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REAL GROSS NATIONAL PRODUCT, POPULATION, LABOR INPUT, AND PRODUCTIVITY, UNITED STATES, BY DECADES, 1891-1950

Decade	*Gross national product* (billions of 1929 dollars)	(relative)	*Population* (relative)	*Total man-hours of labor input* (relative)	*Output per manhour* (relative)
1891-1900	294	100.0	100.0	100.0	100.0
1901-1910	455	154.8	120.6	126.1	122.8
1911-1920	603	205.1	143.4	140.5	146.0
1921-1930	838	285.0	165.4	145.1	196.4
1931-1940	843	286.7	181.9	122.8	233.5
1941-1950	1,493	507.8	201.4	180.5	281.3

above). These trends are examined in the pages that follow. We there attempt to determine the magnitudes of some of the elements of growth, to outline the uses to which we have put our expanding productive power and, in so doing, to define some aspects of the pattern of progress over this half century of economic expansion.

I

FACTORS IN THE GROWTH OF PRODUCTION

Economic resources may be used for maintenance, for defense, or for material progress. Maintenance includes the support of the population (which may be a growing population) at an established consumption level and the full upkeep of an existing stock of capital equipment. It could, indeed, include defense, because military protection is necessary to the preservation of an existing way of life, but there are advantages in treating defense in a separate category of uses. Economic progress is possible when there is a margin of output over and above the needs of maintenance and defense.

Output, effort input, and productivity

Progress in this sense is not, of course, defined by the rate of change in total output. Yet, with a growing population, an increas-

ing supply of physical goods and services is a basic requirement of material growth. I first note, therefore, certain conditions bearing on the growth of production.

The aggregate physical output of an economy may be expanded by an increase in the input of human effort or by an increase in output per unit of labor input. We may expend more effort or we may resort to the diverse factors that render human effort more productive. Manpower input[1] may be increased by fuller use of an existing labor force (i.e., by drawing upon the unemployed), by expansion of the labor force, or by a lengthening of working hours. Except during limited periods, expansion of output in the United States over the last half century has been achieved primarily by means of rising productivity; the instrument of augmented manpower has played a secondary role. The forces enhancing output per unit of work time have been many. In their aggregative influence as elements of productivity they have been the major factor in our recent material growth.

The distinction between effort and the unit effectiveness of effort as factors in the productive process cuts across the conventional classification of factors into land, labor, capital, and enterprise, and corresponds in no wise to that division. From the present view we have but two interacting agents: on the one hand, the mental and physical effort exerted by all grades and levels of producers; on the other, the combination of elements that determine the effectiveness of this effort in production. The latter, the productivity factor, comprehends the quality and magnitude of available natural resources, the amount and quality of capital equipment used, the skill, intelligence and training of all personnel, and the quality of organization and management. Effort and the productivity factor are, of course, not additive; they are related in a multiplicative way. They are integral components of every unit of the ultimate product.

[1] In this study I use manpower input, as defined by manhours of work time on the part of the total employed labor force, as a measure of human effort expended in production. This quantity is meant to include all labor entering into the productive process. It includes the efforts of managers as well as wage earners, of proprietors as well as employees. No attempt is made to distinguish qualities of work input.

In their usual form, indexes of output, of effort input, and of productivity define relative changes in these elements over time.[2] Such measures were cited in the opening paragraphs of this paper. In addition, it is useful to deal with absolute increments to output, and to divide them into two components, one associated with increases in the quantity of effort input, the other with increases in output per manhour of work done. These two components of a production increment are termed, for convenience, the *labor input increment* and the *productivity increment*. The former is the absolute increase in output between two stated periods that would have resulted from the recorded increase in labor input, had the employed labor force been working at a productivity level equal to the average of the two periods compared. The latter is the absolute increase in output that would have resulted from the recorded gain in output per manhour, had this gain been utilized by a working labor force equal to the average of the two periods compared. (Either of the two components may, of course, decrease, in which case we should have a decrement instead of an increment.) The productivity increment is the "technological margin", the concrete resultant of the diverse influences that determine the effectiveness of productive operations. It is, at once, the substance for which producing and consuming groups compete and the mainspring of material progress.[3]

I should emphasize that the productivity increment (or decrement) is restricted to the yield of *employed* resources. Its sign will depend upon the direction of change in manhour output; its size will depend upon the absolute amounts of work input in the two periods compared. There may be such an increment (as in fact there was in the thirties) during a period of extensive and growing unem-

[2] See Note 2 at the end of this paper for a discussion of measures of productivity.

[3] It should be clear that neither the labor input increment nor the productivity increment is to be regarded as the marginal product of any of the conventional factors of production. The labor input increment could be negative when the marginal product of labor (which in this situation must relate to the result of changes over time) is positive; it could be positive with a negative marginal product. Both increments are, of course, joint products of all productive factors; neither increment is in any sense the specific product of any one factor. See Note 3 at the end of this paper for a discussion of the method here employed in estimating these quantities.

ployment. Neither a productivity index nor a productivity increment is a measure of the effectiveness with which total available resources have been used; nor does either indicate the output that might have been won had all resources been employed.

In tracing changes in a given economy we are concerned not only with the sources of the increments to national product; we are equally interested in uses. Progressively, in a growing economy, additional productive resources are opened up and new productive power is won. These resources and this power may be put to diverse uses. To some extent, too, resources carried over from earlier periods may be shifted to new uses. The pattern of resource use, as it is modified from decade to decade and from generation to generation, is one of the most revealing aspects of economic growth. We shall turn to the subject of uses after tracing the expansion of national product over the last half century and defining the parts played by labor input and productivity as contributors to changes in total product.

II

Increments to National Product, and their Components

The growth of the gross national product of the United States, in real terms, has been conspicuously uneven during the twentieth century, with the major fluctuations coming in the last three decades. Decade increments and the two components of each such increment are given in the following table and are charted in Figure 1. All values relate to decade aggregates.[4]

[4] The basic national product estimates here used are those of Simon Kuznets. To Kuznets' figures, on his peacetime concept, M. Slade Kendrick's estimates of the war and defense expenditures of the federal government have been added, with a correction to prevent duplication (see Note 1 at the end of this paper). This modification gives us measures corresponding to Kuznets' wartime concept of gross national product, except that the present totals include all defense expenditures in years of peace, as well as in wartime. I am indebted to Dr. Kuznets also for the classification of elements of the national product used in later sections.

In deriving estimates of labor input I have used continuing series of the Bureau of the Census and the Bureau of Labor Statistics, and employment and hours of work estimates of Clarence Long, Leo Wolman, and others.