

Productivity
(1956 folder)

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TRENDS IN PRODUCTIVITY SINCE THE WAR, *Address*

by

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before the

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U. S. Bureau of labor statistics

The U. S. Department of Labor's Bureau of Labor Statistics

has recently published a report of trends in manufacturing productivity, consummating several years of intensive effort on a difficult problem of statistical measurement. A brief summary of the results of this study was presented by Secretary of Labor James P. Mitchell before the Joint Committee on the Economic Report during their recent hearings on automation.

The Joint Committee's interest in productivity is, of course, much broader than the problems of automation alone. As you probably know, the staff of the Committee has previously published estimates of private real product per man-hour and used these estimates for long-term projections dealing with the labor force and Gross National Product. Mr. Knowles will probably speak further on this point.

One reason that it has taken us so long to issue our report on manufacturing productivity is because of the many statistical problems that arise in the measurement of the two parts of the ratio—output and man-hours. I am not going into all of the details here—they are described in our report if you should wish to examine them more closely. I am making the point now because it is important to remind you that measures of productivity are seldom precise. The results which we can obtain should be regarded as general indicators, more reliable when they cover a span of years than for any single year.

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Trends 1947-1953

With this precaution in mind, let me turn now to some of the results arising from our study of productivity trends. As you may know, we have prepared four different measures covering the period 1947-1953. While the primary purpose of preparing four measures was to examine differences -- or similarities -- arising out of different concepts of productivity measurement, the availability of the four measures and the detailed work which has gone into their preparation also provides us with a rough check on the statistical reliability of the results of each.

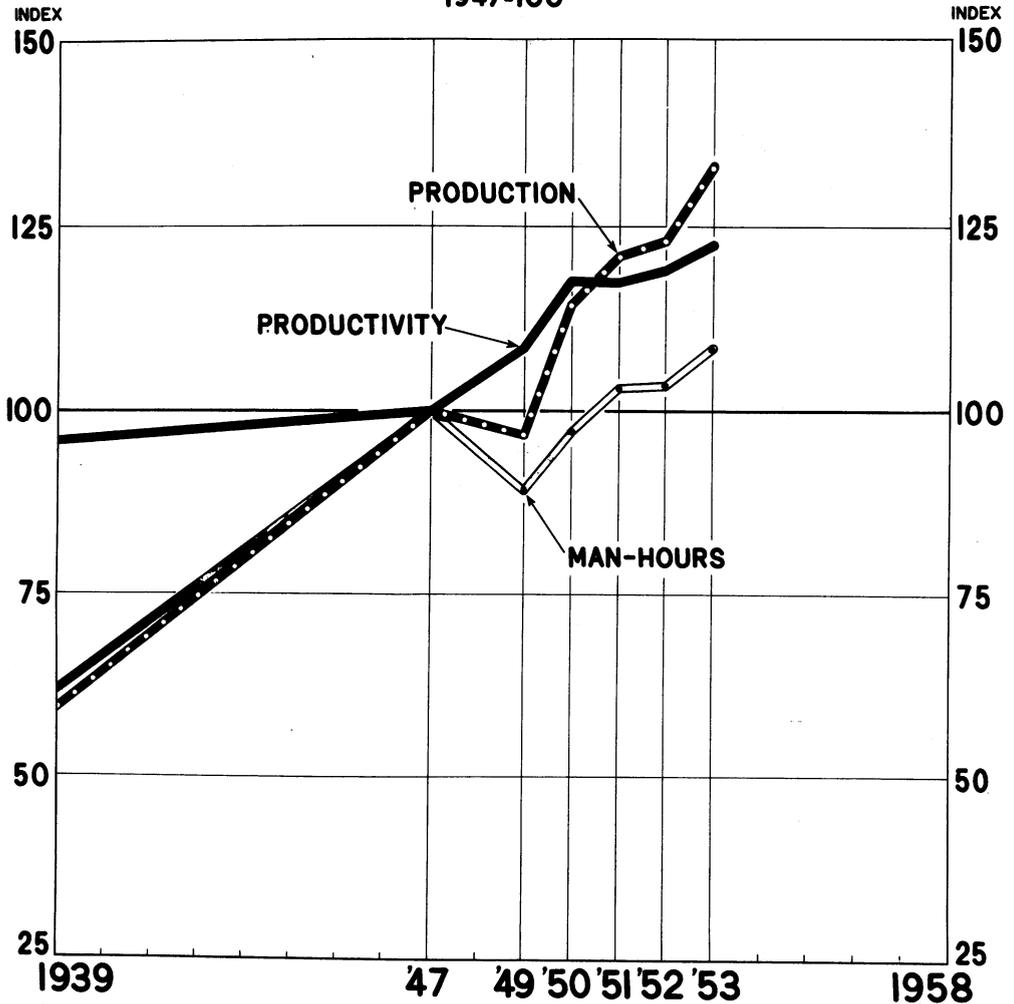
According to these four measures, productivity -- or output per man-hour of production workers -- increased at an average annual rate of between 3.0 and 3.6 percent, from 1947 to 1953. (Chart)

This range of figures arises partly out of the different methods of measurement -- for example, in two of the measures we deal with a concept of physical output; in the other two, with value added in constant dollars.

Although the differences may be partly statistical -- that is, arising out of our inability to obtain absolute precision -- they are also partly conceptual; to some extent they occur because of shifts in the importance of industries. For example, in one type of index the relative importance of industries may be held fixed, or constant; in another type of index, rapidly expanding industries may be given more weight as they increase in importance.

PRODUCTIVITY, PRODUCTION, AND MAN-HOURS

(USING PHYSICAL OUTPUT CURRENT YEAR
WEIGHTED PRODUCTIVITY INDEX)
1947=100



Although figures for single years should be cited with more caution than the long-term trend, we do find that the trend for the first three years after the war appeared to be "higher than average". In 1950 especially, exceptional increases took place, not only for total manufacturing but also in many individual industries. In the next two years, from 1950 to 1952, the rate of gain appears to have slowed down considerably, and then began to pick up again in 1953.

It is probable that high postwar levels of production, coupled with large investments in plant and equipment, accounted for large gains which failed to hold when the Korean War occurred. At any rate, these 6 postwar years may well be insufficient to establish the nature of the long-term trend following World War II.

Current Trends - 1953-1955

Our report on output per man-hour in manufacturing industries provides estimates through 1953, the latest year for which data are available in sufficient detail to provide a comprehensive measure of productivity in manufacturing. It is probable that for some time to come, there will continue to be a delay of about two years in the availability of detailed data. Meanwhile, however, there is considerable interest in some information on current trends, and we have been doing a little experimenting in this area.

The regularly published FRB index of manufacturing production has frequently been used, with BLS man-hour estimates, to compute indexes of output per man-hour. There are several problems connected with this method, but the most important is the fact

that current FRB production indexes are based to a large extent on current man-hour statistics. Quantity data for industries covering about 50 percent of manufacturing are not available, and BLS man-hours, adjusted for assumed productivity trends, are used to estimate production. This applies to the indexes thus far published for 1953, 1954, and 1955.

We have tried to examine the possible implications of this latter problem, by constructing some indexes using only the industry estimates which are based on quantity data, and comparing them with the FRB total index. We have used data readily available to the public, and avoided special adjustments and unpublished material, in order to test whether rather simple calculations can provide workable interim indicators.

In order to avoid some of the problems involved in the use of the FRB index and its components, we have developed two other experimental measures of output per man-hour for the period since 1947, based on the deflation of manufacturers' sales, adjusted for change in inventories of finished products and goods in process. The data on sales and inventories are from the published estimates of the Office of Business Economics, Department of Commerce. The price indexes used for deflation are derived by regrouping of the wholesale price data of the Labor Department's Bureau of Labor Statistics.

The deflation approach to the measurement of recent changes in productivity has some advantages over the use of the FRB index or its components, but at the same time it presents difficulties of its own. The chief advantage of the use of the OBE data lies

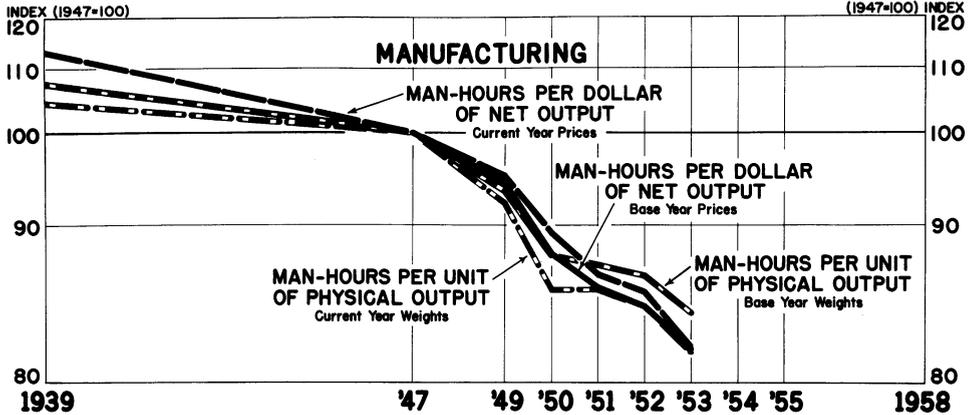
in the fact that they provide estimates of total manufacturing production which are not based on specific assumptions of productivity at the industry level. One disadvantage is the fact that the Office of Business Economics estimates are based on company rather than establishment reports, and therefore cover the non-manufacturing operations of manufacturing companies. In addition, since these are consolidated reports and the sales between plants of the same company are netted out, company reorganizations and mergers may affect the reporting of sales.

Comparison of these various experimental measures with our own indexes for the period 1947-53 shows mixed results. The average trend for the entire period is fairly good while the year to year changes are good in some years, poor in others.

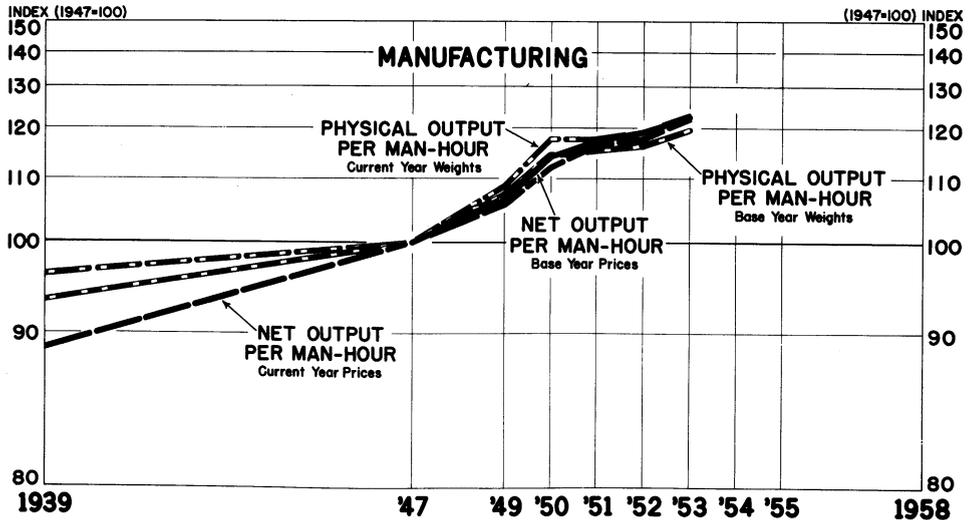
Measures based on the published FRB index of production and on deflated OBE value of production indicate approximately the same increase in output per man-hour from 1953 to 1955, close to 10 per cent, with more than half of it occurring in 1955. (Chart) (The 1955 estimate is based on data for the first 3 quarters of the year.) This is an average annual increase of nearly 5 per cent -- higher than the average 1947-53 increase, which ranged from 3.0 to 3.6 per cent.

The truncated FRB measures, that is, those based on components of the FRB index for which quantity data are available, show an even greater increase of between 13 to 15 per cent, with the larger increase taking place in 1955.

INDEXES OF UNIT MAN-HOURS



INDEXES OF NET AND PHYSICAL OUTPUT PER MAN-HOUR



Too much confidence cannot be placed in the experimental figures because of their mixed record as indicators during the 1947-1953 period, and because we do not have sufficient experience over time in evaluating their usefulness as indicators for current periods. Nevertheless, the various measures, taken in conjunction with each other, suggest that the increase since 1953 has been significantly higher than the previous postwar average.

Although the increase in 1955 seems to have been significantly greater than the annual increase indicated by our estimates for the postwar period up to 1953, it is not unusual during a period of recovery from recession, for output per man-hour to increase substantially. This, for example, is probably what happened in 1950, which I spoke of earlier. The subject of change in output per man-hour during the course of a business cycle requires further investigation, and it is in this area that quarterly estimates may make a contribution.

We have also been doing some experimenting with measures of quarterly change but here the statistical problems really become formidable. All of the problems of measuring annual change are not only present, but also frequently in more exaggerated form. In addition, seasonal fluctuations enter the picture, and these may affect the output and man-hour segments of our productivity ratio in different ways or, at least, to a different degree.

Let me just say that our experimental measures--surrounded by all kinds of qualifications--indicate that a major portion of the 1954 to 1955 increase appears to have occurred between the

last quarter of 1954 and the first quarter of 1955. From this point to the third quarter of 1955 (the most recent date for which data are available) the picture is somewhat mixed. One experimental measure indicates no change, while another indicates a continued but moderate rise. This may be important in trying to assess future developments in manufacturing productivity.

One factor which may have had some effect on productivity since 1953 has been the various technological changes which come under the general term of automation. Although there has been a great deal of verbal and written comment about automation, relatively little is known in a quantitative sense about its actual effect on the economy, particularly with reference to productivity. The information which is available usually deals with specific innovations introduced into specific plants or industries. It is difficult to evaluate this information in broader terms, such as the impact on productivity of an industry or a major sector of the economy such as manufacturing. At the present time the Bureau is devoting some resources to collection of data on automation and to individual case studies at the plant level. As Secretary Mitchell testified before the Joint Committee on the Economic Report, we are not yet in a position to indicate whether automation was a significant factor in the substantial increases in productivity since 1953. It is probable, however, that its role was minor compared to the effect of the expansion in the economy from the levels of the preceding business downturn.

Comparison with Past Periods

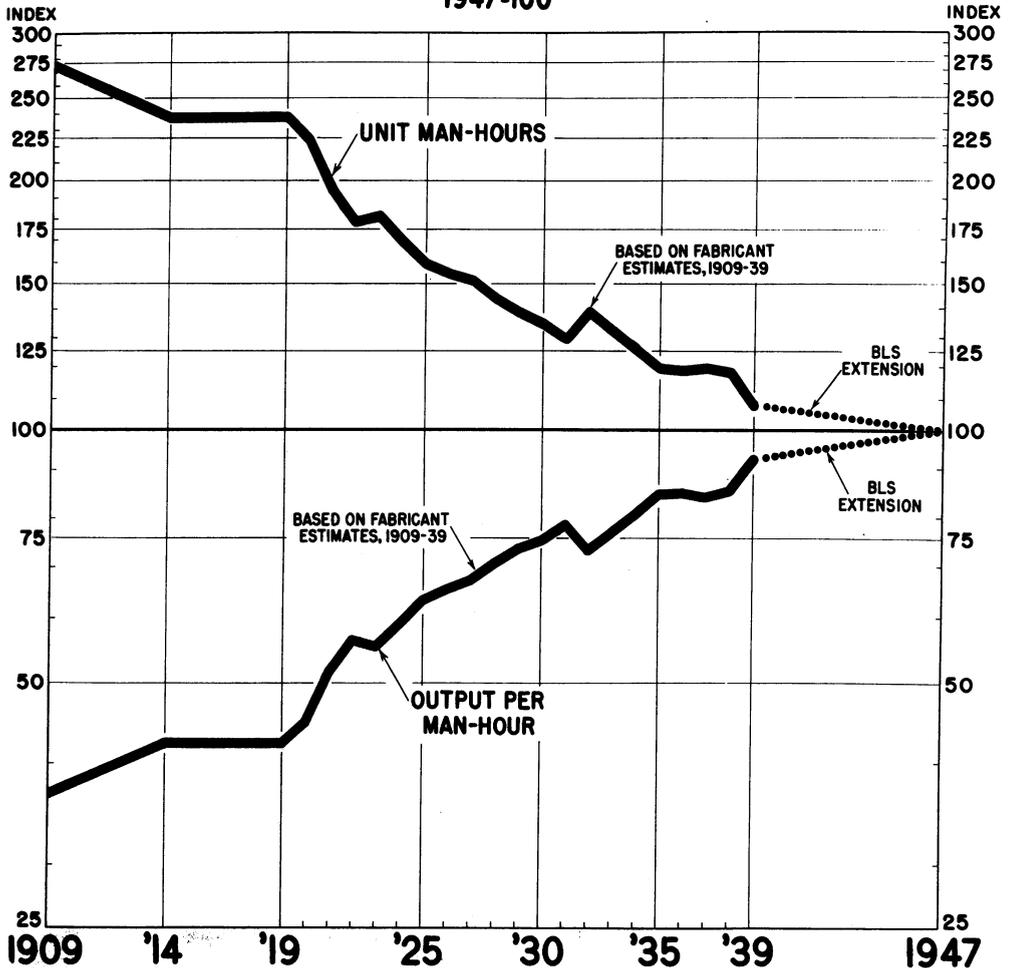
In evaluating the postwar trends we must, of course, examine the past. We can see that from 1939 to 1947, spanning the war years, the rate of productivity increase was very low. After 1947 the rates of increase improved.

Figures for years prior to 1939 are not strictly comparable with those we have computed for the period since 1939. Nevertheless, it seems fairly clear that the same kind of productivity trends occurred during and after World War I. (Chart) From 1914 to 1919, spanning the war years, there was practically no change in productivity. For the next 6 years, 1919 to 1925, the average rate of increase was quite high, except for one interruption in 1923.

We should bear in mind, at this point, that while comparison of over-all trends in manufacturing with the past gives us some good clues for evaluating current trends, further investigation would be desirable. For example, was the high rate of productivity growth in the early twenties spread among many industries or concentrated in a few rapidly expanding ones? We hope we will be able to explore this in our work in the Bureau. We do know, from Fabricant's studies, that productivity trends in manufacturing were significantly affected by shifts in the relative importance of industries for the entire decade 1919-1929. Studies of a WPA research project also indicate that there were substantial shifts during this period of time.

INDEXES OF OUTPUT PER MAN-HOUR AND UNIT MAN-HOURS ALL MANUFACTURING, 1909-47

1947=100



All Employees and Production Workers

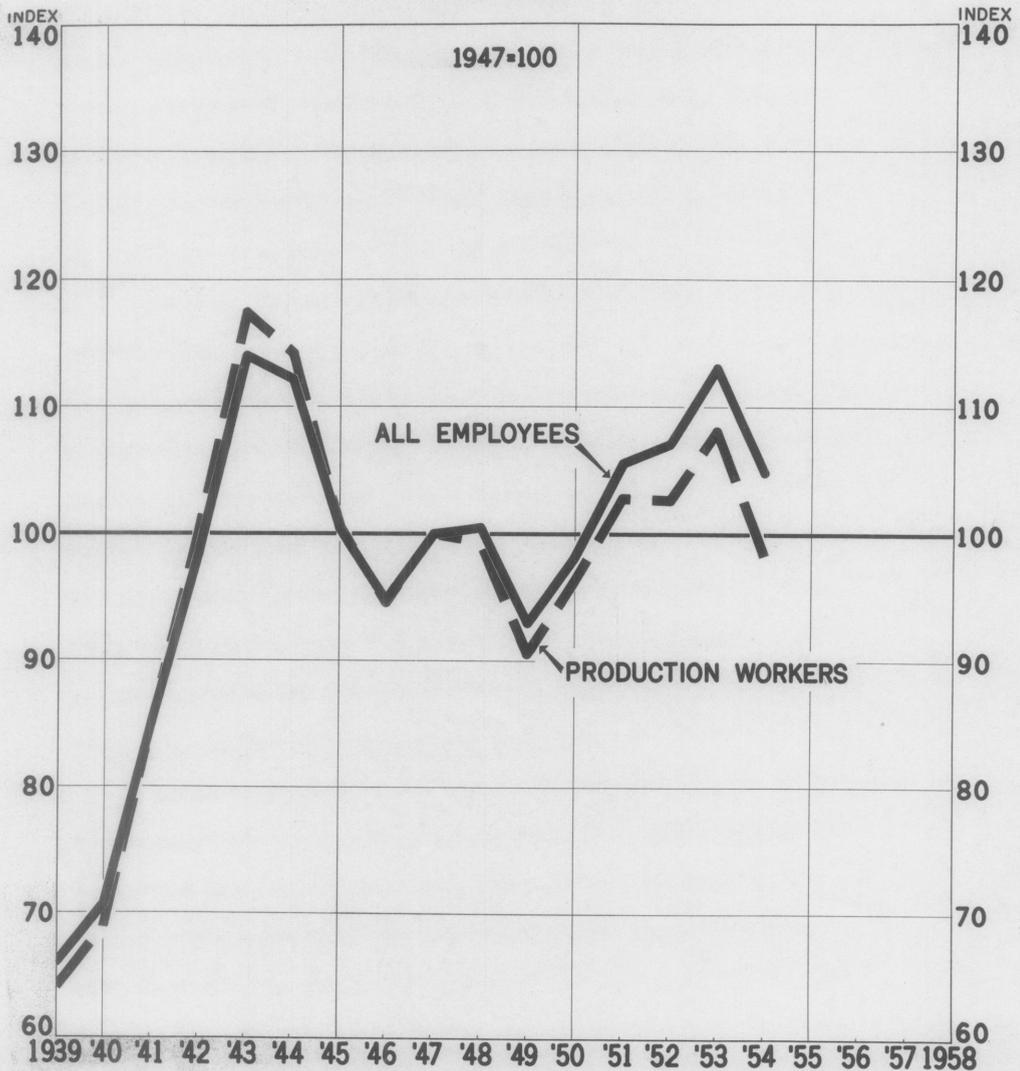
The productivity trends I have been discussing deal with the ratio of output to man-hours of production and related workers. recent technological developments have raised some questions about the possible growing importance of the so-called "non-production worker". Unfortunately, statistics of man-hours for non-production workers are not available. However, data on total number of employees may be useful in studying this problem.

Between 1947 and 1955 the number of production workers in manufacturing increased about 2 percent while all employees increased by 8 percent. (Chart) The ratio of production workers to all employees thus dropped from 84 percent in 1947 to 79 percent in 1955. This decline in the proportion of production workers was found in every broad industry group in manufacturing, but was particularly evident in the chemical, petroleum refining, and instruments industries. These industries already had significantly lower-than-average ratios of production workers to all employees.

Private Gross National Product Per Man-Hour

Productivity trends for the total economy are also of some interest because of their use in analysis of economic trends and for projections of GNP and total labor force requirements. We do not have any official BLS estimates of GNP per man-hour but have prepared some preliminary figures using an approach similar to that initially used by Kendrick and continued by staff of the Joint Committee. These deal with man-hours of all persons at work

EMPLOYMENT IN MANUFACTURING 1939-54



and thus involve special estimates for the non-production workers.

We find that for the private non-farm sector of the economy, productivity has increased at approximately the same rate, since 1947, as productivity in manufacturing (using an estimate for all persons at work). However, this postwar rate for the non-farm sector is considerably higher than the rate of progress in the decade following World War I, when the average annual increase was about 2.5 percent. By contrast, as you will recall, the average rate for manufacturing has been lower since World War II than it was after World War I.

In trying to analyze these differences in historical and current trends we must remember that the non-farm economy is composed of various sectors such as manufacturing, trade, mining and so on. The output and employment trends among these sectors may vary considerably over time. For example, between 1919 and 1929, employment in manufacturing was virtually unchanged, while construction and the service industries expanded by about 50 percent. Such shifts in the relative importance of the sectors can have a significant affect on average productivity trends. Exactly what these shifts were and how they affected productivity is still under examination in the Bureau, although we have tentatively concluded that productivity was considerably more influenced by changes in the structure of the non-farm economy during the 1920's than it has been since World War II.

It is obvious that intelligent appraisal of current productivity developments requires careful study of previous historical trends. In moving from the present to projections of Gross National Product and labor force--and the key role which productivity plays in the relationship between the two--we must have some comprehension of the dynamics of our economy. If we must make assumptions about the future productivity of our economy we must also make assumptions--implicitly or explicitly--about the growth or decline of its component parts.

These present some challenging problems. I am glad to say that we have begun some exploratory work on them, in the Bureau, and hope that we will be able to make a contribution to this important and interesting area of economic statistics.

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