

THE AUTHOR COCITATION STRUCTURE OF MACROECONOMICS

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Cocitations of the work of 42 prominent macroeconomists (past and present) were examined, using multidimensional scaling and clustering techniques. Author clusters, corresponding primarily to current schools of thought in macroeconomics, are arranged along two dimensions of scholarly style; 1) a relative orientation toward quantitative or mathematical models and issues and 2) a continuum of active concern with older scholarship in the field. Social relationships demonstrated by these techniques include joint journal editorship, mentor-student links and institutional affiliation. New to this study is evidence of the cocitation of prominent authors as 'concept symbols'.

Introduction

In the early 1970's, *Small*¹, *Small and Griffith*² and *Griffith et al.*³ demonstrated that document cocitation patterns could be used to investigate the structure of speciality areas in the sciences. In a series of recent papers, *White*^{4,5} and *White and Griffith*⁶⁻⁸ have shown that authors can serve the same function as citations of specific documents – they can also be used in the mapping of subject specialities. Completed author cocitation studies reported by *White and Griffith* include investigations of the literature of information science, judgment and decision making, social indicators, and science, technology and society.

In author cocitation analysis, the author's name represents not a single document but an entire body of work (a corpus or oeuvre). Two authors are cocited when one work by each is included in a subsequent reference list. The overall cocitation frequency of these two authors might include the repeated pairings of different individual works. As a result of the various clusterings and mapping procedures (detailed in *White and Griffith*, note 6), authors frequently cited together are placed close together; those rarely or never cocited are farther apart. Clusters of authors can be identified with schools of thought or theory groups, specific subject specialities, temporal, institutional or language groupings, shared methodologies and the like. These techniques can, like document cocitation analysis, be used at a number of different levels of investigation – ranging from a broad overview of related disciplines down to the individual speciality area.

This paper reports the results of an investigation of the literature of macroeconomics, using the techniques of author cocitation analysis. Macroeconomics is the study of the performance of a market or mixed market economy as an aggregate whole, with particular reference to the determinants of employment and inflation and the impacts of central government policies (fiscal and monetary) on these. Macroeconomics is a highly technical, quantitative (rather than primarily qualitative), and discrete speciality area in economics; authors may borrow tools, techniques, and models from adjacent specialities, e.g. microeconomics or econometrics. There are a number of readily identifiable 'schools of thought' in contemporary macroeconomics, as defined by macroeconomists themselves⁹. The two most familiar to noneconomists¹⁰ are the 'Chicago school' and the 'Neoclassical Synthesis' (often referred to as Keynesian Economics' in the press).

Methods

Author selection:

Current texts in macroeconomics were used as a source of authors to be studied. The final author list (see Table 1) was compiled primarily from a list of all economists with 5 or more unique page references in at least one of four books¹¹. Additional authors were selected, based on consultation with knowledgeable economists¹². Table 1 is not intended to represent a list representing, or restricted to, the most highly cited or most important macroeconomists but to provide a broad overview of the range of past and present scholarly activity in the field.

Search:

All 42 authors' names were searched in *Social Scisearch*, the online version of *Social Science Citation Index* (accessed through Lockheed's DIALOG) for the period 1972 to week 50, 1981. Sets of all citations of each author (actually of his or her body of work) were constructed and cocitation counts for each author pair were retrieved using a method of rapid online intersection of sets.

White¹³ has shown that individual and paired authors' names can be manipulated as though they were subject headings or key search terms used to retrieve groups of specific documents via an online search. SELECT CR = CLOWER R? retrieves the set of all citations of any work by *Clower*¹⁴. SELECT CR = CLOWER R? AND CR = LEIJONHUFVUD, A? forms a cocitation set of all papers citing any work by *Clower* and any work by *Leijonhufvud*. Considered as paired thesaurus terms or subject headings, the *Clower–Leijonhufvud* pairing stands for "general disequilibrium theory" and most, if not all, the citing papers retrieved in this pairing should be related to this topic.

Table 1
 Authors selected for study

Constantine C. Azariadis	John Maynard Keynes
Robert J. Barro	L. M. Koyck
Karl Brunner	Axel Leijonhufvud
Phillip Cagan	Robert E. Lucas
Robert W. Clower	Alfred Marshall
Paul Davidson	Allan H. Meltzer
James S. Duesenberry	John Stuart Mill
Martin S. Feldstein	Franco Modigliani
William J. Fellner	Arthur J. Okun
Irving Fisher	Luigi L. Pasinetti
Milton Friedman	Don Patinkin
Robert J. Gordon	Arthur C. Pigou
Herschel I. Grossman	David Ricardo
Robert E. Hall	Joan Robinson
Roy Harrod	Paul A. Samuelson
John R. Hicks	Thomas Sargent
David Hume	Warren L. Smith
Stanley Jevons	Robert M. Solow
Harry G. Johnson	Piero Sraffa
Nicholas L. Kaldor	James Tobin
Michal Kalecki	Sidney Weintraub

In this way, cocitation counts were retrieved for all author pairs. 831 of a possible 861 unique pairings (96.5%; not counting self-pairing) occurred in the citing papers at least once. This is a higher percentage than has previously been found¹⁵ and may reflect either the level of investigation (specialty rather than discipline level) or a greater integration of macroeconomics as compared with, say, information science (or, more simply, higher frequencies of citation and cocitation).

Data Analysis:

As a result of the search, a cocitation matrix of all author pairs was created. With the exception of the cells on the diagonal, this matrix represents a profile of cocitation for each individual author with every other author on the list. The diagonal cells represent the intersection of each author's citation set with itself – and, since it may include homograph citations and self-citation, the total count may be disproportionately large when compared with the remainder of the cocitation profile¹⁶. Accordingly, the values in the diagonal cells were scaled down in relation to the cocitation profile for each author with the remaining 41¹⁷.

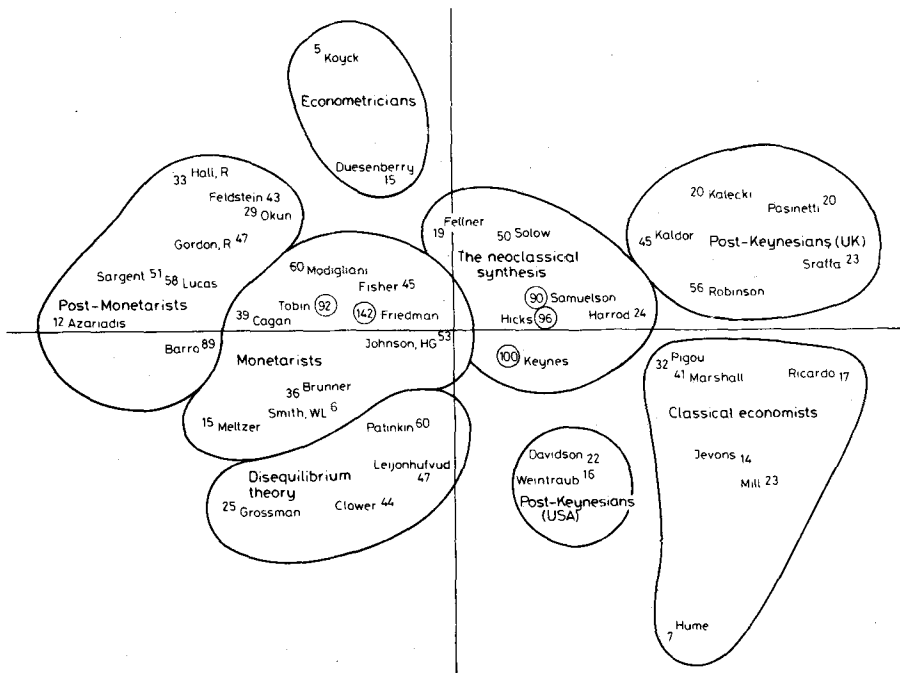


Fig. 1. A map of macroeconomics

The raw cocitation data were converted to a matrix of Pearson product-moment correlations. The correlation matrix was used as input into a nonmetric multidimensional scaling program, MDSCAL¹⁸. This program generated “maps” of points (representing authors) in two and three dimensional space, the distances between the points being determined by the Pearson correlation values. The use of Pearson correlations, rather than raw cocitation data, presents two major advantages. It eliminates scale effects – absolute differences in cocitation rate between authors otherwise perceived as “similar” by the citing audience – and makes use of more information (in this case, 42 data points instead of 1).

A cluster generating program, the SAS variable clustering program VARCLUS¹⁹ was used to investigate the possible grouping of authors. The resulting clusters are shown in Figure 1.

Results

Figure 1 shows the 2-dimensional plot of points (representing authors' oeuvres) generated by the MDSCAL program. The "fit" of the points in two dimensions is reasonably good (Stress II = 0.31). To aid in the interpretation of cluster position, the map's axes have been rotated slightly from the positions originally generated by the program, but the origin remains the same. The VARCLUS clusters are delimited by solid lines and the position of each author is shown by a number representing his or her mean cocitation rate with the other 41 authors in the study. Mean values above 90 have been circled for emphasis — these authors might be considered particularly prominent.

Cluster identification:

Many of the clusters can easily be associated with existing schools of thought or theory groups in macroeconomics, based on the assemblage of authors in each cluster, and names can be assigned accordingly²⁰. The two most central macroeconomic clusters/schools, are the neoclassical (Keynesian) and monetarist (Chicago school) groups, containing *Samuelson* and *Friedman*, respectively, in relatively central intracluster positions. The classical (historical, essentially pre-Keynesian) economists are grouped in one cluster as are the representatives of disequilibrium theory. *Koyck* and *Duesenberry*, two econometricians, constitute a small cluster which was split from the monetarist cluster in the last VARCLUS iteration²¹.

Other clusters are not as easily named. *Robinson* and the other Cambridge (UK) post-Keynesian economists are separated from the two (American) editors of the *Journal of Post-Keynesian Economics*, *Weintraub* and *Davidson*. (The latter pair was actually split from the neoclassical cluster in the penultimate iteration of the VARCLUS program.) The remaining cluster has been, rather impressionistically, designated "post-monetarist". It contains a composite group of authors whose work, in part, represents extensions of "standard monetarist economics". Several can be identified with relatively recent theoretical positions or new research areas, such as rational expectations and implicit contracts theory²².

Cluster location;

The distance of a point (or a cluster of points) from the origin of the map, established by the MDSCAL program, reflects the perceived similarity of that author's works with those of surrounding authors and with the group of 42 as a whole. Authors who are

highly (positively) correlated with the greatest number of other authors will be placed in the central area of the map. Neighboring clusters share some associations (e.g. authors in adjoining clusters are cocited, groups share a common focus). Dissimilar authors (and clusters) will be at some distance from each other; peripheral authors are those with few perceived associates – related, through cocitation, to fewer neighbors.

In Figure 1, both the neo-classical and monetarist clusters share the central area of the map – neither has an apparent territorial advantage – and their location represents the focus of macroeconomics on these two theoretical positions. (It is tempting to view the vertical axis as symbolic of this division.) The neoclassical economists (including *Keynes*) separate the post-Keynesians from the monetarist and disequilibrium economists. Both post-Keynesians and disequilibrium theorists are concerned with reinterpretation of *Keynes*' work, but they take quite different positions on this question²³.

Contiguous clusters share more cross-boundary cocitations than those more isolated. For instance, the post-Keynesians appear to be closely linked only with the neoclassical economists – most prominently, perhaps, in the literature associated with the "Cambridge-Cambridge controversy" of the 1960's²⁴. The classical economists appear to have tenuous associations with both the neoclassical cluster (*Pigou* and *Keynes* were both students of *Marshall*) and with the post-Keynesians (who actively cite *Ricardo* as an important forebear). The two econometricians are even more isolated – their contributions to macroeconomics being primarily in the area of quantitative methods.

Axis identification:

The vertical axis, running from highly quantitative authors (*Koyck* and *Duesenberry*) to the (essentially non-quantitative) disequilibrium theorists, appears to represent an orientation towards quantitative or mathematical models and issues. Moving from bottom to top, authors will show an increasing tendency to be associated with quantitative models (Friedman's modern quantity theory of money and "Okun's law") or mathematical approaches to macroeconomic theory (Solow's "Contribution to the Theory of Economic Growth" and the post-Keynesians' mathematical restatement of Ricardian economics). However, this quantitative/mathematical orientation is more apparent in the distribution of clusters than of authors within clusters (*Fellner* is not more "quantitative" or "mathematical" than, say, *Samuelson* or *Hicks*.) The quantitative orientation may account, in part, for the apparent displacement of *Davidson* and *Weintraub* (as relatively non-quantitative/mathematical) in the lower right quadrant of the map, away from the major post-Keynesian cluster²⁵.

The positions of the classical economists and post-monetarists, anchoring the ends of the horizontal axis, suggest that the clusters might be arranged along a "time line" from 18th century moral philosophy to the most contemporary macroeconomic theory,

However, the positions of the two post-Keynesian clusters (a school of thought most prominent in the macroeconomics literature in the 1960's and early 1970's) suggests an alternative interpretation. Post-Keynesian authors still actively cite pre-Keynesian economists (especially *Ricardo*) more frequently than do other contemporary schools of thought²⁶; by contrast, many of the post-monetarist authors (especially those associated with the newest theoretical positions) appear to cite (and be cited with) primarily recent scholarship²⁷. The distribution of clusters along the horizontal axis, from right to left, may reflect an increasingly active concern of a group with its "roots".

Intracluster author location:

Anomalous placement. As noted previously, most of the authors contained within a cluster can be associated with a specific school of thought. *Patinkin, Leijonhufvud, Clower, and Grossman* are prominent disequilibrium theorists. All the classical economists are in one cluster, as are the econometricians. The post-Keynesians are split, but the clusters contain no "inappropriate" authors; this is also true of the neoclassical group.

An obvious anomaly, however, is the close (spatially) association of *Tobin* and *Modigliani* with *Friedman* in the center of the monetarist cluster; the former two being prominent neoclassical economists, while *Friedman* is, certainly, the preeminent monetarist economist. These three authors' locations are a reflection of their high Pearson correlations: *Tobin & Friedman* ($r = 0.95$), *Modigliani & Friedman* ($r = 0.83$). These high positive correlations do not simply mean that, for instance, *Friedman* and *Tobin* were very highly cocited (although that is certainly the case – *Friedman* and *Tobin* yielded 478 cocitations). Rather, it indicates that these two authors were cocited with each other and the other 40 authors in the study in almost the same way. The calculation of Pearson correlations from the raw cocitation matrix is, in essence, a profile analysis²⁸. In this case, the high positive correlation is an assessment of the similarity of shape of the two authors' cocitation profiles (eliminating the difference in scale, the elevation), *Tobin* and *Friedman* have almost identical "profiles", Their cocitation frequencies (each with the other 40 authors in the study) vary jointly – both tend to be highly cocited with certain authors and infrequently cocited with others. Their respective oeuvres apparently serve, in some fashion, the same purposes for the citing audience.

Tobin and *Friedman* may well have become symbols of their respective schools²⁹ and are being cocited as concept symbols (not unlike the citation and cocitation of classic documents³⁰). The *Modigliani/Friedman* pairing may also serve this function, but *Modigliani's* association with *Friedman* and also be attributed to their interrelated contributions (along with *Duesenberry*) to consumer theory³¹. *Friedman's* total identi-

fication with the monetarist position has apparently shifted the focal neoclassical/monetarist controversy to the left of the map's origin.

Okun, another prominent neoclassical economist, appears to occupy a similarly anomalous position in the post-monetarist cluster³². However, a brief examination of the citing literature suggests that he shares specific methodological, subject and institutional connections with the two authors subsumed under the homograph *R. Gordon*³³ and other post-monetarist authors as well. Additionally, his most recent work shows evidence of his association with the implicit contracts group³⁴.

Generalists. The placement of authors who have contributed to several different areas in macroeconomics depends largely upon the perspective with which they are viewed by the citing audience, time and perceived function of the cited works being important factors. The most central figure in the map is *H. G. Johnson*, whose cluster assignment fluctuated between neoclassical and monetarist in the last VARCLUS iterations. As noted above, centrally placed authors are those highly correlated with the greatest number of other authors. *Johnson* contributed to both neoclassical and monetarist economics over the course of his scholarly career and his position in the map reflects this³⁵.

Shifting associations. *Barro* and *Grossman* are examples of authors who have "changed direction" over the citing period (1972–1981). Both made important contributions to disequilibrium theory in the early 1970's and more recently (1975 to date) have written in the areas of rational expectations and implicit contract theory, respectively. The disassociation of *Barro* and *Grossman*, and the former's placement in the post-monetarist cluster, probably reflect the length of time since the publication of *Barro*'s first rational expectations work and the degree to which *Grossman*'s later contributions still relate to his earlier work.

The authors' peripheral intracluster positions are suggestive of movement over time. A similar mapping in the mid 1970's would probably have placed *Barro* squarely in disequilibrium theory; a mapping in 1983 might well associate *Grossman* more strongly with *Azariadis* and the implicit contracts group (perhaps establishing them as a separate cluster as well).

Discussion

In selecting authors for this study, an attempt was made to include representatives of a wide variety of temporal and theoretical/methodological positions within macroeconomics, subject to the criterion of "prominence" and to program constraints on maximum matrix size. Despite this attempt to create diversity and dispersion, macroeconomics appears to be an extremely coherent, well integrated area of scholarship

within economics. Over 96% of all possible author pairs were cocited at least once. Many of these single cocitations probably occur only in survey articles and are not representative of associations made in research papers. However, there were also many more cross-boundary associations than reported in other studies³⁶.

The mapping did produce a number of separate clusters. Clear distinctions appeared between "contemporary macroeconomics", econometricians (tool-providers), and classical economists (temporally isolated). Contemporary macroeconomics is divided into identifiable, distinct schools of thought. However, the differences between these groups turn on technical points — attempts to provide different answers to the same questions — rather than focussing on specific separate subject areas³⁷. The most heterogenous cluster, the post-monetarist, might be considered a residuum, but, upon closer examination, it appears to be composed of a number of closely associated theory groups; some of which are still too new or too indistinct to have been identified at this level of analysis³⁸.

As a result of the mapping, the clusters are distributed along two dimensions, both of which identify aspects of scholarly style. Macroeconomics is a quantitative/mathematical specialty area in economics. Within this speciality, however groups and authors differ in 1) their reliance on mathematics and quantitative models and 2) their use of scholarly literature; the intercluster distinctions along these two dimensions are relative rather than absolute. The identification of two style dimensions is in some contrast to previous studies in which a subject dimension of some nature was identified as well as a style dimension (usually an aspect of the "hard/soft" continuum). In this study, the dimensions are "quantitative/nonquantitative" and "roots/no roots". (The latter dimension might also be described as "archival/research front" based on further investigation characterising authors' citing practices).

In addition to these broader, more general associations, this study has confirmed the ability of cocitation mapping to identify or suggest the existence of more specific cocitation links (e.g. institutional, geographical, language). For instance, *White*³⁹ lists a number of organizational or personal ties demonstrated by cocitation. In this study, several mentor/student pairs are closely linked (*Clower–Leijonhufvud*, *Brunner–Meltzer*, *Marshall–Pigou*⁴⁰). The Brookings Institution, Cambridge University and The University of Chicago (specifically Friedman's Money and Banking Workshop⁴¹) are organizations represented in cocitation linkages.

The cocitation of authors as concept symbols has not been reported previously, but is almost certainly not unique to macroeconomics. For this to occur (e.g. in the case of *Tobin* and *Friedman*), source papers must be citing these two authors less for their substantive contributions than for what the authors (and their respective bodies of work) have come to represent. At this level of abstraction, *Tobin* and *Friedman* are symbolic

of ideas expressed not only in their own work but in the work of those authors associated with their respective schools. They have become "standard symbols"⁴².

The lack of a subject dimension in this study, and the clustering of cited authors into schools of thought rather than distinct subject areas, reflects the level of investigation as well as the characteristics of macroeconomics itself. Given an equal number of authors covering all aspects of scholarly activity within an area under scrutiny, a map based on author cocitation data should demonstrate a decrease in diversity (e.g. variety of subject areas represented, methodological diversity) as the level of analysis moves from discipline to speciality and then to research area. This increasingly narrow focus should be accompanied by an increase in integration (number of possible cocitation pairs actually formed) as cited authors' research interests are perceived as being related in one way or another.

Macroeconomics thus appears more "coherent" or "connected" than information science or studies in science, technology and society and more similar to decision science (three fields studied by *White* and *Griffith*⁴³) because it is "smaller" or more narrowly focussed than the former two areas in terms of the above discussion. A study at the level of *White* and *Griffith*'s investigation of information science might result in dividing economics into macroeconomics, microeconomics, econometrics and a number of distinct applied fields (e.g. urban economics, labor economics, agricultural economics, international trade) with a cocited pair formation rate closer to 65% (information science) or 68% (SSTS) than to 85% (decision science).

Summary

In this study, cocited author retrieval and mapping techniques are used to investigate the structure of macroeconomics as perceived by the citing social science journal literature over a 10 year period (1972–1981). The results demonstrate that 1) clusters of cocited authors, in a coherent specialty area such as macroeconomics, can be identified and mapped; 2) these clusters correspond to recognized schools of thought, shared methodological interests and other significant associations in macroeconomics; and 3) the spatial orientation of authors within clusters and of clusters with respect to each other permit identification of general dimensions of scholarly activity which are prime determinants of the structure of this specialty. Specific cocitation functions are suggested by the anomalous placement or linkage of certain authors, including organizational links and the cocitation of authors as concept symbols.

The general identification of clusters with known scholarly groupings provides confirmation of the usefulness and validity of these techniques. Detailed investigation

of the citation activity of selected groups of authors, the context of citation of cited authors by source papers and the extension of author cocitation analysis to include time-series studies would provide additional insights into the changing intellectual structure of macroeconomics.

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Notes and References

1. H. G. SMALL, Co-citation in the Scientific Literature: A Measure of the Relationship between Two Documents, *Journal of the American Society for Information Science*, 24 (1973) 265–269.
2. H. G. SMALL, B. C. GRIFFITH, The Structure of Scientific Literatures I: Identifying and Graphing Specialities, *Science Studies*, 4 (1974) 17–40.
3. B. C. GRIFFITH, H. G. SMALL, J. A. STONEHILL, S. DEY, The Structure of Scientific Literatures II: Toward a Macro- and Microstructure for Science, *Science Studies*, 4 (1974) 339–364.
4. H. D. WHITE, Cocited Author Retrieval Online: An Experiment with the Social Indicators Literature, *Journal of the American Society for Information Science*, 32 (1981) 16–22.
5. H. D. WHITE, A Cocitation Map of the Social Indicators Movement, *Journal of the American Society for Information Science*, in press, 1982.
6. H. D. WHITE, B. C. GRIFFITH, Author Cocitation: A Literature Measure of Intellectual Structure, *Journal of the American Society for Information Science*, 32 (1981) 163–171 (information science).
7. H. D. WHITE, B. C. GRIFFITH, A Cocitation Map of Authors in Judgment and Decision Research, in, Concepts in: *Judgement and Decision Research*, B. F. ANDERSON et al. Eds, New York, NY: Praeger, 1981, p. 261–271.
8. H. D. WHITE, B. C. GRIFFITH, Authors as Markers of Intellectual Space, *Journal of Documentation* (in press).
9. *Baily* reviews briefly the state of contemporary macroeconomics and notes that "Scientists must be dismayed as well as amused by the constant wrangling among schools of thought in macroeconomics. From the inside these disputes are fun..." see M. N. BAILY, Economic Models under Challenge, *Science*, 216 (1982) 359–362.
10. The influence of Marxist economics on contemporary western macroeconomics is largely limited to the work of post-Keynesian economists, such as *Robinson* and *Kalecki* in the present study.
11. W. H. BRANSON, *Macroeconomic Theory and Policy*, 2nd. ed. New York, NY: Harper & Row, 1979; R. DORNBUSCH, S. FISCHER, *Macroeconomics*, 2nd. ed., New York, NY:

- McGraw-Hill, 1980; S. WEINTRAUB, *Keynes, Keynesians and Monetarists*, Philadelphia, PA: University of Pennsylvania Press, 1978; F. C. WYCOFF, *Macroeconomics Theory, Evidence, and Policy*, Englewood Cliffs, NJ: Prentice-Hall, 1976.
12. Names added to this list include three authors (*Azariadis, Lucas and Sargent*) representing relatively new research areas which are not well covered in the texts. *Clower* was added as an important member of an existing school. 18th and 19th century economists and contemporary post-Keynesian authors were selected from Weintraub's extensive listings after consultation with Roger A. *McCain*, Fordham University and Eileen *Applebaum*, Temple University.
 13. See note 4, op cit.
 14. As R. *Clower* or R. E. *Clower*. The position of the truncation symbol (?) permits this more "general" retrieval. In certain cases, retrieval of multiple authors sharing the same first initial (homographs) may require the inclusion of a second initial, if the author has one, or a blank after the first initial. In most cases, however, the intersection of two author sets eliminated the inappropriate author(s) sharing the first initial. the R. *Gordon* homograph includes papers by R. J. *Gordon* (the target) and R. A. *Gordon*. The latter, also a macro-economist, did not drop out of all pairings; to muddy things further, both authors are occasionally cited as R. *Gordon*. It should also be noted that the ISI data bases index cited papers by first author only. Consequently, papers on which any of the target authors was second (or later) author are not indexed under that author's name and were not counted. Each author's oeuvre as described by the retrieval sets include only first authored works.
 15. See WHITE and GRIFFITH, note 5-6, op. cit.
 16. For instance, the homograph M. *Friedman* (no middle initial!) received 3840 citations during the period under study - distributed largely between the economist Milton *Friedman*, who published in economics journals, and Meyer *Friedman*, author of *Type A Behavior and your Heart* as well as numerous articles in biomedical journals.
 17. The three highest cocitation values were added together and the sum divided by two. The resulting number was placed in the diagonal cell. See WHITE and GRIFFITH, note 5-8, op. cit.
 18. J. B. KRUSKAL, M. WISH, *Multidimensional Scaling* (Quantitative Applications in the Social Sciences No. 11), Beverly Hills, CA: Sage Publications, 1978.
 19. SAS Institute, the VARCLUS Procedure, in, SAS 79.5 Changes and Enhancements (SAS Technical Report P-115): 14.1-14.12, 1981.
 20. See the source texts, note 11, for general background on macroeconomics and prevailing schools of thought.
 21. VARCLUS is an iterative clustering program based on principal component factor analysis. In the first iteration, the set of variables are split into two groups. In each successive iteration, all variables in each group are examined; a group will be split as long as there is more than a specific percentage of variation to be explained by splitting. Unlike factor analysis, each variable is assigned a unique position in a single cluster (although the variable may change cluster assignment from one iteration and splitting to the next).
 22. See A: OKUN, *Prices and Quantities*, Washington DC, Brookings Institution, 1981, for a review of these two new theory groups.
 23. See A. EICHNER, J. A. KREGEL, An Essay on Post-Keynesian Theory: A new Paradigm in Economics, *Journal of Economic Literature* 13 (1975) 1293-1314; A. LEIJONHUFVUD, *On Keynesian Economics and the Economics of Keynes*, New York, NY: Oxford University Press, 1968.
 24. See R. P. WOLFE, Piero Sraffa and the Rehabilitation of Classical Political Economy, *Social Research*, 49 (1982) 209-238 for a general discussion.
 25. They may also be more frequently cocited with the disequilibrium theorists (as representatives of contrasting positions). E. APPLEBAUM, personal communication.
 26. See WOLFE, note 24, op. cit.

27. This description derives from discussions with economists familiar with the literature and not from experimental studies of literature use by authors in the several groups.
28. See discussion in F. N. KERLINGER, *Foundation of Behavioral Research*, 2nd. ed., NY: Holt, Rinehart and Winston, Inc., 1973.
29. Gordon refers to Tobin as "the outspoken arch-opponent of Milton Friedman's analysis of monetary problems and of his opposition to activist government intervention"; see R. J. GORDON, *Macroeconomics*, New York, NY: Little, Brown and Co., 1978, p. 342.
30. H. SMALL, Cited Documents as Concept Symbols, *Social Studies in Science*, 8 (1978) 327-340. See S. E. COZZENS, Split Citation Identity: A Case Study from Economics, *Journal of the American Society for Information Science*, 33 (1982) 233-236, for a review of the literature on citation context.
31. Roger A. McCAIN, personal communication.
32. Among his other activities and contributions, he served and later chaired the Council of Economic Advisers during the administration of Lyndon Johnson. He is also associated with "Okun's Law" - which describes the relationship between the rate of increase of employment and that of productivity.
33. Okun and R. J. Gordon were both fellows of the Brookings Institution.
34. See OKUN, note 22, op. cit.
35. Andrew POLICANO and Paul BECKERMAN, personal communication.
36. See comments on infrequent pairings in information science, WHITE and GRIFFITH, note 6, op. cit.
37. For instance, the neoclassical/monetarist division focusses largely on the magnitude of interest inelasticity of the demand for money; disequilibrium theorists and post-Keynesians are united in their doubt that "market equilibrium" can encompass all observed phenomena but differ in their proposed solutions.
38. During the VARCLUS run, the minimum eigenvalue was set at 1. Were it reduced to, say, 0.5, a finer division of clusters might have resulted (in the same way that lowering the eigenvalue in a factor analysis results in more factors being derived),
39. See WHITE, note 5, op. cit.
40. Keynes was also a student of Alfred Marshall but, of course, his position as progenitor of "Keynesian" economics removes him from the classical cluster and a strong association with Marshall and Pigou.
41. See, for instance, comments by R. J. GORDON, note 29, op. cit. introductory remarks.
42. See SMALL, note 30, op. cit.
43. See WHITE and GRIFFITH, notes 6-8, op. cit.