

COWLES COMMISSION
FOR RESEARCH IN ECONOMICS

REPORT FOR 1943

THE UNIVERSITY OF CHICAGO

COWLES COMMISSION FOR RESEARCH IN ECONOMICS

THE COWLES COMMISSION FOR RESEARCH IN ECONOMICS is a not-for-profit corporation, founded in 1932 for the purpose of conducting and encouraging investigations into economic problems. A function of the COMMISSION is to issue from time to time papers and monographs of an econometric or economic-statistical nature without, however, assuming responsibility for theories or opinions expressed therein. The COMMISSION is affiliated with the ECONOMETRIC SOCIETY, an international society for the advancement of economic theory in its relation to statistics and mathematics.

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THE UNIVERSITY OF CHICAGO

RESEARCH ACTIVITIES

THE main research effort of the Cowles Commission during the year 1943 was concentrated on three types of studies: A. Wartime price control and rationing (No. 1); B. Studies in economic behavior (Nos. 2, 3, 4, 5); C. Unemployment and business cycles (Nos. 6, 7). These are described under the appropriate headings below. Under D other studies by staff members are described, followed under E by an account of the co-operative arrangements with other institutions.

A. 1. Study of Wartime Price Control and Rationing

This study is being conducted by the Committee on Price Control and Rationing established by the Cowles Commission jointly with the Conference on Price Research of the National Bureau of Economic Research. The project has been supported by these two organizations and by a grant from the Rockefeller Foundation. As stated in the previous annual report the object of the Committee has been to study the effect of price control and rationing on the civilian sector of business. Its main tasks, therefore, have been to find out in what way pricing policies, buying and selling practices, and other business decisions have changed under the impact of wartime developments and regulations.

The year 1943 was devoted mainly to the collection of material by means of interviews with businessmen. The staff, under the direction of George Katona, research associate of the Cowles Commission, consisted of six to eight research workers (mostly graduate students), some working full

time, others part time. The structure of various fields of business and the relevant regulations applied to them were carefully studied; a sample of large and small manufacturers, wholesalers, and retailers in the Chicago area was selected; and extensive interviews were conducted with these firms. During the fourth quarter of 1942 and throughout 1943, interviews were conducted with 123 retailers and 78 wholesalers and manufacturers of apparel and housefurnishings, 97 grocers (retailers, wholesalers, and processors), 35 meat packers and processors, 37 restaurants, 32 drug firms, and 115 firms in several less important fields. Of these 517 interviews 48 can be classified as "case studies," inasmuch as 48 firms were visited several times and permitted the consultation of some of their records. In addition, reinterviews were made with 40 other firms, so that a certain amount of information on changes during the year was obtained from them.

Only a part of the results of these field studies was tabulated and analyzed in 1943. Four mimeographed interim reports were privately circulated among interested scholars, government officials, and other experts. The subjects of those reports were:

1. The effects of price control on retail trade in apparel and housefurnishings.
2. Quality deterioration. Attitudes toward price control.
3. The effects of price control and rationing on manufacturers and wholesalers of apparel and housefurnishings.
4. The effects of price control and rationing on wholesale and retail grocers.

In addition George Katona prepared a report on the progress of the study, which was presented at the annual meeting of the Conference on Price Research at Hillside, New York, on May 1, 1943.

The Special Committee of the American Statistical Association appointed to appraise the cost-of-living index of the Bureau of Labor Statistics requested information gathered in the course of our field studies. We were able to furnish them with material, especially on "hidden" price increases such as quality deterioration and reduction in number and size of price discounts (clearance sales, etc.)

The National Bureau of Economic Research has asked the Committee on Price Control to supply a paper on certain basic problems of price control for the Bureau's series of pamphlets entitled "Our Economy in War." This paper, to be published in March, 1944, will contain part of the findings of the investigation.

By the end of the year 1943 most of the important field work was completed. The main tasks to be accomplished in 1944 will be to recheck and analyze the information received and to write the final report, appraising the effects of price control and rationing within the framework of the war economy as a whole. This report is intended for publication in the fall of 1944.

B. Studies in Economic Behavior

These studies are concerned with the behavior of consumers, entrepreneurs, and investors. Studies Nos. 2, 3, and 4 aim at estimating certain parameters which, until 1941, characterized the economically relevant behavior of indi-

tries to establish "consistent" estimates (in the probability sense) of the elasticity of product with respect to labor and capital, using for the first time the method suggested by Haavelmo and by Mann and Wald (*Econometrica*, 1943), and, in addition, trying to estimate the error involved in using data for whole industries instead of individual firms. This study, by W. H. Andrews and Jacob Marschak, is nearly completed, and will be published in 1944. In effect, it tries to make explicit the probability implications of the production theory.

4. *Investment and Savings Studies.* To estimate the amount of employment possible without government spending, the relationship between the nation's savings and incomes must be analyzed. But savings depend on (and determine) simultaneously the consumption propensity of families and the expansion policies of firms. We have thus to estimate simultaneously a pair of equations (at least), not a single equation. Because of the presumable influence of past profits on current expansion, the system is a dynamic one and may give rise to fluctuations; it is, in fact, generally regarded as a necessary, perhaps pivotal, element of any business-cycle theory. Empirical work in this field (just as in the case of the studies Nos. 2 and 3) has to take account of these properties of the relevant time series. Also, aggregate data have to be reinforced, as far as possible, by data on individual families and corporations.

This work was started in the fall of 1943, under the joint direction of Oscar Lange and Jacob Marschak, by Bert F. Hoselitz, advised at fortnightly conferences by Leonid Hurwicz, Israel Kosloff, and D. H. Leavens. So far,

some theoretical groundwork has been laid out and the data of the United States Bureau of Internal Revenue on aggregate profits and investments of various industries have been analyzed to provide preliminary information on the relationships between past profits and current business expansion.

5. *Critique of Stock-Market Forecasting*. This subject was treated in previous publications by Alfred Cowles (*Econometrica*, 1933) and by Alfred Cowles and Herbert E. Jones (*Econometrica*, 1937). The former study was based on stock price data of 1928-1932. To see whether the conclusions were due to the peculiarities of that period, the study has now been extended to the end of 1943 to cover several bull and bear markets. This study has been carried out by Alfred Cowles with the assistance of Forrest Danson and Dickson H. Leavens, and the results will be published in 1944.

C. *Unemployment and Business Cycles*

These studies were started in 1942 to deal with the theoretical aspects of economic disequilibrium, and with the methods of testing hypotheses referring to business cycles.

6. *Price Flexibility and Unemployment*. This is the title of the manuscript prepared by Oscar Lange for publication in the series of Cowles Commission Monographs. Using the tools of modern theory of economic stability as developed, for example, by Hicks and Samuelson, Lange attempts to clarify important concepts which, so far, have had much currency in the practical discussion of depressions and wars but have remained too vague to allow of useful handling: such are the concepts of "flexibility" of prices and

wages; underemployment; bottlenecks; etc. Conditions are derived under which a given system of tastes, technologies, and expectations leads to stable or unstable prices. Neither delayed adjustment nor imperfect competition are neglected: thus a few more abstractions are dropped. The effects of monetary decisions (by the public, the banks, or the government) are shown. Thus a synthesis is attempted between Keynes's hypothesis and the achievements of the modern theory of dynamic markets.

7. *Statistical Methods to Test Business-Cycle Theories.* The tools used for empirical tests of theories of economic dynamics need further sharpening. One problem, tackled by Leonid Hurwicz, under the direction of Oscar Lange, was that of the autocorrelation properties of the "disturbance" component in stochastic difference equations. In a paper scheduled to appear in the April, 1944, issue of *Econometrika*, Hurwicz has discussed the autocorrelation patterns in variates satisfying such equations. Among questions still unsolved is that of designing proper tests to find the order of the difference equation to be fitted. As mentioned under B, further development of these studies is planned.

D. *Other Work of Staff Members*

Harold T. Davis has been continuing his studies in the mathematical interpretation of history. He has assembled data from various sources for the construction of price series for both the Alexandrian and the Roman economies from about 300 B.C. to 400 A.D., including details of the extensive copper inflation under the last Ptolemies and the inflation at the end of the Roman Empire. Incidental to this study he has estimated the income distribution in Rome at

the time of Cicero. Professor Davis is also constructing a table of the incomplete Gamma function for values of the argument different from those used by Karl Pearson. This table is being used for the construction of a table of another function needed for the study of the distribution of income.

Trygve Haavelmo has revised the manuscript of his work "On the Theory and Measurement of Economic Relations" (hctographed in Cambridge, Massachusetts, 1941, for private circulation), which is to be published as Part I, "The Probability Approach in Econometrics," of Cowles Commission Monograph, *Contributions to the Theory of Economic Measurements*. This study contains suggestions on methods which have greatly influenced the work of the Cowles Commission in the current year. Mr. Haavelmo also has in progress a critical analysis of the theory of expectations, a discussion of the price-homogeneity postulate in dynamic theory, and an analysis of the Wicksellian theory of interest and prices.

E. Co-Operation in Research

The study of price control and rationing is organized under the joint auspices of the Cowles Commission and the Price Conference of the National Bureau of Economic Research. The Rockefeller Foundation has contributed a substantial grant in aid of the project.

The Social Science Research Committee of the University of Chicago has supported the studies on demand and on production by contributing towards salaries and computing expenses. These studies are also supported in part by the Rockefeller Foundation.

The study on investment is also supported in part by the Social Science Research Committee of the University of Chicago, which contributes the salary of Professor Lange's research assistant, Bert F. Hoselitz.

UNIVERSITY ADVISORY COMMITTEE

THE University of Chicago Advisory Committee of Cowles Commission for Research in Economics was established in the summer of 1943. It meets from time to time to co-ordinate the work of the Cowles Commission with other research and teaching work of the University. The chairman is Simeon E. Leland, chairman of the Department of Economics. The vice-chairman is Louis Wirth, secretary of the Social Science Research Committee of the University. Other members are: Walter Bartky, professor of applied mathematics, Alfred Cowles, president of the Cowles Commission, Garfield V. Cox, acting dean of the School of Business, Oscar Lange, research associate of the Cowles Commission, Jacob Marschak, research director of the Cowles Commission, Theodore W. Schultz, professor of agricultural economics, and Jacob Viner, professor of economics. D. H. Leavens, research associate of the Cowles Commission, acts as secretary of the Committee.

COWLES COMMISSION SEMINARS

SEMINARS for faculty members, graduate students, and others interested in the studies of the Cowles Commission were started in July. The following papers were presented and discussed:

July 6. Leonid Hurwicz, "The Study of Price Determination."

July 22. Gerhard Tintner, Iowa State College, "Verification of a Simplified Theory of Business Cycles."

September 29. George Katona, "The Study of Price Control and Rationing."

November 3. Research assistants of the Committee on Price Control and Rationing discussed various aspects of the study then in progress. Speakers were: Rolf A. Weil, Marvin L. Braude, and Jack Letiche.

November 26. The discussion of price control and rationing was continued. The speakers were: Sylvia M. Kafka, George Katona, and Jack Letiche. Lt. (j.g.) Martin Hilby, U.S.N. (formerly of OPA) and Professor Theodore W. Schultz also participated.

December 13. Tjalling Koopmans, Statistician of the Combined Shipping Adjustment Board, "Dynamic Economic Systems."

STATISTICAL TEACHING IN THE DEPARTMENT OF ECONOMICS

SINCE 1939 when the Cowles Commission established its connection with the University of Chicago, staff members have participated in the teaching activities, especially in the field of statistics and of economic theory. In 1943, the sequence of statistical courses given in the Department of Economics was revised to lay greater stress on the connection between mathematics, economics, and statistics. At present, three kinds of courses are listed:

1. Mathematics (beginning with elementary calculus) applied to economics: (a) Mathematics for economists; (b) Problems in mathematical economics; (c) Mathematical colloquium for economists (in co-operation with Professor Bartky).

2. Statistical methods: (a) Univariate analysis; (b) Multivariate analysis.

3. Statistics applied to economics: (a) The main economic magnitudes; (b) Static econometrics; (c) Dynamic econometrics.

These are additional to relevant courses given in the Department of Mathematics and recommended to more advanced students. The University's Committee on Statistics co-ordinates the instructional facilities in statistics provided by the various departments of the University.

LIBRARY AND EQUIPMENT

THE library at the Cowles Commission offices includes most of the material in mathematics, statistics, and economics that is needed for the studies in which the Commission is engaged, and forms a very convenient working collection for its staff and for others in the University. The Commission's own collection contains about 1500 books, 2000 pamphlets, and 300 bound volumes of journals in addition to extensive unbound files of less important periodicals. Additions during the year totalled 129 books, 183 pamphlets and reprints, and 25 bound volumes of periodicals; some 75 journals are currently received. The library of the late Professor Henry Schultz, belonging to the University and shelved in the Commission's offices, contains about 850 books and 1700 reprints and pamphlets.

The Cowles Commission has four Monroe calculating machines, two adding machines, and drafting tools, and so is well equipped for making the computations and charts appropriate to its investigations.

STAFF CHANGES

FORREST Danson left the staff of the Cowles Commission on March 1 to take a statistical position in the Army Air Force Materiel Command, at Wright Field, Dayton, Ohio.

Trygve Haavelmo became a research associate of the Cowles Commission in July. Mr. Haavelmo was born in Norway and received the degree of *cand. oecon.* from the University of Oslo in 1933; he also studied at various European universities, and in 1939-42 at various American universities on an American Scandinavian Foundation Fellowship and a Rockefeller Foundation Fellowship. He was research assistant at the University Institute of Economics in Oslo, 1933-38, and lecturer in statistical theory at the University of Aarhus, Denmark, 1938-39. Since 1942 he has been statistician of the Norwegian Shipping and Trade Mission in New York. He has published various demand studies in Norway and Denmark and articles in American economic journals.

William H. Andrews became a research associate of the Cowles Commission on July 1. Mr. Andrews received the degree of B.S. in 1933 and the degree of A.M. in economics in 1937 at Indiana University. He was instructor in economics at Purdue University, 1937-1941, and fellow at

the University of Chicago, 1942-1943. He is also research associate of the Department of Economics of the University.

OUTSIDE ACTIVITIES OF STAFF MEMBERS

JOEL Dean has continued on leave of absence as director of the Fuel Rationing Division in the Office of Price Administration in Washington.

Leonid Hurwicz has continued as a research associate of the Institute Meteorology of the University of Chicago, where he has been engaged in teaching and research. In the winter quarter he is to teach a graduate course in Univariate Statistical Analysis in the Department of Economics of the University.

Oscar Lange was on leave of absence as a visiting professor at Columbia University during the first half of 1943.

Dickson H. Leavens has been teaching mathematics to one section of army students in the basic engineering phase of the Army Specialized Training Program.

H. Gregg Lewis has been executive secretary of the Chicago Regional Office of the War Labor Board during the greater part of the year.

Jacob Marschak has served on the executive committee of the Conference on Research on Income and Wealth, organized under the National Bureau of Economic Research; he has given lectures on the economic structure of Germany to students of Civil Affairs Training School at Northwestern University.

Jacob L. Mosak has continued on leave of absence as chief of the Statistical Trends and Forecasting Branch of

the Research Division of the Office of Price Administration in Washington.

Theodore O. Yntema has been on leave of absence as research director of the Committee for Economic Development.

THE ECONOMETRIC SOCIETY IN 1943

THE Cowles Commission offices have continued as the headquarters of the Econometric Society, an international society for the advancement of economic theory in its relation to statistics and mathematics, founded in 1930. Members of the Commission staff holding offices in the Society are Alfred Cowles, Harold T. Davis, Oscar Lange, Dickson H. Leavens, and Jacob Marschak. Mr. Cowles is secretary and treasurer of the Society and business manager of its quarterly journal, *Econometrica*. Professor Davis is an associate editor of *Econometrica*. Professor Lange is acting editor to serve while it is impossible to communicate with Professor Ragnar Frisch of the University of Norway, member of the Advisory Council of the Cowles Commission, who has been editor since the foundation of the journal and whose present term expires December 31, 1944. Mr. Leavens is managing editor. Professor Marschak is a member of the advisory editorial board.

During 1943 Volume 11 of *Econometrica* was published, consisting of two regular issues and one double issue, totalling 288 pages. The regular mailing list includes 224 subscribers, chiefly libraries, and 718 members of the Society, of whom 160 subscribers and 340 members are in the United States and the remainder in foreign countries. Because of the

war it is impossible to mail copies to many of these countries, but a sufficient quantity is being printed to supply those who may wish to complete their files after the war.

Because of war transportation conditions, no meetings of the Society were held in 1943.

COWLES COMMISSION MONOGRAPHS

NO monographs were published during 1943, but the following are planned for publication in 1944, subject to securing paper quota:

General-Equilibrium Theory in International Trade, by Jacob L. Mosak. This applies the modern theory of economic equilibrium (as expounded by J. R. Hicks and others) to an important field.

Contributions to the Theory of Economic Measurements. Part I, "The Probability Approach in Econometrics," by Trygve Haavelmo. Part II, "On the Statistical Treatment of Linear Stochastic Difference Equations," by H. B. Mann and Abraham Wald.

Price Flexibility and Employment, by Oscar Lange. This book brings into a co-ordinated whole recent discussions in applied economic theory. There is a mathematical appendix.

It is also planned to publish two other monographs, one on the results of the study of price control and rationing, the other on the results of the demand studies.

OTHER PUBLICATIONS AND PAPERS

DURING 1943 members of the Cowles Commission staff have published 15 articles and presented 19 papers before meetings of scientific societies, as follows:

ALFRED COWLES

"Stock Market Forecasting," presented at Chicago, October 5, 1943, before the Seminar on the Changing Economy.

HAROLD T. DAVIS

Review of "William Fleetwood Shephard, *The Probability Integral*," and of "Project for the Computation of Mathematical Tables, *Tables of Probability Functions*," in *Mathematical Tables and Aids to Computation*, Vol. 1, April, 1943, pp. 48-51.

Review of "Zaki Mursa, *Tables of Legendre Associated Functions*," *Mathematical Tables and Other Aids to Computation*, Vol. 1, October, 1943, pp. 116-119.

"The Econometric Problem," presented at Evanston, January 19, 1943, before Sigma Delta Epsilon, women's scientific organization of Northwestern University.

"The Saddle-Point Method (Method of Steepest Descents) in Approximation," presented at Ames, May 12, 1943, before the Mathematics Seminar, Iowa State College.

"Serial Correlation," presented at Ames, May 12, 1943, before the Statistical Seminar, Iowa State College.

"Alexandria, the Golden City," presented at Ames, May 13, 1943, before the Graduate School, Iowa State College.

"The Econometric Theory of History," presented at Ames, May 13, 1943, before the Social Science Seminar, Iowa State College.

"The History of Price Movements," presented at Chicago, August 25, 1943, before the Seminar on the Changing Economy.

"Orthogonal Functions," presented at Chicago, October 13, 1943, before the Chicago Chapter of the American Statistical Association.

"Archimedes and Mathematics," presented at Chicago, November 27, 1943, before the Central Association of School Science and Mathematics Teachers, Junior College Section (to be published in *School Science and Mathematics*).

TRYGE HAAGELMO

"The Statistical Implications of a System of Simultaneous Equations," *Econometrica*, Vol. 11, January, 1943, pp. 1-12.

"Statistical Testing of Business-Cycle Theories," *The Review of Economic Statistics*, Vol. 25, February, 1943, pp. 13-18.

GEORGE KATONA

"Psychology of Rationing" — Letter to the Editor of the *New York Times*, February 28, 1943.

"Psychological Factors Contributing to Inflation," presented at Chicago, February 7, 1943, before the Seminar on the Changing Economy.

"Psychological Studies of Inflationary Attitudes and Expectations," presented at Chicago, March 11, 1943, before the Psychology Club of the University of Chicago.

"The Fight Against Inflation and Its Social Implications," presented at Chicago, August 7, 1943, before the 22nd Annual Institute of the Society for Social Research.

"The Impact of Price Control on Business," presented at Chicago, September 22, 1943, before the Seminar on the Changing Economy.

OSCAR LANGE

"A Note on Innovations," *The Review of Economic Statistics*, Vol. 25, February, 1943, pp. 19-25.

Review of "Paul M. Sweezy, *The Theory of Capitalist Developments: Principles of Marxian Economy*," *The Journal of Philosophy*, Vol. 40, July 8, 1943, pp. 378-384.

"The Theory of the Multiplier," *Econometrica*, Vol. 11, July-October, 1943, pp. 227-245.

The Working Principles of the Soviet Economy, Pamphlet Series No. 1 of the Russian Economic Institute, New York, 1943, 30 pp. (reprinted from *U.S.S.R. Economy and the War*, New York, 1943).

"Price Flexibility and Employment," presented at Cambridge, Massachusetts, March 11, 1943, before graduate students of the Department of Economics, Harvard University.

"The Contribution of Social Insurance and Full Employment to Freedom from Want," presented at New York, May 8, 1943, before the League for Industrial Democracy.

DICKSON H. LEAVENS

"Silver [review of 1943]," *Engineering and Mining Journal*, Vol. 144, February, 1943, pp. 79-80.

Far Eastern Postwar Monetary Standards, New York, The Monetary Standards Inquiry, 1943, 24 pp.

H. GREGG LEWIS

(With L. M. Court) "Production Cost Indices," *The Review of Economic Studies*, Vol. 10, Winter, 1942-43, pp. 28-42.

JACOB MARSCHAK

"Demand Elasticities Reviewed," *Econometrica*, Vol. 11, January, 1943, pp. 25-34.

"Money Illusion and Demand Analysis," *The Review of Economic Statistics*, Vol. 25, February, 1943, pp. 40-48.

"Income Inequality and Demand Studies: A Note," *Econometrica*, Vol. 11, April, 1943, pp. 163-166.

"Inflation," presented at Chicago, March 10, 1943, before the Seminar on the Changing Economy.

"Influences of Prices and Incomes on the Demand for Meat," presented at Chicago, March 24, 1943, before the Chicago Chapter of the American Statistical Association.

"Simultaneous Analysis of Demand and Supply," presented at Ames, May 5, 1943, before the Economics Seminar, Iowa State College.

"Studies on the Management of Russian Industry and Agriculture," presented at Ames, May, 1943, before the Social Science Seminar, Iowa State College.

COWLES COMMISSION MONOGRAPHS

No. 1. DYNAMIC ECONOMICS, by Charles F. Roos, 1934. 275 pages. Price \$3.50. This book applies mathematical analysis in the investigation of economic theory, especially by differentiating between theories of static and dynamic economics.

No. 2. NRA ECONOMIC PLANNING, by Charles F. Roos. 1937. 596 pages. Price \$5.00. This book describes the policies and working of the NRA and discusses the problem of economic planning.

No. 3. COMMON-STOCK INDEXES, by Alfred Cowles and Associates. Second edition, 1939. 499 pages. Price \$6.00. New monthly indexes of (1) stock prices, (2) stock prices adjusted for the reinvestment of cash dividends, and (3) yield expectations; and annual indexes of (4) yields, (5) dividend payments, (6) earnings-price ratios, and (7) earnings; all for 69 industry groups or combinations of groups, and running from 1871 through 1938.

No. 4. SILVER MONEY, by Dickson H. Leavens. 1939. 439 pages. Price \$4.00. A sketch of the history of the monetary use of silver, followed by detailed consideration of recent developments.

No. 5. THE VARIATE DIFFERENCE METHOD, by Gerhard Tintner. 1940. 175 pages. Price \$2.50. This method emphasizes the role of the random element in the analysis of time series.

No. 6. THE ANALYSIS OF ECONOMIC TIME SERIES, by Harold T. Davis. 1941. 620 pages. Price \$6.00. This book reviews the historical development of the subject, describes the methods used, and makes applications to a variety of economic phenomena.

No. 7. GENERAL-EQUILIBRIUM THEORY IN INTERNATIONAL TRADE, by Jacob L. Mosak. To be published in 1944. This applies modern theory of economic equilibrium (as expounded by J. R. Hicks and others) to an important field.

In addition, the Cowles Commission has sponsored the publication of a text book by two members of its staff:

ELEMENTS OF STATISTICS, by Harold T. Davis and W. F. C. Nelson. Second edition, 1937. 434 pages. Price \$4.00. The elements of the subject are presented without recourse to calculus, but with as complete mathematical treatment as is thus possible.

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