1986, Rosenthal 1984).

Importance of Research Design

Research designs can be seen as the structure and process through which the researcher attempts to measure the event or phenomenon. Any single study will only have one research design. We know from the Heisenberg Uncertainty Principle that any attempt to measure an object changes that object. It can be concluded that the research design will have an effect upon the results of the study regardless of the magnitude of that effect. Also, it may be possible that the research design has a greater impact upon the findings than does any single variable. However, the impact of a research design cannot be examined in a single study. The impact of different research designs can be explored through the use of Meta-analysis (Glass et al 1981, Wolf 1986, Rosenthal 1984, Light 1984).

Policy Studies Example: Interaction Effects

A relevant example from the policy studies literature deals with the Head Start program. In 1968 Westinghouse Learning Corporation and Ohio State University conducted an evaluation of the Head Start program. The findings were released the next year, and were highly controversial. The Westinghouse-Ohio study found that Head Start had only a slight effect, and that was only on some measurements of achievement. These findings had a large impact upon policy and put supporters of the Head Start program on the defensive (Light, 1984).

A synthesis of the Head Start literature was conducted by J. W. Bissell. The main effects found by this synthesis were not dramatically different from those of the Westinghouse-Ohio study, but, Bissell was interested in the effects of interactions. This was what set her study apart from the Westinghouse-Ohio study. Bissell found that:

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> "Directive, highly structured preschool programs tend to be more effective with the *more* disadvantaged of the poor ... In contrast, nondirective, less-structured programs tend to be more effective with the *less* disadvantaged of the poor children" (Light, 1984).

A reexamination of the Westinghouse-Ohio study found that the directors of the Head Start programs tended to favor the more open, less directed format with the poorest children. This fact coupled with the findings of Bissell's study helps to explain why the Westinghouse-Ohio study found that Head Start had little effect. When the two pieces of information are considered together it becomes clearer why the Westinghouse-Ohio study found little academic achievement in the Head Start programs (Light 1984).

The Westinghouse-Ohio study did not find the interaction between the background of the children and the program type. It would have been difficult to find out this information because the initial study did not build this interaction effect into the research design. However, Bissell's synthesis was able to uncover this interaction by examining study characteristics as well as the results of the studies (Light 1984).

Policy Studies Example: Explanation of Conflicting Results

The U. S. Department of Labor initiated studies to determine whether job training alone or "integrated services" were more effective in breaking a family's cycle of poverty. In order to examine this question several pilot programs were established, and the results of these programs were studied. The results from these pilot programs were in conflict. The Department of Labor was able to learn a great deal from the results of these studies, but the question of conflicting results still remained (Light 1984).

How can research synthesis produce more information from conflicting studies? Light argues that conflict should not be avoided, but should be embraced as conflict offers an opportunity to gain insights that would not be otherwise available. The following table represents two studies conducted on the question of whether job training or integrated services offer a better opportunity to break the cycle of poverty (Light 1984).

From the following table it is apparent that in the first study integrated services provided an average of 80 weeks of employment for the 40 people in the program, but job training provided only 70 weeks of employment for its 40 people. But, in the second study integrated services provided only 60 weeks

Table 1: Policy Studies Example for Explanation of Conflicting Results

	Problem Set A	Problem Set B	Overall Mean
Study One			
Integrated	90wks(30p)	50wks(10p)	80wks(40p)
job Training	50wks(20p)	90wks(20p)	70wks(40p)
Study Two			
Integrated	90wks(10p)	50wks(30p)	60wks(40p)
Job Training	50wks(20p)	90wks(20p)	70wks(40p)

of employment while job training again provided 70 weeks. A closer look at the table will also reveal that this difference can be explained by the different numbers of people within each cell. When the program type is well matched with the problem set the effectiveness of each program is maximized. The above difference probably would not have come to light through an individual study (Glass 1979, Light 1979, Light 1984).

Policy Studies Example: Impact of Research Design

The Senate, when it was examining the relative costs of adding in-home health care to the list of items covered by Medicare, had the GAO gather studies on the relative merits of both programs. The GAO examined about thirty studies. One group of studies was generally case studies, which found that the costs associated with health care would go down if in-home health care was an alternative to hospital care. The second group of studies, generally quantitative, found that the cost of health care would go up. The second group of

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studies concluded that individual costs would decline, but that more people would avail themselves of the services and therefore the total cost would increase.

The difference between these two groups can be related to the different research designs. The first group of studies focused only on individual costs, which were decreased. On the other hand, the second group had a broader focus and found that while individual costs did decrease there was a large group of people willing to use in-home health care which were unwilling to be hospitalized, and therefore, the total cost would increase (Light 1984).

Hypothetical Voter Study Example: Interaction Effects

The following is a hypothetical example from the area of voting behavior. Let us suppose that we have been presented with two studies that examined the relationship between party identification and vote decision. Both of these studies have come to approximately the same conclusion; there is a significant relationship between party identification and vote decision, but it is not a particularly strong relationship.

At first we may be tempted to take these two studies as the final proof necessary to lay this question to rest. Our initial examination of these studies does nothing to dissuade us from our first conclusions. Both studies are national studies that looked at voting behavior in presidential and congressional elections and both examine the relationship between the vote decision and party identification. In the first study we note that the definition of party identification used was from Campbell and in the second study the definition used was from V. O. Key. Again, the researcher finds nothing out of line, and if anything, this adds strength to the researchers' argument about the relationship between party identification and vote decision, as the two main conceptualizations of party identification show equivalent results. At this point the researcher may be tempted to write up the results of the literature review.

Were the researcher to go one step farther and look for an interaction between party identification and election type the results

would have been interesting. Let's assume that the data appear as follows:

Table 2: Correlation between Vote and Party Identification by Level of Election: Hypothetical Example

	Presidential Election	Congressional Election	Average
Study 1	.70	.30	.50
Study 2	.35	.65	.50

It is now obvious that the relationship between party identification and vote decision is not the simple medium strength relationship that both papers reported. There is more to the relationship that needs to be examined, and explained. This relationship may never have come to light if a simple research synthesis had not been conducted.

If the numbers for study #2 had been reversed the case that party identification is more important in national than regional elections would have been strengthened. And the opposite is true if the numbers for study #1 were reversed. In any case the researcher has learned more than what the two papers reported as their conclusions. From these two examples it should be obvious that the techniques of meta-analysis can be useful in identification of interaction, and that meta-analysis can be used to increase the understanding of previous research.

Hypothetical Voting Study Example: Explanation of Conflicting Results

In the above hypothetical voting studies, if the results were examined concerning the relationship between party identification and vote decision at different electoral levels, the studies could have been considered to be in conflict. The researcher for the first study may have concluded that the relationship between party identification and voter decision is greater in presidential elections than it is in

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congressional elections. But, the researcher of the second study would have objected to this conclusion given the results obtained in the second study. The second researcher may have argued that party identification is more important in congressional elections and has less effect in presidential elections. The traditional literature reviewer would be hard pressed to resolve these differences.

The traditional literature review may attempt to resolve the conflict by down-grading one of the two studies, or by simply ignoring one of the studies, or by attempting to examine why there are differences. But often literature reviews are conducted by simply examining the conclusions and the reviewer may never have come into contact with the breakdown of the relationship between party identification and election type. In contrast, the meta-analyst could conclude that the differing results may be due to the different conceptualizations and images researchers have of party identification.

The examples show that the use of meta-analysis is able to bring greater understanding to questions of conflicting results. In addition, meta-analysis affords the political scientist the opportunity to understand the problem of conflicting results without resorting to *a priori* rejection of results.

Hypothetical Voter Studies Example: Impact of Research Design

Let us assume that we have just been handed two studies from the 1992 election. Both studies examined the relationship between party identification and vote decision. Both of these studies use Campbell's idea of party identification, and are virtually identical on all characteristics except, that they had different research designs. Further it is assumed that there are adequate controls in the two studies. The first study was a panel study and the second study was a cross-sectional study. Each found that there was a significant relationship between party identification and vote decision, but the first study showed the stronger relationship. It can be argued that the difference between the two studies is due to the different research designs.

Table 3: Correlation between Party identification and Vote Decision: Hypothetical Example

	Study 1	Study 2
r-Value	.8	.6

Conclusion

Meta-analysis is a quantitative literature review. Meta-analysis has many advantages as well as draw backs. Meta-analysis is a tool and the advantages and disadvantages of meta-analysis are partially inherent in the tool, but also reside in the person using the tool. When a hammer is used with care and good intentions it can be a creative tool, but when the same hammer is used with malice or without care it can become a tool of destruction.

The ability of meta-analysis to identify interactions and to explain conflicting results is, at the present, the most important benefit of the addition of the technique of meta-analysis to the arsenal of the political scientist. Meta-analysis allows the researcher to better assess the current state of the field. Meta-analysis better allows political scientists to see where they have been so there is a better idea of where we should go.

The future of meta-analysis may not be limited to simply being an alternative to the traditional literature review. The meta-analyst can use the technique to examine the effect of the research design upon the results of the study. This would allow researchers to assess the phenomenon without the effects of parallax and would lead to greater understanding of the actual event. And it is in this area that the future of meta-analysis may unfold (Rubin 1990).

Rubin (1990) argued that the goal of meta-analysis has been wrong. The goal of meta-analysis should not be the synthesis of literature. Rather, the goal of meta-analysis should be to expand the limits of science. Furthermore, meta-analysis is uniquely qualified to do this, in at least one area. The meta-analyst can estimate the effect

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that the research design has upon the results, and by extrapolation, the effect of research design could theoretically be eliminated. The researcher would have only the impact of the treatment without any extraneous effects from the research design. This is an area for further examination in meta-analysis, and it would seem to hold great promise for scientific research (Rubin, 1990).

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