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ANNUAL REPORT
of the
DIRECTORS OF RESEARCH
of the
NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.

FEBRUARY 4, 1929



NATIONAL BUREAU OF ECONOMIC RESEARCH, INC.

Annual Report of the Directors of Research

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Survey of Recent Economic Changes

At the close of the last annual report attention was called to the Survey of Recent Economic Changes, upon which work had then begun. This study, undertaken at the request of then Secretary Hoover, for a Sponsoring Committee which is expected to make practical recommendations, has been vigorously carried on during the past year, and upon it the directors of research and the staff of the National Bureau have expended much time and attention. Mr. E. E. Hunt was appointed on the staff of the National Bureau to organize the work. He has served also as secretary of Mr. Hoover's Committee, thus facilitating the coordination of the two bodies. Your directors of research divided the field of inquiry into twelve main sections, a procedure which was approved by the Sponsoring Committee, and gave our cooperation to Mr. Hunt in obtaining the collaboration of a group of men peculiarly qualified to deal with the topics assigned. The sections and those responsible for them are as follows:

Introduction—Dr. Edwin F. Gay

- I. Changes in Consumption and the Standard of Living—Dr. Leo Wolman
 - II. Industry
 1. Technical Changes—Mr. L. P. Alford
 2. Changes in New and Old Industries—Dean Dexter S. Kimball
 3. Construction—Mr. John M. Gries
 4. Changes in Physical Organization—Dr. Willard L. Thorp
 - III. Transportation
 1. Railroads—Prof. W. J. Cunningham
 2. Shipping—Mr. E. S. Gregg
 - IV. Marketing—Prof. Melvin T. Copeland
 - V. Labor—Dr. Leo Wolman
 - VI. Management—Mr. Henry S. Dennison
 - VII. Agriculture—Dr. Edwin G. Nourse
 - VIII. Price Structure—Dr. F. C. Mills
 - IX. Profits, Interest and Wages—Dr. Morris A. Copeland
 - X. Capital Accumulation and Investment—Dr. W. Randolph Burgess
 - XI. Foreign Markets and Loans—Prof. J. Harvey Rogers
 - XII. Money and Banking—Prof. O. M. W. Sprague
- Conclusion—Dr. Wesley C. Mitchell

The aim of those who wrote these sections or chapters has been to bring together and to set forth the available facts and figures which throw light on the remarkable period in the economic experiences of the United States since 1922. In the main, new material was not sought, although in some sections, notably those on The Standard of Living, Industry, Marketing and Management a considerable amount of fresh data was obtained and a number of experts contributed to the findings. Several conferences of this special staff were held before and after the sections were written. Before taking their final form these sections were discussed at a series of sessions with the Sponsoring Committee. It is expected that the completed report will be submitted soon to the Directors of the National Bureau and after their approval will then be turned over formally to Mr. Hoover's Committee for publication. The recommendations of the Sponsoring Committee and our results will be printed in the same volume; but of course the Directors of the National Bureau take responsibility solely for the fact-finding report.

With this report there has not been quite so great a pressure to meet a short time-limit as with the earlier report of 1922-23 on *Business Cycles and Unemployment*. Nevertheless, the exigencies of time and space have been serious. All those who have cooperated in making this study have been conscious of the great difficulties of this attempt to depict the salient features of a complex and elusive present situation. For the earnest and competent collaboration of the special staff, the National Bureau has reason to be both proud and grateful.

As in 1922, so again, though not to so great an extent, the regular work of the National Bureau has been somewhat retarded by reason of the participation of its research staff in this special enterprise. Drs. Mills, Mitchell, Thorp, Wolman and Jerome have been called upon, each in his special field, for contributions to the Survey of Recent Economic Changes. As far as the publication plans for 1928 were concerned, this diversion of time and energy affected primarily the first volume of Dr. Wolman's study of the Labor Market and the first volume of Dr. Thorp's collection of statistical series. The work on both of these books, however, is far advanced, and they will undoubtedly be submitted to the directors in 1929.

Estimates of National Income.

There has also been delay in the publication of two other studies, long eagerly awaited. Dr. King's long protracted and regrettable illness, together with the reduction in the number of his assistants, necessary at the time he left full-time employment with the National Bureau, has postponed the appearance of his revised report on The National Income of the United States. Dr. King informs us, however, that the labor of revision and verification is nearly completed. Of the total number of tables, 120 altogether, which will appear in the new volume, all but about seven are ready, giving estimates for the National Income as completely as possible from 1909 to 1925, and preliminary estimates for 1926 to 1928. Meanwhile, Dr. Morris A. Copeland has summarized and supplemented Dr. King's current estimates in one of the chapters of *Recent Economic Changes*.

Bond Yields and Interest Rates

Dr. Macaulay's notable study of interest rates and bond yields still awaits the finishing of the descriptive text, although tables and charts are ready for the press. But the most difficult chapters of the text have been written and the prospect of early completion is favorable.

International Migration Statistics

Of another large and time-consuming study, undertaken by the National Bureau, it is gratifying to report marked progress. The first volume of the investigation of International Migration Statistics, containing in 1086 pages the statistics collected for the National Bureau by Dr. Ferenczi of the International Labour Office, is now complete in page proof, awaiting only the second revision by Dr. Ferenczi in Geneva. The proof-reading of this great collection has entailed great labor on Dr. Ferenczi, and the revision has made also unforeseen demands upon the time of Professor Willcox who is in editorial charge. There are also in hand for the second volume chapters by twenty writers from as many countries, each analyzing and discussing the migration statistics of his country. Professor Willcox has been engaged not only in the revision of the material for both volumes, but also in writing the two chapters which he himself contributes to the second volume. There, as a necessary background to the movements of migration, he has examined critically the estimates of the present and past population of the Earth and has replaced these contemporary estimates by better ones based on the recent progress of knowledge in this field.

Professor Willcox expects to have the manuscript of the second volume ready to submit to the Directors in the spring of this year.

Labor Market

Somewhat later in the year the Directors may expect to see the text of Dr. Wolman's first volume on the American Labor Market. The bulk of this volume will be devoted to the discussion of wages in the manufacturing industries, in the coal in-

dustry, and in rail transportation, the building trades and other trade-union rates of wages. Dr. Wolman has developed a number of new and interesting series, such as full-time weekly earnings and derived hourly earnings, wage differentials, and indexes of wages and of unemployment for persons on payrolls.

Mechanization and Restriction of Immigration

Dr. Jerome also plans to complete this year his survey of Mechanization and the Restriction of Immigration. A large number of the chapters in the subjoined provisional table of contents are practically completed.

MIGRATION AND THE MECHANIZATION OF INDUSTRY

A study in the Effects of Immigration Restriction and the Causes of Changing Productivity

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Output—Per—Hour

Despite the demands on Dr. Jerome's time made by his academic work at the University of Wisconsin, he has nevertheless pushed steadily forward not

only the detailed study of Mechanization, but also the experimental investigation, under a grant from the Social Science Research Council, of output-per-hour in a variety of industries. His field workers obtained last summer data from 113 industrial plants, of which 69 were beet-sugar plants and 20 were brickyards. This additional experience seems to confirm the impression gained from the previous summer's work, namely, that to be most effective such an inquiry should be made on a scale such as only a governmental bureau or a group of strong trade associations can undertake, but that this experiment will have justified itself, if, as seems likely, the completion of this well-controlled and painstaking inquiry succeeds in setting more critical standards for a much-needed study of larger scope.

Business Cycles

The work on Dr. Mitchell's second volume on Business Cycles has been prosecuted steadily during the past year. The plan of study, outlined in the closing pages of the first volume, published last year, has been perfected and applied in a manner which will be of interest to the Directors and to others who watch with keen interest the quest for reasonably valid answers to the questions raised by *Business Cycles: The Problem and Its Setting*.

The first step in executing the plan of attack, now being developed by Dr. Mitchell and his assistants, is to draw up for each country included in the investigation a set of "reference dates", marking the beginning, culmination and end of the successive cycles in general business. The National Bureau's collection of *Business Annals* affords the basis of this chronology. But it is necessary to fix the dates of revivals and recessions more precisely than the annals permit, and for that purpose resort must be had to statistical evidence. Needless to say, there is an element of the arbitrary in assigning every revival and every recession to some single month; but this creates no serious difficulty, because the dates are used mainly as bench marks from which to measure the leads and lags of numerous time series. Any serious error in dating revivals and recessions is revealed as soon as the reference dates are applied to the statistical series under analysis.

In dealing with any time series, the first step is to break it into the business-cycle segments fixed by the reference dates for the country in question. Then the original data for each of these segments are turned into relatives, on the basis of the average value of the data during that cycle as 100. Next comes the scrutiny of the relatives to see whether they contain appreciable seasonal fluctuations. If tolerably regular seasonals are observable, they are measured by methods which allow secular changes in the seasonal factor to appear. After the elimination of the seasonals from the first set of relatives, the series is ready for analysis of its cyclical behavior.

It should be noted that this procedure eliminates the secular trend of a series from one cycle to the next, but retains what we call the "intra-cycle

trend". For this rather unusual procedure we have a special reason. Our aim is to discover how cyclical changes in business activity come about. We think that one highly important factor in this process consists of the adjustments which business men are continually making in their scales of operations, scales of prices, credit policies, financial programs, and the like. Such adjustments are based upon current business developments, as understood by the business public. Hence we must keep the statistical records in a form which reveals the facts taken into account by business men in actual practice. To use devices which make these time series differ in any essential respect from the reports on which the business public based its plans would lessen the value of the statistics as clues to business behavior.

For example: To transmute a production series into deviations from a secular trend usually shifts some of the turning-points in the series, making certain recessions come earlier and certain revivals come later. If these transmuted series be used to explain the influence exerted by the industry in question upon other business operations, the changed dates might prove misleading. For an increase or decrease in any line of production exerts an influence upon current demand and supply, and an influence upon business sentiment, when the increase or decrease takes place or becomes known—not at the time when the cyclical deviations from a computed trend rise or fall. Business men do not discriminate between the secular and cyclical elements in short-period fluctuations. But they do make rough allowances for the secular trend over longer periods. That is, they consider current changes with reference to the general scale of operations when these changes occur. We believe that we are following common business thinking when we shift the base on which we compute our relatives from one cycle to the next, but keep the segment of the trend which is found within each cycle. But we believe that business men do allow for seasonal variations in their planning, wherever these variations are appreciable in magnitude and tolerably regular. Hence we do not hesitate to eliminate seasonals from the series.

To find what cyclical behavior is characteristic of a series we use two fundamental schemes of analysis, which we call Table A and Table B. In Table A the cycles found in the series itself are examined. In Table B the series is stretched upon the Procrustean bed of our reference cycles, in order to see how its fluctuations fit that hard and fast chronology.

Table A shows first how many cycles a series runs through in the period it covers. A comparison of this number with the corresponding number of reference cycles produces an "index of conformity," which shows the degree to which the cycles of the series under analysis match the cycles in general business. Many of the series have indexes of 100 (indicating perfect conformity); some have indexes of 90, 80, 50—a few of zero. A study of the poorly conforming and non-conforming series may be scarcely less illuminating than the study

of the perfect conformers. Now and then a conforming series may skip a reference cycle entirely. Also a considerable number of series show "extra cycles"—that is, now and then they have two distinct cycles within the period covered by a single reference cycle. Extra cycles are most common in what may be called financial series—such as metropolitan clearings and central money-market discount rates. Often, perhaps usually, the extra cycles in one country correspond in time to reference cycles in another country.

Besides the index of conformity, supplemented by notes on all skipped cycles and extra cycles, Table A gives measures of (2) the lead or lag of the turning points in the series under analysis compared with the reference dates for revival and recession; (3) the duration of the phase of expansion, the phase of contraction and the whole cycle; (4) the amplitude of the rise from trough to crest and of the fall from crest to trough; and (5) the percentage increase in the actual value of the variable from one cycle to the next cycle. This last set of measurements will facilitate a comparison of secular rates of increase with leads and lags, durations of expansion and contraction, and amplitudes of rise and fall. All these measures are taken cycle by cycle. Then averages are made, and studied to see whether they represent characteristics present in the majority of cases.

Table B is designed to show the behavior of a series during the standard periods marked off by the reference dates. We enter in this table for each cycle covered by the series its average standing during the three months centering upon the reference date for revival; during the first, middle and last thirds of the reference period for expansion; during the three months centering upon the reference date for recession; during the successive thirds of the reference period of contraction; and finally during the three months centering upon the next reference date for revival. These nine measures of average standing are taken in the same way for every reference cycle covered, whether the reference cycle be long or short. Of course, this procedure pushes the idea of the business cycle as a recurrent unit in economic experience to its logical limit. Unless it is a genuine unit, we can expect little uniformity in the cycle-by-cycle measures of Table B. But the investigation already shows a sufficient body of internally consistent results to banish any doubts which have been suggested of late concerning the genuineness of the phenomena under examination, or concerning the value of the methods here followed.

On comparing the average standings at the nine successive points of the cycle, which Table B gives for different series, and on comparing the average change per month from one of these points to the next, there develops a clear picture of the similarities and differences in the cyclical behavior of the various economic activities represented by the series. This picture in fractions of the standard reference cycles is an invaluable addition to the picture of the cyclical idiosyncracies of each series given by Table A. By combining the two pictures

a much clearer and fuller view of cyclical fluctuations is presented than has been available to any earlier investigator.

As for our rate of progress, Dr. Kuznets, with assistance not quite equal to three full-time workers for a year, has made out Tables A and B for 265 statistical series for the United States, England, France and Germany. In addition, the clerks have compiled a considerable number of summary tables designed to facilitate comparison of certain aspects of the cyclical behavior characteristic of different series. Besides supervising this clerical work, Dr. Kuznets has made a number of special studies—notably concerning the alleged gestation cycle of farm-animal slaughter and prices, stock turnover ratios in manufacturing enterprises, and the trends of chain store sales. Dr. Mitchell has devoted much time to consultation concerning problems and methods, and has written a first draft of the opening chapter and part of the second chapter of *Business Cycles: The Rhythm of Business Activity*.

During the year to come, the staff will add somewhat to the list of series analyzed in Tables A and B; but they have already worked up most of the significant materials in this form. More time will be devoted to testing the representative values of the averages; to making summary tables of many kinds; devising and applying reliable indexes of the similarity among the measures of various aspects of cyclical behavior; to compressing much of the comparable data into a few significant indexes, and to conducting the many supplementary studies which an investigation like the present one requires. Considerable progress should be made in writing the report, but there is no prospect that the volume can be completed in 1929.

The Encyclopaedia of Statistical Series

The preparation for publication, under the editorship of Dr. Thorp, of the voluminous and valuable statistical material, collected by him in connection with the National Bureau's work on Business Cycles, has proceeded, with the interruption already noted. Of the five volumes now planned, to be issued in successive years as rapidly as Dr. Thorp's time permits and as funds become available, the first, containing production statistics, is nearly ready. For the second and third, covering trade and transportation, and finance, respectively, a large part of the work is done. The fourth volume will give labor statistics, and the fifth price series.

Dr. Thorp is giving meticulous care to the preparation of these historical statistics. Many of the series, owing to faulty description or definition, have hitherto been incorrectly used. For example, the Department of Agriculture's statistics of crop production begin in 1866, and thereafter show a great increase for several years. This increase has been misinterpreted as indicating a remarkable post-war recovery; but in fact the production of several areas, notably the Pacific States, was omitted in the initial years of the series and then suddenly added, thus accounting for a large part of the increase. Dr. Thorp has also found valuable series which were discontinued before the recent war and

are now neglected, such as a boots-and-shoes series by weeks for over fifty years, and another giving for twenty years cotton print cloth production, shipments, stocks and sales by weeks and months. We repeat the hope that a special fund may be given to the National Bureau to help defray the heavy expense of printing this remarkable collection of statistical material.

Price Study

A full report of Dr. Mills' price study is presented this year not only because of its interest as one of our major enterprises, but especially because, as an outgrowth of this work, a plan has been proposed which is of great importance for the future development of the National Bureau.

The work already completed by Dr. Mills has dealt with certain aspects of the behavior of prices in the United States. A standard method of describing the behavior of individual commodity prices has been developed, and this has been applied in the study of price movements during the period 1890-1926. Measures relating to individual commodities have been supplemented by a number of indexes and averages descriptive of the behavior of prices in combination. Some of the basic materials and certain of the results so far secured have appeared in *The Behavior of Prices*, which is Volume XI of the Bureau's publications.

The next major task is the study of price groups in the United States and in other industrial countries. It is desired to determine just what groups of commodities possess distinctive modes of price behavior, which differ significantly from the modes of behavior of other commodity groups. Since the movements of specific price groups are of immediate interest to economists and to various groups of producers, consumers, and business men, it is planned to make the results of certain of the group studies available as they are completed, although the discussion of relations among price groups will be postponed to a final volume. The separate reports will appear in small, non-technical volumes, each dealing with a particular group of commodities or with several closely related groups. The groups to be thus treated will not include all those studied in the general analysis, but will be restricted to commodity groups of general economic interest or of immediate concern to particular industries. The groups to be treated in separate volumes will include some of the following, and possibly certain other groups:

- Agricultural and non-agricultural products
- Foods and non-foods
- Producers' goods and consumers' goods
- Raw materials and processed materials
- Textiles and textile products
- Metals and metal products
- Forest products
- Building materials
- Coal and petroleum and their products
- Live stock, meats and fats
- Hides and skins and their products

In the study of commodities in each of these groups, attention will be paid to the movements of

group averages, to the variability of individual prices (and of corresponding quantities produced and consumed), to the cyclical movements of prices and quantities, to pre-war and post-war trends, to the relations between prices and quantities, to industrial and regional price margins, and to other aspects of price behavior. It is planned to make each study international in scope, including the chief industrial countries of the world. Differences among countries in respect to the behavior of particular commodity groups, as well as differences among commodity groups in a single country, will be investigated.

One of the first of these volumes on price groups will deal with the prices of agricultural and of non-agricultural products. This will cover, it is hoped, the major industrial countries of the world, as well as all important areas producing agricultural products. A comprehensive study and comparison of the prices of commodities falling in these two broad groups may be expected to throw some light on the present agricultural situation, and to yield material of considerable economic interest. It is probable that a comparison of the prices of foods and of non-foods will be incorporated with this study of cultivated agricultural and of non-agricultural prices. The two classifications of commodities are in many respects similar, although one is based upon methods of production, the other upon form of consumption.

Interest attaches, also, to the relation between the trends of agricultural and of non-agricultural prices. During the several decades before the war the prices of agricultural products in the United States were rising at a rate of 2.9 per cent a year, while the prices of non-agricultural products were rising at a rate of 1.9 per cent a year. The purchasing power of agricultural products in terms of other products was rising at a rate of one per cent a year. The drastic recession of 1920-21, which was more serious for agricultural than for non-agricultural products, wiped out this gain; but during the period since 1921 the advance has been resumed. Between 1922 and 1927 agricultural products rose in price in the United States at an average annual rate of 0.7 per cent; the prices of non-agricultural products declined at a rate of 1.8 per cent a year.

It is hoped to answer such questions as the following: What has been the situation in other countries in this respect? Was the great agricultural decline in 1920-21 a distinctively American phenomenon? What have been the trends of agricultural prices and of non-agricultural prices in recent years in other countries? Has the movement been the same in food-exporting countries as in food-importing countries?

Another subject of importance is that of price margins, geographical and industrial. Have regional price differences (i. e. the differences between prices of identical commodities in different markets) been declining for agricultural products? Have distribution costs, as represented by the spreads between prices at different distributive stages, been lowered? The available data will not enable us to give definitive answers to all these questions, but

we shall explore the field with these questions in mind.

Another early volume, perhaps the first to be ready for publication, will deal with the prices of textiles and textile products throughout the world. Many of the questions enumerated above, as well as others not mentioned, must be answered with respect to the commodities in this group. This field is one which is of interest not only to important groups of agricultural producers, but to manufacturers, industrial workers and consumers. The present situation in the textile industries would render a report on this subject particularly timely.

When the basic material needed for these special group studies is assembled and put in shape for analysis, the preparation of the various volumes should proceed with a fair degree of speed, but the task of assembling material is of necessity a rather lengthy one. This work is now going forward, and it is hoped that it may be greatly facilitated through the organization of the combined library and laboratory which is mentioned below.

The final section of the investigation will deal with the interrelations among commodity groups, viewed as constituent elements of the price system, and with the organization, attributes and functioning of that system as an economic instrument. This concluding phase of the study of the structure of prices will call for a considered interpretation of all the materials employed in the earlier group studies. The preparation of the final volume will be going forward while the group studies are under way.

New Projects

The general plans for the study of price structure are closely related to two new projects which are now being considered. One of these, a plan for the establishment of a library and laboratory for quantitative economic research, is a direct outgrowth of the present price study, and one of the purposes of this laboratory is to facilitate the studies which have been described above. The other is a project for a study, international in scope, of factors affecting the level of prices, a study which, it is hoped, may throw light on the practical problem of stabilizing the purchasing power of the dollar, and of other monetary units. Although the study of factors affecting the level of prices would be in considerable part an independent enterprise, it is planned to conduct this investigation in close association with the study of price groups and of the price structure, and to make full use of the results of the latter study in planning and prosecuting the former. It is believed that a knowledge of the internal structure of the price system, with particular reference to the sensitivity of different elements in that system to changes in factors affecting the purchasing power of money, is essential to an understanding of the general relations between money and prices.

The News-Bulletin

Three numbers of this informal publication were issued during the year, each number with a circulation of over 15,000 copies. Besides going to subscribers, additional complimentary copies went to editors, reviewers and other persons interested in the work of the National Bureau in all parts of the world. The three numbers had contents as follows:

- No. 27 issued February 15 featured a preliminary report by Dr. Leo Wolman on Wages and Hours in the American Cotton Textile Industry, showing that the increase of manufacturing activity was more marked in the South than in the North and comparing earnings in the different sections over a period of 20 years. A smaller article in the same issue summarized some of Dr. Wesley C. Mitchell's figures on how the money incomes of individuals from different sources are affected by business cycles.
- No. 28 issued April 23 featured an official announcement of the scope of the Survey of Recent Economic Changes and gave to the public the names of the personnel in charge and the division of the work. Besides reporting the election of Messrs. Lamont and Woll to the Board, this issue also summarized some of the findings from Dr. F. C. Mills' book *The Behavior of Prices*.
- No. 29 issued September 10 featured a preliminary report by Dr. Willford I. King on Changes in the Cost of Living for five large classes of consumers for the years 1909 to 1928. This issue which was illustrated with a large chart and two tables also presented the National Bureau's weighted index number of the retail price level for the years 1909 to 1928.

More numbers would have been issued had not the scientific staff been concentrating on the Survey of Recent Economic Changes and so been precluded from releasing preliminary figures. This reduction in the number of issues of the News-Bulletin reduced expenses and the saving was carried in surplus over to 1929. During 1929 it is planned to issue the Bulletins at more frequent intervals.

Thanks to the Staff

In summing up the work of the year, it would not be fitting to conclude without an expression of appreciation to all the members of the regular staff for their highly efficient and loyal service to the National Bureau throughout the year. Many trying situations have been met and difficulties surmounted, which tested the skill of some, and the patience of others, and which found none wanting.

Respectfully submitted,

EDWIN F. GAY

WESLEY C. MITCHELL