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Notes on the Quantitative Approach to Economic Growth

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Introductory

1) Economic growth is described, in a preliminary way, as a sustained increase in the product of a social unit. Economic stagnation and decay are defined by substituting 'stability' or 'decline' for 'increase'; but for the sake of brevity, economic growth in subsequent discussion covers them as well. 'Sustained' means changes that go on for at least twenty-five years.

This definition is obviously subject to challenge on several counts: it emphasizes mere quantitative over any other kind of change, and does not mention structural changes, i. e., shifts in the character and relative weights of the components; it does not define the 'social unit'; and it selects a minimum period that may be either too short or too long. The definition cannot be defended here. Its sole purpose is to provide a basis for observation and measurement. Since some countries in certain periods have been characterized by marked growth or decline unaccompanied by significant changes in structure (cf. China in the eighteenth century or even India since the last quarter of the nineteenth century), it seemed best not to complicate the definition by introducing structural changes. Once the results of economic growth have been measured, attention may be turned to the determining factors that may be revealed by scrutinizing the accompanying structural changes or the reasons for their absence. The social unit is discussed in paragraphs 4-6. The minimum period is chosen largely to avoid confusion with short cycles.

2) Economic growth is viewed as a process that has characterized the recorded history of human society for the last five to six thousand years

(i.e., the canvas Toynbee claims to cover). The space and time limits are very wide, and we assume here that all essential data can be had.

It may seem foolhardy to discuss such a broad historical canvas. No one person, least of all the author, possesses the knowledge to be able to use it properly for reference. Yet in considering the choice of unit and of aspect, as well as of the scope of a project, preliminary decisions cannot be intelligent unless based upon experience. And for the background of experience it is best to use the widest possible canvas. Consequently, our discussion will be in terms of what is known about human history, which, little as it may be, could well prove useful in guarding against hasty commitments to any particular theory, thereby narrowing the field from which we can select the unit, aspect of observation, and the area of study.

3) Before outlining a study of economic growth on this long time scale we must answer the following questions: What is the most effective unit for which to observe economic growth? Given the unit, what is the most effective single (simple or composite) measure of economic growth for it? Would measuring economic growth for this unit yield a continuous record of long term economic changes?

Subsequent discussion attempts to suggest the meaning and bearing of these three questions.

I Unit

4) All units are human aggregates. An individual cannot be the unit in recording and observing economic growth partly because the life span of a person is relatively short, partly because the number of units must be small, partly because the social unit must be emphasized. But human groups (com-

prising in toto all mankind) can be differentiated by several characteristics. The dimensions of the possible units in both space and time should be kept in mind.

Scholars who attribute economic growth mainly to certain individuals (entrepreneurs, statesmen, etc.), particularly those inclined to the 'hero in history' view, may object to the elimination of the natural person as a unit. But as will be indicated in paragraph 7, we are concerned here with units for observing economic growth, not (at present) with the determinative factors on the basis of some preconceived theory. To observe economic growth by natural person units is obviously hopeless. Even were the data available, economic activity is not exhausted by accounts in terms of individuals; nor, for reasons that will soon become obvious, does the natural person unit meet adequately the relevant criteria of selection.

5) Three broad types of social unit have been employed by investigators in the past: (a) physical or natural -- human groups living in distinct climatic zones or regions; or divided into subgroups that have marked physical characteristics (ethnic groups when distinguished on a purely physical basis); (b) concrete social units -- firms, industries, political units, organized religions, etc.; (c) abstract social entities -- economic and social systems (capitalism, socialism, etc. or democracy, etc.); stages (pastoral, agricultural, industrial, etc.); class divisions; ethnic-cultural groups. (c) differs from (b) in that it lacks an overt mechanism registering the affiliation of man to the unit.

Numerous illustrations could be cited. Units of type (a) were ordinarily chosen by scholars entertaining the theory that economic (or social) growth is determined by natural factors (climate, soil, topography, etc.) -- cf.

among many, Ellsworth Huntington and the geopoliticians -- or biological factors -- Gobineau and other 'racists'. Units under (b) are found in profusion in all empirical studies of economic growth. Units of type (c) are employed by economic and social theorists concerned with 'laws' or 'stages' of development (some of the German historical schools and Marx); or with definitions of ideal types (Max Weber). Often the unit is deliberately normative rather than realistic -- formulated for the purpose of exploring hypothetical changes in accordance with desirable goals or policies (a great deal of economic theory leading to policy conclusions is of this type).

6) These types of unit are simple. Various combinations are possible; e.g., political units (states) in given climatic zones during certain phases of capitalism. As each broad category contains several types of unit, the number of combinations is large. Some principles or criteria are therefore needed if the choice among the various units, no matter how preliminary, is to be wise. The alternative -- obviously not feasible -- is to try grouping mankind within the long time span of recorded history by each possible type and combination of units.

Here we assume full availability of data. Even if the data are already grouped in various combinations, the investigator must have some clue in order to find his way through the maze. And, if data were sparse, he would need even more guidance in planning his efforts to bridge gaps. Such guidance can be sought only in hypotheses concerning the units that would be most effective from the standpoint of the aims of the study.

7) Criteria for selecting units can be formulated only in the light of these aims. The following propositions are fundamental. First, in the absence of any specific theory about economic growth we can accept as valid, the first

task is to observe the forms it takes. This means that the unit must be susceptible of observation. Analysis is a later step. Second, the purpose of the study, at present, is to organize the account of economic growth by such units as will most effectively reveal the common and the disparate elements in experience, the constant and the variable, the persistent and the transient, thereby getting as close as possible to the factors that determine the various elements. This means that the unit must be chosen on the basis of some notions, however tentative, about the factors responsible for the measurable results of economic growth.

These propositions are illustrated by the criteria for selecting units formulated in paragraphs 9-12.

8) If the effectiveness of various units is to be judged by the above propositions, the choice of unit obviously makes a big difference. Once it has been selected, effort is directed primarily toward observing economic growth for it.

To illustrate: if we choose the sovereign state as the most promising unit, effort would be directed first at observing economic growth for various sovereign states, and the various components of the national economies (industries, economic classes, etc.) would be studied for their contribution to the growth of the sovereign states. If we choose industries as the unit, effort would be directed first at observing growth in various industries (each on a world scale), then at the contribution of the components of each (country- or sovereign state-shares in the world industry). When data and intellectual resources are limited, as they are in any study, priorities -- indicated by choice of units -- make a difference in the result.

9) The first criterion in selecting a unit for recording economic growth is recognizability. Unless a unit is so defined that it can be identified in space and time, no observation of its economic growth can be even reasonably accurate. Of course, space and time boundaries cannot be drawn precisely, even for units that seem at first to be concrete and specific. But in this, as in the other criteria, we must be content with rough approximations to the ideal. Hardly any human aggregate can be defined so specifically as to leave no fuzziness in the boundaries of space and time (consider the difficulties with firms in the case of subsidiaries, political units with disputed boundaries, etc., etc.). But this is no reason for not using the criterion in advance, as far as possible, to assist in choosing the potentially most effective unit. As with all such criteria, refinement is part and parcel of the cumulative process of research -- so that in a field in which a fair amount of empirical research has been done, each unit will in turn more nearly meet the requirements of recognizability (and of other criteria to be discussed).

10) The second criterion is independence, i.e., the representatives of a unit-type must be relatively independent of one another to ensure measurement of the whole, not of parts of a bigger whole (e.g., not areas that are segments of a sovereign state that, from the standpoint of economic growth, is a whole; or states during periods that are merely phases of economic growth). Independence must prevail in space (among coexisting units) and in time (among sequential units); and must obviously be judged in terms of economic growth.

Clearly this criterion implies some preliminary theory (or 'notions', a species of theory) concerning the factors that govern economic growth.

For unless we have such a theory, how are we to decide whether, e.g., to treat industries in a given country as dependent parts of the country's economy rather than as independent units? The theory may be just a hunch based upon slight knowledge or it may be a heavily buttressed conviction; but without it the criterion cannot be used. Here again, in using the criterion we would be employing a little knowledge to acquire, in the apparently most promising fashion, more knowledge; then use the latter to get more knowledge, and so on -- with continuous improvement in the efficiency with which the criterion is applied.

11) The third criterion is irreducibility; i.e., no sub-units as independent as the main unit can be distinguished within the unit. For example, if the sovereign state is the unit, it must be irreducible in that its parts are not as independent of one another as sovereign states are of one another. In other words, the unit must be elementary, not a synthetic composite of independent sub-units. Once the unit has been defined and meets the criterion of irreducibility, it must be divided into its components, but by definition they will be interdependent, not independent.

This criterion is complementary to the one noted in paragraph 10, and like independence, involves tentative theories, notions, hunches, etc., about major factors that determine economic growth or preliminary generalizations concerning the basic uniformities resulting from them. The criterion of independence is to assure a unit large enough to be independent, of irreducibility, to assure an entity small enough to be a genuine, single unit.

12) We now apply these three criteria to the three broad types of unit described under (5). Physical and natural units, in and of themselves, do

not meet the criterion of irreducibility. For instance, in a given climatic zone, taken as a space and time unit, the successive human aggregates display diverse experience in economic growth, experience characteristic of the several fully independent units that have lived successively in it (e.g., any region of North America). A similar observation can be made about any purely physical or natural basis of grouping people.

This statement should not be interpreted as implying that physical and natural factors do not impede or promote economic growth. In some small natural regions (e.g., the Arctic Circle), physical factors may exclude so much social experience as to leave only a few potentials. But the general impression one acquires from observing a broad canvas of economic history is how diverse economic experience can be in similar physical and natural conditions. If a physical unit were the unit of observation, we would have a heterogeneous mass in which the parts would not easily fall into any coherent system and that could not be effectively analyzed until it was divided into homogeneous units.

13) Abstract social units do not meet the criterion of recognizability. The greatest difficulty in using them is not in definition but in application, that is, establishing the area and the time each unit represents. Of course, each unit could be given arbitrary space and time boundaries but they would be subject to doubt and dispute. Consequently, the use of an abstract unit would be difficult.

This judgment brings up once again the perennial problem of the relevance of theory to empirically observable reality. The implication is that whatever theories have been embodied in such concepts as capitalism (qualified by various adjectives), of different 'types' of economic system and the like,

have not rested upon a solid enough basis of recorded fact to cover all the varieties. If one could argue, e.g., that England in the nineteenth century and the United States in the nineteenth and twentieth centuries were units that could be identified as belonging to the species 'democratic industrial capitalism', could one be sure that Germany from 1870 to 1938 or Japan since the Meji era also was a member? And if one is never sure about the specific reference of a unit (e.g., democratic industrial capitalism) except within a relatively narrow realm of historical experience, how useful would the unit be for encompassing a sufficient variety of experience to permit eventually the recurring elements to be sorted from the variable?

14) Concrete social units satisfy the criterion of recognizability, and many, although not all, that of irreducibility. But many concrete social units, e.g., firm, industry, subordinate parts of a sovereign state, are eliminated by the criterion of independence. On the whole, the sovereign political state is the unit which, despite its limitations, most nearly meets all three criteria.

This conclusion obviously rests upon the theory that political organization is a dominant, if not the predominant element, in the economic growth of a social unit; that as far as any differences (and similarities) in growth are observable among subgroups, in either space or time, they are best revealed by observing sovereign political units. Like any hypothesis, the choice of a sovereign state as a unit may be a false lead. But I have no better unit to offer for empirical study of economic growth; and I am especially sceptical about larger units (such as Toynbee's 'civilizations') which either fail to stand up under empirical study or are reduced to ideal constructs, which may contribute to spiritual insight but not to testable knowledge.

15) While the sovereign state seems to be the least inefficient unit for observing and measuring economic growth and while it extends over most of recorded human history, it is defective. We often find difficulties in knowing whether a political unit is sovereign or subordinate; when it was born and when it died; when it contains segments that might be viewed as independent. In other words, the sovereign state does not meet fully the criteria of recognizability, irreducibility, and independence, as defined above. But other primary units have more serious defects; and some of the above questions are answered when economic growth is observed not only for each sovereign state as a whole but for significant components within it that are viewed, at least initially, as interdependent segments.

Since many of the questions are interwoven with the problem of continuity, at least partial answers are given in Section C.

16) Because we seek the most efficient unit for observing economic growth, rather than for analyzing it, a fourth possible criterion -- narrow range of variability -- was omitted. Calling for defining a general type whose representatives would differ in size (in either space or time) only within a set and limited range, it seems reasonable by analogy with the observation of the growth of organisms, where the final irreducible units studied are such that the individual representatives vary in size and time only within a narrow range. In view of the conspicuous variations in their size and the great differences in their longevity, sovereign states certainly do not satisfy this criterion. But the criterion is relevant only to a field that has been so thoroughly studied that units have been classified by size (in space and time), and intra-class variability is limited and non-overlapping. Our knowledge of the economic growth of societies has not yet reached this stage.

Premature narrowing of the field would be unfortunate. In general, we must be careful not to exclude in advance any segment of observable experience because it does not accord with what one tends to accept as 'normal' or 'typical'. And surely our present knowledge about the economic growth of nations is so scant as to prohibit assuming a typical pattern as a standard to which specific groups of units must conform or be ostracized as deviations that are best analyzed as such.

II Aspect of Unit as Object of Measurement

The statements in this section are a brief reformulation of the discussion presented more extensively in an article, the Measurement of Economic Growth, in The Tasks of Economic History, (Supplemental Issue of The Journal of Economic History), VII (1947), 10-34. In view of its bearing upon the questions treated here, the article has been mimeographed and is attached as an Appendix.

17) Since economic growth is a continuous process, some index or total that permits the calculation of rates for comparisons over time and across space is essential. It should serve also as the dependent variable, for which measurable factors would be sought as independent variables.

18) Economic growth may be measured either by the size of the unit or by shifts in the relative size of its components. The preliminary definition under (1) and the discussion in the Appendix stress changes in the total because patterns of structural change that would inevitably accompany the growth in social units have not been established. But this does not mean that components that would reveal structural changes or their absence should not also be studied.

19) In the search for a gauge of long term changes in total magnitude, the choice lies between trying to get a comprehensive estimate of total production or total wealth and taking, as a measure of growth, some symptom -- e.g. a combined index of population and morbidity, arguing that an increase in population and lack of sickness, etc., are sufficient indicators of economic performance judged in terms of social welfare. The difficulty with such symptomatic indexes is that they assume some stable and common pattern, in which, e.g., population size and morbidity are always related to such more accurate measures as total output and wealth, and they discourage studying components. While even comprehensive estimates contain some symptomological elements, they are more accurate and complete than indexes.

20) The base for such comprehensive measures, the particular economic aspects of the unit to be measured, may be either economic stock (wealth) or economic flow (output, product, income). The reasons for preferring the latter are given in the Appendix, Section II. All we need add here is that they are as valid for sovereign states of pre-modern times as for those of modern times (provided data are equally plenty).

21) The first broad problem is what to exclude and include, i.e., where to draw the line between economic and non-economic items. The broader and more diversified the historical canvas the more inclusive the definition of 'economic' should be (see Appendix).

22) Ordinarily the basis for measuring diverse economic goods is their market price. For social units that do not do their trading in the market place we have to resort to relative weights of goods established by the

exchange among individuals, families, clans, etc. even though they are determined by a combination of factors markedly different from that determining relative prices on the free markets of a democratic, capitalist system. The difficulties in comparing totals, across space and time, that are based on vastly different scales are logically the same as those in intercountry or interperiod comparisons of national income estimates now being made. Of course, on a broad historical canvas the gaps between the scales may be so wide as to render comparison almost meaningless. But we do not have to cross this bridge until we come to it.

23) The net and gross output or product of a social unit must be appraised in terms of the goals of economic activity. Does any sustained change in economic activity represent growth? Or, using the analogy to organisms, can we differentiate between healthy or normal growth and unhealthy or abnormal? To illustrate: if in a given state total activity expands but an increasing proportion is diverted to war or conspicuous waste, can we classify the expansion as economic growth? And if we do, should we not qualify it to distinguish it from expansion that definitely contributes to the satisfaction of human wants?

24) This question of the normative elements in the definition of economic growth is present whether we measure growth as a change in over-all output or associate it with some pattern of structural change. In the latter case we may ask also whether the greater growth in one sector than in others is normal or should be classified as abnormal. However intuitive, such judgments are common and they are based upon some concept of growth that is much more than mere change in activity or mere unilinear movement in the

structure of the economy. The normative element is present also in problems centering about the basis of valuation (see 22 above). The acceptance of weights for the different products that enter total output implies that the system weights them properly, i.e., measures them in terms of goals, of some positive function economic activity is designed to satisfy.

25) The difficulty of defining measures of total output so that their netness and the relative weights of the parts are geared to some unchallengeable concept of the function of economic activity is logically similar to the difficulty of defining the unit of observation to meet the related criteria of independence and irreducibility. These difficulties will never be resolved; but their proximate solution should gradually improve as we learn more about the processes of economic growth, and some preliminary solution must be made on the basis of whatever knowledge we have, before the processes are studied systematically. Our choice of the sovereign state is based on preliminary notions, derived from general and unorganized observation. In defining the aspect of the sovereign state by which to measure economic growth we adopt a concept such as national product which embodies some general notions concerning the goals of economic activity.

26) The concept is not hard and fast; indeed, several variants claim validity. In mapping out the broad lines of study there is no need to choose among the competing concepts. We should rather look upon them as an interrelated series, whose roles differ according to our interpretation of the goals of society, but all are useful in revealing somewhat different aspects of total output. The main thing is to perceive clearly the relation between the totals and their components, on the one hand, and the goals of economic

activity, on the other; and to recognize that the units and concepts of economic magnitude now available are primitive tools for digging deeper into the records in search of constants and significant factors. Once such an attempt at a broader and more penetrating analysis has been made, both the unit of observation and the particular economic aspects of its life to be segregated for measuring economic growth may be modified.

27) No complete enumeration, let alone thorough discussion, of the components of units that call for measurement is possible or necessary here. From what has already been said it is clear that national (sovereign state) economics must be divided into their components in order to measure (a) economic growth in a composite, over-all total; and (b) structural changes. Also, going beyond observation to analysis, the division into components will be governed by (c): hypotheses concerning active and passive factors and the like. The classifications forced by (a), (b), and (c) are rather closely interrelated: the distinctions made under each stem from a common source -- recognition that there are different patterns of group behavior within the social aggregate treated as a unit, and the resulting differences must be taken into account in deriving the synthetic total (a), in tracing shifts in structure (b), and in distinguishing between active and passive elements, etc., (c).

III Continuity

28) The choice of the sovereign state as the unit of observation implies that such a political organization both fosters and channels economic growth so that it is relatively independent of others, while it integrates its components into an interdependent system. This assumption is valid for our

purposes, whether one claims that the political framework of the sovereign state itself can be credited with successfully accomplishing the goals or whether it is merely evidence that the social unit is so organized and integrated. What of historical periods in which the political units fail to display the continuity, integration, and external independence implied in our choice of the sovereign state as the primary unit of observation? Three groups of events call for comment: changes in territory; changes in internal organization; periods of major wars.

29) As already indicated, the advantage of a concrete social unit, such as a sovereign state, lies in the definiteness of its area. But in observing economic growth, must there be identity of area so that any change means, in and of itself, a change in the unit and the end of one series and the beginning of another? Two answers are suggested: (a) Areas are forever expanding and contracting, and our concept would be unduly narrow were it confined to identical areas. States that grow faster than their neighbors usually incline toward territorial expansion as an element in extending and reenforcing their differential advantage; and a similar connection can be discerned between lag in economic growth and contraction of area. (b) External expansion and contraction are often not different from internal, i.e., <u>within</u> the given identical area over which the state exercises sovereignty; and it would be inconsistent to exclude the former and include the latter.

30) As far as possible, the sovereign state is to be treated as a continuous unit, despite changes in area. When changes are marked and abrupt (not necessarily in terms of sheer area but of area weighted by its economic significance) the series ends. The most extreme case is a complete loss of

area, i.e., the death of the territorial sovereign state unit (e.g., disappearance of Poland). In less extreme cases, the marked expansion or contraction, usually the latter, of area, is so that we cannot help but diagnose abrupt discontinuity. Whether in such cases economic growth can be treated as continuous, bridging the change in area, is a question that cannot be answered in advance. All one can suggest is the obvious utility of observing the economic group of the given unit, with and without changes in area, leaving to further analysis to determine the effects of changes in area on economic growth.

31) Internal changes in the historical life of a sovereign state raise two problems: (a) the treatment of periods characterized by different modes of the organization of society (e.g., France before and after the 1789 revolution); (b) the treatment of the periods of transition, i.e., the times when revolutionary changes are going on, usually disrupting old institutions and delaying the crystallization of new.

32) Problem (a) under 31 is clearly one of 'periodization' or 'phasing'. With little knowledge of historical theory and practice, I can only argue that, in general, the unit of observing economic growth must be so treated as to maximize its continuity; and that the selection of periods within such a continuous record is inherent in the analysis designed to yield, by the comparative method, conclusions concerning the relative strength of various recognizable factors affecting economic growth. It is not important whether France before and after 1789 are treated as distinct units or as two distinct phases in the life of the same unit. What is important is to have a comparable record of economic growth for both, as basis for an analysis that takes

into account the different results for the two stretches of experience and the factors, similar or different, that conditioned these results.

33) The advantage of continuity is apparent in dealing with interregnum or revolutionary periods (problem b under 31.) Episodes in the continuous life of one and the same social unit, they can be viewed as phases in the process of growth, not unlike the 'critical' phases in the life cycle of some complex biological organisms (say, puberty in human beings). Economic growth can be assumed to go on even when the political and social framework is not stable.

34) Major wars (I am not concerned here with the distinction between major and minor; the former are sufficiently described as 'life and death' struggles) are not unlike domestic revolutions: they often mean the end of one period and the beginning of another in the life of the political units engaged. Can the long term changes during the period that includes major wars be classified as economic growth and considered proper parts of the continuous historical process; or are they like revolutionary periods, to be treated as a separate species, not comparable in any way with the continuous process that goes on at other times?

35) I am inclined to treat war periods as well as revolutionary periods as parts of the continuous record history shows wars to be a common form of the behavior of states. The attempt to exclude them or group them separately, in advance, raises the difficulty of distinguishing between hot and cold wars, etc. One could argue that the function of the social unit, represented by the sovereign state, even viewed as an economic entity, is not only to provide goods to its members but also to insure their mode of life against competing

neighbors. Economic growth, a form of response to these functions, may not be lacking in periods of war and preparation for them.

36) In dealing above with problems of continuity, the emphasis was against allowing apparent discontinuities -- changes in area, internal disruption, violent or otherwise, and external conflict -- to be reason for separating units of observation. At the present stage, when we are concerned with observing economic growth, with preliminary analysis in the light of a richer accumulation of data, there is danger in prejudging the classifications and distinctions that are to be made. It seems preferable to assume that a given political unit, with a central core of area, and the persisting body of history and heritage of social institutions, is continuous throughout its observed history -- unless definitely proven otherwise. The burden of proof in limiting the unit in time or even recognizing distinct periods is on the analyst; and such proof may or may not eventually be indicated by the record initially assumed to be continuous.

Appendix To

Notes on the Quantitative Approach to Economic Growth

Measurement of Economic Growth

This article, from The Tasks of Economic History (Supplemental Issue of The Journal of Economic History), VII (1947), 10-34, has been mimeographed with the permission of the editors.

I

By a nation's economic growth we understand a sustained increase in its magnitude as an economic unit. Conversely, stagnation and decline can be defined as a sustained failure of the nation's economic magnitude to increase, or as its persistent decline.

In applying this definition in actual measurement, we need to specify three elements that admit of varying interpretation: the aspect of the nation, as a unit of human society, that could best be chosen for measuring its economic magnitude; the meaning of nation as a unit of observation; and the distinction between sustained and transitory movements.

Lack of space prevents adequate discussion of the last two elements noted; their meaning and implications can only be briefly stated. The emphasis on a 'sustained' or 'persistent' movement serves to distinguish the longer term trends from the shorter term fluctuations, cyclical or irregular, that can be observed not only in modern industrial society but as early as the time of the Pharaohs. Given the approximate duration of these fluctuations as rarely exceeding a decade, we can agree to define as sustained movements those that manifest themselves over periods of at least a quarter of a century.[1] By a nation we understand a human society

[1]We disregard here the question of 'long cycles' or 'trend cycles', whose duration is suggested as ranging from twenty to fifty years. When observed in real magnitudes (as distinct from current price levels and current dollar totals), these cycles appear as relatively minor variations in the underlying rate of secular movements, and may reasonably be treated as refinements in a careful study of rate of growth rather than as distinct cyclical phenomena. For a recent bibliography of articles on the subject, see Readings in Business Cycle Theory, edited by a Committee of the American Economic Association (Philadelphia: Blakiston Company, 1946), pp. 483-84. It has been discussed and analyzed by N. D. Kondratieff, A. F. Burns, J. A. Schumpeter, and S. Kuznets; and most recently by L. H. Dupriez, Des Mouvements economiques generaux (Louvain: Institut de Recherches Economiques et Locales de l'Universite de Louvain, 1947), II. 5-276.

endowed with distinct territory, a state having sovereign power over that territory and its inhabitants, and a feeling of community, often derived from a common past, and of differentiation from other human societies, equally endowed.[2] That we study a nation thus defined assumes

[2]For an explicit discussion of the meaning of 'nation', see Nationalism: A Report of a Study Group of the Royal Institute of International Affairs (London: Oxford University Press, 1939), p. xx and Ch. xiv, pp. 249-63.

the cardinal importance of a territorial base and of state sovereignty (with the underlying social unity residing in past history) in determining the course of long-term economic movements. Questions concerning precise definition of these units in measurement inevitably arise, and there is also a major question, regarding the suitability of nation-states as units in a study of economic growth directed at purposes basic in the investigation of economic behavior of human society. But for the present we cannot go beyond the above simple definitions, and we turn now to consider the main-topic problems of so defining the magnitude of a nation as to make possible the measurement of its economic growth.

II

Growth is a concept whose proper domicile is the study of organic units, and the use of the concept in economics is an example of that prevalent employment of analogy the dangers of which have been so eloquently stressed recently by Sidney Hook.[3] Nevertheless it might be useful to see how the

[3]See Theory and Practice in Historical Study: A Report of the Committee on Historiography (New York: Social Science Research Council, 1946), pp. 108-10.

concept is defined in the field of its original habitat as a clue to what it may mean in application to human societies.

To use one definition, growth signifies "a process, indirectly resulting from chemical, osmotic and other forces, by which material is introduced into the organism and transferred from one part of it to another."[4] By analogy, economic growth is a process by which economic

[4]D'Arcy W. Thompson, On Growth and Form (Cambridge: The University Press, 1942), p. 82.

material is introduced into a nation's economy and transferred from one part of it to another.

If long-standing statistical practices are any indication, the economic material in question is most directly represented by what economists designate productive resources: natural, irreproducible goods, such as land, mineral deposits, rivers, and waterways; population; and reproducible wealth, in the form of all types of equipment, inventories, and so forth, including (from the standpoint of a given nation) effective economic claims upon other nations. Just as the growth of an organism would be measured by the increase of its weight, height, number of cells, and so forth, so the growth of a nation would be gauged by additions to its wealth and population.

That sustained increases, in natural resources viewed as materials and means of production, in population viewed as labor supply, and in reproducible resources viewed as accumulated capital, are, each separately and all together, indications of a nation's economic growth can hardly be disputed. But we are interested in reliable measures, indexes that would

state unequivocally not only the existence of economic growth over a certain period but also its rate for comparison with other periods or among nations. Identification of economic growth with increase in the stock of resources, when examined from this standpoint, suffers from several major shortcomings.

The first is the inherent difficulty of measurement -- particularly true of natural resources. The controversies among geologists concerning the definition and amounts of proven and probable resources and the apparent difficulties in measuring the changing quality of the soil in agriculture are significant not because of transient disagreements about magnitudes involved.[5] They are important because in the case of resources that have

[5] For the former, see a popular discussion in Kirtley F. Mather's Enough and To Spare (New York: Harper and Brothers, 1944); for the latter, some information is provided in United States Department of Agriculture, Soils and Men, Yearbook of Agriculture for 1932 (United States Government Printing Office, 1932).

not been brought into active economic circulation, secure knowledge of magnitudes may be impossible -- in the sense that society is not forced to value them and may be unwilling to incur the costs of establishing their magnitudes unequivocally in any other way.

The second, more important, difficulty is that some productive resources, that is, some factors that can be viewed as contributing to economic production, are by their very nature not measurable. The most important productive resource available in modern society is the stock of technological knowledge embodied in tangible records and in the personal skills and habits of the population. One might argue that this is not a separate resource but rather part and parcel of population as a productive resource or of the natural deposits and of accumulated reproduc-

ible capital. This does not remove the difficulty that this separate resource or aspect of other resources is not measurable -- that, in other words, the simple natural units, such as numbers of people, tons of minerals, acres of land, horsepower of machinery, and so forth, in which we can measure amounts of productive resources in the categories suggested fail to reflect what is perhaps the most important item in the stock of economic resources.

The third difficulty is that of finding a common base for combining into a whole the measures of separate categories, wide or narrow, of stocks of resources. Unless one is willing to claim that a single category is either determinative or symptomatic of all other quantitative aspects of economic growth, some way of combining the measures of the separate categories must be found. This is particularly important for modern economic societies in which historical experience suggests that movements of population, reproducible capital, and natural resources can diverge in rate, if not in direction, for the same nation over considerable periods. Yet how can one combine population numbers with dollar values of accumulated reproducible capital, or with B.T.U. equivalents of fuel deposits?

It is important to note the source of this difficulty: that only a small proportion of the existing stock of even <u>tangible</u> resources enters, in its own form, into economic circulation. Not the resources themselves but their current services flow and are appraised in the process of economic circulation. For this reason, even for such categories of resources as carry economic magnitudes, for example, reproducible-wealth items (machinery, inventories, buildings, and so on),

it is not easy to find a reliable appraisal of economic value: only a small portion of the total stock passes through current markets, and even that portion may be qualitatively different from the total. Anyone studying the successive censuses of wealth in the United States cannot but be impressed by the difficulty of finding a valuation basis roughly meaningful at any given time and consistent from time to time[6] -- even

[6]For a technical analysis of the difficulties in valuation of national wealth, see my article in Studies in Income and Wealth (New York: National Bureau of Economic Research, 1938), III, 1-73. It is significant that increasing realization of these difficulties, and perhaps a lessened emphasis on the increase in material stocks of resources, reduced the need for a decennial census of wealth in this country; and none has been taken since 1922. Circumstances have changed as a result of the last war in the direction of renewing emphasis upon material resources, particularly those of a strategic character. And it is not improbable that a census of all material resources will be revived.

for the given, narrowly circumscribed stock of economic resources included (exclusive of population, foreign debt, and, in most cases, of direct measures of inventories).

Measures of the stock of resources, in so far as they can be secured, can be extremely useful as rough approximations to at least some of the determinants of economic growth of a nation, and, for lack of better measures, can often be used as symptoms of the existence or absence of economic growth. But the shortcomings just noted render them rather inefficient measures of the rate of growth. We turn now to search for more efficient measures, not on the plane of accumulated tangible resources in their natural units, but on the plane of economic production and circulation. This shift is necessary because no stable relations can be found (or at least, as far as I know, have been found) between sustained movements in the measurable stock of resources and in the magnitude of the total performance of national economies.

III

On this plane one begins by viewing the nation primarily as a production unit and assuming that the approach by way of production will yield the most comprehensive measure of the functioning of a nation's economy. Exchange, distribution, consumption, and accumulation can then be seen as stages in the circulation of economic goods whose total magnitudes are most likely, especially in the long run of economic growth, to be less comprehensive than the magnitude of total production. By production we mean the output of all scarce goods.

Measurement of total production, as practiced in the old and rapidly growing literature on national income and product, can be, and has been, attempted at different stages of economic circulation: at the point of origin of goods in the producing units of the economy; at the point of payments flowing from producing units to the currently engaged productive factors; at the point of flow of these goods into ultimate consumption or capital accumulation. We need not consider here the problems in the different forms in which they emerge in each of these several approaches. It is sufficient to indicate their nature by that approach in which they are perhaps most clearly revealed -- in the one in which we view total output as a sum of products flowing to the individuals and families who are the nation's ultimate consumers, and into net capital accumulation of various types, including additions to claims against foreign countries.[7]

[7]The discussion in this section is but a brief restatement of some conceptual problems treated at length in the literature of national income. See, for example, my National Income and Its Composition (New York: National Bureau of Economic Research, 1940), I, Pt. I, and a more recent statement in my National Income: A Summary of Findings (New York: National Bureau of Economic Research, 1946), Pt. IV.

Of the three major problems encountered in defining total output the first, that of scope, arises because production is maintained under the auspices and governance of several economic institutions, which are distinguished by differences in the whole complex of motives, rules, and measures that govern choices. Thus in our modern society, as in many societies of the past, at least three major institutions are to be distinguished: the family, the business enterprise, and the state. Unless a measure of total output is to reflect the growth of a given institution alone, it obviously should include all economic production within the family, the business enterprise, and the state. Yet most measures of national income note only market-bound output, including almost all state production but omitting large portions of productive activity which, not being market-bound and forming an integral part of family life, are not considered properly economic. There is a definite choice here between totals more comprehensive but less homogeneous and those less comprehensive but more homogeneous.

However unimportant this difficulty may appear for short-term studies, in the long periods implied in measuring economic growth the problem is of too large a magnitude to be dismissed easily. Such long periods are characterized by important shifts in the weight of these different institutions, and reducing the scope of measurement will necessarily produce a substantial bias. Of the quantitatively impressive growth of total output in this country, as measured in the ordinary estimates of national income, a large part is to be associated with the extension of the business at the expense of the family sector. Consequently, one important prerequisite for a more efficient measurement of economic growth lies in the inclusion

of such sectors of production that easily escape the statistical eye. As specific examples we may cite the capital formation involved in the work of American farmers in bringing virgin land into cultivation, or the work within the old-fashioned large family, so much of which has been taken over in recent decades by business firms.

The second problem is that of obtaining an unduplicated total of all output. This problem might seem to have been solved in the definition of total output used here: as the sum of products flowing into ultimate consumption plus net additions to the stock of goods within the country and to claims against foreign countries. Yet this simple definition hides grave problems.

The first emerges when we ask why flow of goods into ultimate consumption is considered in and of itself an unduplicated total. The reason presumably is that we view ultimate consumers, individuals and families, not as productive resources and machines but as human beings for the satisfaction of whose wants the economy operates. Hence any goods which they purchase cannot be viewed as being consumed in the productive process of turning out other goods, and hence for this total such duplication, as that between say the value of pig iron produced and the value of the bridge constructed with this iron, is impossible.

But if this is the case, two parts of flow of goods to consumers are to be viewed with suspicion. One is that purchased by individuals who want it not as ultimate consumers but as producers. This may range all the way from such easily classifiable items as work clothing or transportation to the place of employment to such perplexing items as a luxury house or car considered indispensable to the functioning of its

consumer as a producer (say as a business executive of high standing). A substantial part of what is currently defined as ultimate consumption is perhaps not final product but actually means of production. Its inclusion represents duplication, and quite likely the relative magnitude of such duplication is much greater in modern urban times than it was in the simpler economic civilizations of pre-industrial societies.

The second questionable sector of flow of goods to final consumers is the product of government. Unless we conceive government output as final by definition, for which there is no reason except convenience, it may be viewed either as services to ultimate consumers and hence a finished product, or as services to business or to society at large and hence an intermediate product which is in turn consumed in the production process and should not be included in a net total of economic output. But what are these services to ultimate consumers? Should we include, as I think we should, only services that are relevant to individuals as ultimate consumers and have a clear counterpart on private markets (for example, medical service, education, and the like)? Or should we include some parts of the general activity of the state in assuring internal peace and external integrity such as judiciary, police, military, and so forth? In the latter case, increased production of munitions by the state would be allowed to swell the unduplicated total of the net product of a nation's economy. Were we to include these types of services under the flow of goods to ultimate consumers, I would argue that intermediate products are counted in, that is, products that are used to provide the basis for further production rather than to serve the satisfaction of the ultimate consumer as such. Anyone who has looked at the

astronomical figures of war expenditures in recent years or made reasonable forecasts of their magnitude for the future can easily see that the question raised involves not minutiae but large segments of current production, and that the way it is answered will affect materially the picture of economic growth in recent years.

There are questions of somewhat different character and magnitude concerning grossness and netness in the second sector of total production as we define it, namely capital accumulation. The concept of net additions to stock of capital is quite clear. In practice, there is only gross output; and we have only the vaguest idea of the consumption of existing capital that should be used as an offset to derive net additions. The reason for this vagueness is exactly that which explained the difficulties in using stocks of resources as indexes of economic growth. Consumption of capital is a hidden process which is known only post factum and not too clearly even then. All we see and all that circulates is gross product. How much of reproducible capital, or particularly of some of the natural resources, has been consumed in the process is not visible, and many of the available measures are mere conventions. What is worse, for some types of capital no measures of consumption are at all available -- as is the case with many natural resources either in public hands or in the hands of individual entrepreneurs not accustomed to proper accounting. It is more than likely that whereas current consumption of reproducible capital is often exaggerated in available data, that of nonreproducible capital is often underestimated. And the destructive effects of the intensive type of production characterizing industrial societies is not often fully reflected in the long-term estimates of what is presumably a net volume of total output.

The third major problem in defining a measurable total of a nation's output is the valuation of its parts on a common basis. As distinct from the existing stock of resources, an overwhelming proportion of current output does pass through the market place and is assigned economic values. Nevertheless, difficulties arise. First, with comprehensive scope, the inclusion of that part of production that never appears on the market must be subjected to valuation comparable to that applied to market-bound goods -- a difficulty that is resolved, if only approximately, by assigning to nonmarket goods the prices of analogous items that do appear on the market. Second, markets differ in the freedom with which prices are fixed in them and the range of difference is from purely competitive situations to the type of exclusive monopoly practiced by governments. Here the solution is much less easily found, for by the very nature of the case analogues cannot be so easily established. Finally, in so far as we speak of volumes relating to different periods, not only changing price levels but also shifting relative prices of various categories of goods are to be dealt with. The available techniques used in compiling index numbers, even disregarding questions of availability of price data, all encounter the difficulty that using the weights of one period as a base will yield results differing from those obtained by using weights of another period as a base. The consequence is that when, from one time point to another, shifts in the weight and composition of the aggregate of production have taken place, the rate of change between two points of time can be established only within certain limits -- the limits indicated by using as base first the weights of the initial time point and then the weights of the terminal time point.

Since economic growth, as repeatedly stressed, involves long time periods and since these periods are necessarily characterized by significant shifts in the composition of aggregate production and in the relative weights of various categories of goods in them, this limitation upon the determinacy of the measured rate is important.

The three groups of problems noted all stem from a single source: conflict between the need for a single, consistent measure that would permit proper comparisons of magnitude or rate of growth for a national economy and the lack of measurability of directly observable economic reality. It is because family and household-bound activities take place away from the yardstick of the market, because the market mechanisms record the flow of goods not once but several times during a year and record also items that by no stretch of the imagination can be classified as goods, because the weights attached by markets to identical goods vary widely from time to time and place to place -- that problems of scope, duplication, and valuation arise. Indeed, these problems may at first appear so grave as perhaps to make us think that we are trying to measure the immeasurable. Yet the questions posed can be answered, at least tentatively; and they are answered in terms of the basic types of uses to which the measures are to be put.

IV

A number that represents the total magnitude of a nation as an economic unit, whether for a given year or for a period long enough to permit observation of economic growth, is a raw datum the efficiency of which must be judged in terms of uses to which it is to be put, scientific purposes which it is to serve. Tentatively, three basic types of use of these national economic magnitudes may be suggested.

First is the establishment of patterns of relation of parts to the whole. In this type of use the total economic magnitude of the nation is derived so that the given or changing relative importance of some significant element in economic activity can be measured and stable or commonly recurring patterns of relation of the part to the whole sought. This use of the total measure of economic growth is clearly analogous to what, in the study of organisms, is referred to as differentiation.

Examples of such uses abound in economic literature. Total production of a nation is measured to establish the relative importance of various productive groupings, such as industries; or of various institutions, such as private business and government; or of various types of uses, such as consumption and capital accumulation; or of various sources distinguished by their national loci, domestic and foreign. Questions relating to a definition of the national total are decided in the light of the definition of the magnitudes of significant particular parts -- the numerators in the fraction in which the over-all national magnitude is the denominator. And with different conceptions of the level at which the magnitudes of the part is to be measured, there will be different definitions of the over-all total to which the part is to be related.

To illustrate simply, let us assume that commodity imports are a significant element in economic growth and that, as a first step in the analysis, we wish to establish, over a long period, the relation of imports to some over-all total that measures the economic magnitude of the importing nation. What is that over-all total, given the imports -- as they usually are -- in values at the importing nation's boundaries, including costs of

transportation, insurance, and financing?[8]

[8]This example was selected largely because in recent studies I had to consider the relation of flows across boundaries to a nation's total activity. It could just as easily have been one dealing with the relation between investment and total product, or agricultural products and total output. The general lines along which the total would be defined in each case would be similar to the ones suggested by the specific example used.

Since imports are an unduplicated inflow of goods into an economy (with the minor exception of re-exports that may return as imports), they are to be compared with an unduplicated total of all uses into which inflows from abroad, as well as inflows from domestic sources, can move. Such unduplicated uses are the flow of goods to domestic ultimate consumers, within the country, including direct services by government; the additions to domestic stocks of capital, such as construction, durable equipment, and inventories, the additions to construction and equipment being gross of current consumption of durable capital (since imports are also gross in this respect); and all exports, not only of commodities but also of other goods, but excluding mere transfers of claims since the whole analysis is on the level of goods. This total, with which imports can properly be compared, is quite close to that ordinarily defined as national income gross of depreciation. But it differs from the latter in that it is also gross of imports and of any inflows of services from abroad on the current transaction account.

The following points are to be noted about this example: (1) The total used is slightly different from that ordinarily employed, having been constructed for the special purpose of relating imports and the nation's total economic activity. (2) Decisions concerning scope, extent

of duplication allowed, and pricing are governed by the definition of imports and by the conception of the over-all total of which imports can legitimately be viewed as a proper part. Thus we allow duplication for consumption of durable capital and for movements across international boundaries so that the limits of the ratio are determinately fixed: o, if there are no imports, and 1, if imports account for all uses to which they can be put; and we require that import prices be the same as prices of similar products within the country, or vice versa. (3) It may be added parenthetically that questions regarding the definition of the nation as a unit of observation and the distinction between sustained and short-term movements are, in uses of this type, decided by the same canons. Hence, in the case of imports, the distinct trading areas (of the type distinguished in statistics of foreign trade and subject to tariff and other regulations) are to be used in preference to any purely political units where the latter differ from the former. And sustained movements are to be viewed as distinct from the kind of short-term fluctuations that tend to characterize the relation under study. Both of these questions may well be answered somewhat differently in other cases within the same broad type -- say in establishing relations between government output and total production of the nation.

In this category of uses, therefore, a considerable variety of totals of a nation's economic magnitude is possible, even if they are all taken at the level of current economic activity rather than at the base of stocks of resources. With respect to scope they may differ in inclusiveness, even though by the nature of the case some total approaching the nation's whole magnitude is sought. With respect to netness and

duplication they may range from the most attenuated net -- limited say to the pure increase in material capital -- to the most duplicated -- say the total volume of all transactions (a magnitude manifestly relevant to any study of the relation of money supply to economic growth). This type of use of over-all totals has increased greatly in the economic literature of recent decades under the impact of Keynesian theory with its postulates of invariant relations between certain parts (such as investment) and the whole. The more widespread the hypotheses concerning the relations among strategic parts and the whole of a nation's economy, the greater is the intellectual stimulus to their quantitative study and consequently to measurement of a nation's economic magnitude in terms of the definition of a significant part. When alternative definitions of the part, and hence of the whole, are possible, the preference will most naturally be in the direction of the definition that permits either a clearer policy formulation or an easier test of the hypotheses. It is not governed by any overriding imminent criteria of what economic growth of the nation really is.[9]

[9] Examples abound in recent literature. The most conspicuous is the recent reformulation of gross national product in the official literature in the United States, United Kingdom, and Canada to provide a national total with which outlays of government on commodities and services may be properly compared. See particularly Milton Gilbert, "War Expenditures and National Production", Survey of Current Business, March 1942.

The second type of use of measures of economic growth is closely related to the one just discussed, indeed directly suggested by it. The variety of totals resulting from definitions in terms of significant parts that constitute and determine the totals may be viewed as different reflections of one and the same unit: the nation as an economic complex. And the sustained increases which these totals reveal are different

reflections of one and the same complex process: the nation's economic growth. These different measures will have a great deal in common, partly because they are defined on the same plane of current economic activity, partly because the theoretical hypotheses used in connecting parts with the whole almost always assume a widespread interdependence within the nation's economic system. We may employ these measures not only, as in the first type of use, to seek stable patterns of relation, either in the short or the long run, among parts and the whole but also -- and this constitutes the second type of use -- to search for some patterns of changes over time. These patterns will vary somewhat from one total to another, but they will at least establish the range within which the rate of that complex process called a nation's economic growth may be found. Whether the range will be wide or narrow, systematic or unsystematic, similar or dissimilar, among different periods or various national units, are questions that can be answered only by substantive study. And the answers to these questions will ultimately determine whether single synthetic measures of economic growth are feasible.

This type of use is distinguished from the first in that interest is concentrated on the temporal pattern of economic growth per se, not on a total obtained for comparison with a given part acting as the independent variable. And it is further distinguished by the fact that, with interest concentrated on economic growth, there is yet a failure to provide in advance a measurable definition of growth that would result in a single, determinable measure. This failure to gauge a process by a single measure may be due to a variety of causes. The process of economic growth may be so defined that its magnitude is measurable by a single

index, but available data fail to provide the latter; and only several alternative approximations are feasible. The process may be so defined that the element most directly characterizing growth is in itself not measurable. Only remote and varied consequences of this element are measurable. I am inclined to classify Joseph Schumpeter's theory of innovations in that category. Finally, the process of growth may be characterized in advance as so complex that no single index is desirable or feasible, at any rate until the complexity has been resolved in the process of further study. It is this last position that is most typical, and perhaps most proper, as a justifiable foundation for the type of use I am now discussing.

In actual practice, measurement and discussion of economic growth quite frequently follow this procedure. One might call it the statistical-compendium method, by which a variety of measures are reviewed in discussing a nation's economic growth, and in which the student, by a rough consensus of indicators, concludes that the rate of growth is high or low, or higher or lower than in a different period or in a different nation.[10]

[10]The literature dates back to the political arithmeticians of the late seventeenth century, and probably even to earlier times. The most useful recent compendium, emphasizing largely national income estimates, is that of Colin Clark, Conditions of Economic Progress (London: Macmillan and Company, 1940). Like most such compendiums, it has to be used with caution since the measures for the different countries are subject to errors of different magnitudes.

This use forces no clear decisions regarding scope, netness, and valuation. Yet there is no reason to be disparaging. It is never, in fact, applied without underlying hypotheses, no matter how vague, concerning relations of the various totals involved, and it induces the indispensable mental

digestion of observed quantitative characteristics of economic behavior of national units without which no cogent theory concerning the pattern and rate of economic growth can ever be formulated.

We come now to the third, the most difficult and tantalizing type of use of measures of economic growth. In it economic growth is explicitly measured by the magnitude of service that a nation's economy is assumed to perform in terms of needs which it is presumed to satisfy. As distinct from the other types of uses it calls for a positive definition of economic growth, not as a presumptive result of some part or factor selected as determinative, not as some complex process that has diverse manifestations not reducible in advance to a single quantity, but as a process that has a definite end from the viewpoint of which its magnitude -- positive and net -- can be measured.

To illustrate by a common example, let us assume that the basic function of economic activity is to provide scarce goods to satisfy the wants of individuals at the lowest cost to them. Correspondingly, the basic purpose of a nation as an economic unit is to provide scarce goods for the individuals comprised in that nation. Economic growth is then a sustained increase in the magnitude that measures the performance of this function.

The definition may seem quite commonplace, but its consequences for the measurement of a nation's economic growth are both difficult and far-reaching. In following this definition we should (a) include the net flow of goods to ultimate consumers after allowing for any goods that are wanted only as instruments of production or offsets to the disadvantages of modern production (that is, of urban life); (b) deduct any personal

costs involved in production, ranging from minor costs (such as the tedium and frustration of some productive functions) to the major ones (the strains and pressures of modern life as determined by the economic organization of society); (c) add only such elements of the total net increment to the stock of capital as are of direct possible relevance to satisfaction of future wants of consumers. Furthermore, all these elements, positive and negative, are to be combined by an acceptable system of weights, based on some cogent theory of equivalence of individuals, not by the market prices that reflect monopolistic distortions and inequalities in distribution of income by size. Finally, this system of weights must be capable of spanning long historical periods despite marked shifts over time in the composition of both the positive elements in the picture (that is, the goods serving as returns from economic activity) and the negative (personal costs or illfare imposed upon individuals by economic society).[11]

[11] On this subject, see Joseph S. Davis' stimulating presidential address to the American Economic Association, "Standards and Content of Living", American Economic Review, XXXV (1945), 1-15.

In so far as the functions whose increasing satisfaction is measured as economic growth are assigned a positive value, we may speak of economic progress. But there is a big step between recognizing a function and assigning it a positive value, and I have, therefore, avoided the use of the term 'economic progress' as involving an additional value judgment not present in the approaches set forth in the text.

Or take another function, in the fulfillment of which we may view the performance of economic society and measure the growth of its magnitude: that of preservation of a given unit of human society against overt aggresion by others. In following this definition of a basic goal of economic activity we would have to include under total output: (a) net

additions to the population, viewed as a weapon in armed conflict; (b) net additions to the stock of reproducible and irreproducible goods that may serve as such weapons; (c) the value of these components in terms of some weights that reflect their true relative importance for this basic purpose.

It is clear that any explicit and incisive definition of basic functions which the economic activity of nations presumably performs threatens to put us beyond the level of measurability. Such a result is almost inevitable; for the items that enter and are visible in economic circulation, and can be measured, are the material tangible units -- men, labor hours, commodities, and the like -- whose significance in terms of the basic criteria resident either within human nature or within such types of complex and explosive phenomena as armed conflicts among nations is but imperfectly revealed by the economic mechanism. Such criteria, these assumed purposes or functions, are outside the economic mechanism proper -- no matter how important they may be in real life in determining social reactions to economic performance or how basic they may be in an evaluation of economic activity from the standpoint of more persistent ends.

Unlike the purely cognitive uses represented by the relation-of-part-to-whole and the statistical-compendium approaches, the present approach, in which valuation from the standpoint of some basic goal outside and transcending the economic mechanism proper is wanted, may never yield a measure that fully and truly reflects the performance of the economy -- especially in the long run. It may never be possible to measure economic growth as a sustained increase in a nation's contribution to the welfare of its members, or as a sustained increase of economic power in defense or

aggression.[12] Granted this, however, the attempts at such use are extreme-

[12]This sometimes leads to a complete abandonment of comprehensive statistical measures, or to their replacement by a set of symptomatic indexes of welfare or of power (for the former, death rates, supply of certain luxuries, and so forth; for the latter, stocks of certain strategic tangible resources). Neither is a satisfactory solution since it represents intellectual abdication and stifles the incentive to a further analysis and refinement of adequately comprehensive measures of <u>total</u> activity.

ly valuable: they provide incentive and guides for looking below the surface of economic activity and for removing misleading layers of institutional mechanisms. As a result one can possibly get closer to an appraisal of the functioning and growth of an economy by viewing it from the standpoint of the basic needs of human beings, or from the standpoint of national power, or from the standpoint of any other lasting criterion which the student may be able to formulate.

Thus in applying the test of welfare, one is induced to look beyond the valuations in market prices provided by the operation of the economic mechanism and to recognize not only differences in price levels over time but also the differences between urban and rural price levels, between prices to consumers in different income brackets, between prices of goods subject to different degrees of monopolization, and so on. Likewise, the implicit egalitarian philosophy of comparability and constancy of human wants would lead an investigator to look closely into the composition of the goods and services that flow out of the nation's economy today as compared with their composition fifty years ago, and to consider what part of the greatly augmented supply of some goods and diminished supply of others can be viewed as an increase and decrease in the satisfaction of real wants, and what part represents only an offset to increased costs imposed by

economic society or a disappearance of offsets to costs that are no longer operative. This may seem like the intrusion of a philosopher, a home-grown one at that, into the domain of a scientist who should limit himself only to what he can observe and measure. But such judgments are implicit the moment one departs from the observable surface of economic activity. They are involved in the simple and indispensable step of adjusting for price changes over time or in combining goods of several categories into a more comprehensive total. So long as the student is aware of the nature of the procedure and does not unconsciously impute to this result an absolute significance or, what is more common, does impute the meaning in terms of ultimate purposes to what are still in effect exceedingly duplicated and distorted measures, no harm is done and an insight into the past is secured. Indeed, one of the great advantages of conscious attempts to evaluate economic performance and economic growth in terms of such basic functions and purposes is the realization of how proximate and crude, how remote from a full and true measure, even the most refined estimates are. Such realization is extremely valuable as an antidote to the all too widespread easy identification of these totals with measures of welfare, or power.

V

We may now summarize the discussion so far.

1) For purposes of measurement, economic growth of a nation can be defined as a sustained increase in the nation's total output.

2) In defining total output numerous questions are encountered of which the major ones are those of scope, with the implicit distinction

between economic and noneconomic, of grossness or netness involved in securing an unduplicated total, and of valuation of different parts, calling for some acceptable common valuation base.

3) In studies of economic growth, the question of scope should be decided in favor of the greatest possible inclusiveness. The long periods involved are ordinarily marked by shifts in the relative weights of the various institutions (family, business enterprise, state, non-profit organizations, and so forth) under whose auspices production takes place. Omitting or underrepresenting any of these will inevitably produce a significant bias in the resulting measures.

4) Such insistence on all-inclusive scope only magnifies the problems involved in removing duplication and in securing a common acceptable base for valuation. These problems can be answered, at least tentatively, in terms of the types of use to which measures of economic growth are to be put.

5) Of these uses, the first type involves attempts to establish patterns of relation between some part or element of the economy and the whole, the former being considered a determinant or a significant concomitant of the latter. In such cases, questions of grossness or netness and valuation are answered largely in terms of the part, that is, in deciding of what particular total of the nation's economic activity the given element may properly be conceived as a determinant or concomitant part. Since the extent of grossness or duplication and the level of valuation are often involved in the definition of the part as a significant variable, the definition of the proper total often follows directly. Various definitions of the latter may be called for in different cases

where the particular relation selected for study involves segments of the economy or of economic processes on different levels of netness and valuation.

6) In the second type of use, economic growth is conceived as a complex process not reducible in advance to a single unequivocal measure. Various totals may then be considered in the minimum expectation that their movement will indicate the range within which the rate of economic growth may lie. At most, some systematic relation among the different totals may be hoped for -- which would then yield systematic comparable patterns of growth among nations, or for single nations, among periods.

7) The third type of use implies selection of one or several basic functions or goals of economic activity and calls for measurement of economic growth as a sustained increase in the magnitude of satisfaction of such basic functions or goals. Since these goals (welfare, power, and the like) lie outside and transcend the operation of the economic mechanism, a full and true measure of economic growth so defined is impossible. But approximations are possible. Conscious attempts to apply such criteria are fruitful in providing an incentive and means to penetrate below the surface of the economic process, to approach with possibly increasing closeness the basic wants and drives of human beings or of types of human societies represented by nations -- and thus perhaps shed greater light on both the significance and driving forces of economic growth.

These conclusions are disappointing in that no single, easily derived index of growth seems feasible. If one could only have an acceptable single yardstick, based upon secure and systematic knowledge of the inter-dependent elements in the process -- something like an official growth

chart against which to lay off the data for any single nation! That such a yardstick could be agreed upon, even after long systematic study of economic growth, may be doubted, although approximations to that goal are within bounds of possibility. A more relevant question is whether such systematic study is at all possible, or potentially fruitful -- a question that calls for a brief discussion.

In spite of a large literature in the field quantitative study of economic growth of nations may be said to be in its infancy. A glance at the obstacles may be illuminating. The first is obviously lack of basic data necessary to a comprehensive measure of the output of one or several nations over a period long enough to reveal not only the existence but also the level and changes in the rate and other characteristics of economic growth. It is most important to note that the supply of relevant statistical data suffers from systematic bias. The abundance of some and scarcity of others is not random, but reflects differences among the several economic sectors in statistical measurability, in the importance attached to them by society, and in the degree to which they call for policy attention. Among nations, too, there are differences in the economic surplus available for such relatively less important uses as the collection and publication of statistics. The underlying reason for these biases is obviously that production of comprehensive, continuous, and comparable statistical data is a costly operation, both in direct outlay of resources and in the burden imposed upon respondents. Such data are not collected unless there is a clearly felt need on the part of society, a need measured proportionately to costs involved in the task. It is, therefore, not accidental that, for example, data on corporate activities are more abundant

than data on activities of individual entrepreneurs, that statistics on production of the simpler type of 'basic' raw materials are more abundant than statistics on the complex types of finished products, that data on production are in general more abundant than data on distribution or consumption. Among national units, the relative wealth of data in countries that have forged ahead in industrial development and their almost complete absence in preindustrial societies is surely no accident. It seems reasonable to suppose that the bias in the supply of nonquantitative economic data is not unlike that in the supply of economic statistics. Data are most abundant for larger, industrially developed national or intra-national units and most lacking for the kind and types of economic activity that are still closely integrated with noneconomic factors within some social or political unit.

The second difficulty lies in institutional conditions of economic research. The handling and analysis of statistical data, particularly of the comprehensive scope involved in a systematic measurement of economic growth of nations, is a time-consuming and laborious task, most often beyond the capacity of an individual investigator. Yet assistance is provided under conditions that militate against focusing such studies on a long view of the past. Statistical and economic research under government auspices is directed mostly toward either production of current measures, or analysis concerned with immediately current problems; and it is not often that an economist or statistician employed under government auspices is permitted to devote his or his staff's time and attention to studies with a long historical view. The same is, to a large extent, true also of nongovernmental research institutions: their dependence upon

current public support and their ever-present and natural desire to justify the outlay of resources make them most partial to studies dealing with problems of current interest and reluctant to engage in a thorough analysis of long past history that cannot so obviously and directly be shown to bear upon the important problems of the present. The economics and cost accounting of economic research, as of all social research, differ from those of research in the natural sciences, where invariant and potentially useful findings can be attained at a materially lower cost, within reach of an individual scholar unhampered by the needs of assistance or of a tie-up with governmental and other organized group-research agencies.

The third, and perhaps most important, obstacle to systematic statistical measurement and analysis of economic growth of nations lies in doubts about the fruitfulness of the approach. Such doubts may stem from many sources, and in presenting a conjectural list of them I must necessarily have recourse to introspection. One source of doubt is the possible feeling that these over-all quantities, no matter how well defined and closely articulated, must inevitably gauge resultants of a wide variety of forces in a form in which analysis of the forces is extremely difficult, much more difficult than in a more elastic approach employing nonquantitative evidence and revealing more directly the drives, aspirations, hopes, and fears of men. Another possible source of doubt is the realization that major differences in rate of economic growth, whether for the same nation over time or among several nations for a given period, are clearly observable without the cumbersome apparatus of comprehensive statistics, and that the refinement of this general knowledge is a doubtful improvement, considering the unavoidable margin of error in the data. For example, the

fact that the United States enjoyed a much greater rate of relative economic growth since the 1870's than did Great Britain or China is obvious without elaborate estimates of national income. Why concern ourselves with the purportedly exact difference in rate? A related source of doubt is also the assumption that economic growth is a phenomenon whose commensurability is confined within definite historical or temporal limits. Is there much value in comparing the rates of economic growth of two entirely different social-economic organizations, say an industrial and a preindustrial society? What stable and explicable patterns can one expect to find by comparing statistical measures of two different species of economic organization? Is it not more important to deal with the critical stages in a nation's economic history, critical in the sense that they mark the transition, peaceful or violent, from one type of economic organization to another? And surely, from the standpoint of historical study, for such crucial phases, statistical measurement, which assumes homogeneity of the process as a precondition of its measurability, is scarcely the relevant and fruitful approach.

The three sets of obstacles just listed are formidable, singly and in combination. Yet they are not prohibitive, and there are some grounds for assuming that a systematic statistical study of economic growth is both feasible and potentially fruitful.

The first two obstacles, scarcity of basic data and the institutional difficulties of statistical research in economics, have been partly overcome by the developments during the last few decades, particularly since World War I. There have been not only marked additions to the supply of available data for recent years but also determined efforts to extend them

into the past and to reconstitute for the benefit of students the main lineaments of economic growth of several nations as far back as the present evidence carries us. It is not possible to present here an exhaustive reference list; but just as an interesting illustration of the literature that has appeared since 1918, one can recall studies dealing with the national income or product over periods extending back to 1860 or earlier for at least three countries (United States, United Kingdom, and Sweden) and for four or five more over periods that, while chronologically shorter, nevertheless represent substantial segments of their recent history (Japan, Australia, Germany, and South Africa). Indeed, my own impression is that the supply of data, not only in raw form, but even in a preliminary digested form (compilation, adjustment for continuity, and so forth), has outrun analysis and that systematic study of economic growth is far from reaching limits imposed by scarcity of available data.

The second obstacle has not been overcome commensurately with the first. Accumulation of data is largely a result of work of governmental and semigovernmental agencies. These have naturally been more effective in adding to the supply of data than in pushing forward the frontiers of analysis. The institutional provisions for facilitating long-range statistical research and analysis by indivudal scholars are still relatively limited. But they are less limited than they were a quarter of a century ago; the past work of the few existing institutions, in and of itself, has made it easier for individual scholars to follow suit, without the prohibitive outlay of resources that necessarily characterizes pioneer ventures. Most of all, the purely material difficulties of quantitative

study should not be exaggerated. Such research is not beyond the capacity of a properly trained individual scholar, provided that a suitable delimitation of the field of inquiry is made, and that proper use of the results of past work in the field is assured.

But all this does not dispose of the major difficulty: doubts about the fruitfulness of such inquiries. Were already established results of past systematic measurements and analysis of economic growth available, such doubts might be resolved. While monographic investigations, devoted to this or that aspect of economic growth abound, comprehensive studies aimed at some significant generalizations are practically nonexistent.[13]

[13] Excepting some of the studies of the Kiel Institute (by Hoffman, Schlotte, and others). Also some of the tentative generalizations in Colin Clark's book already cited.

Yet one can indicate the goals that such study may pursue with reasonable expectation of at least partial success.

The first feasible result of systematic measurement is that there will be many segments of economic growth whose magnitudes have been established by means relatively independent of the current or distant observers' judgments and biases. The resulting stock of quantitative knowledge might then be useful in providing touchstones in the testing of various hypotheses in regard to factors affecting economic growth or in regard to necessary concomitants under specified conditions. By forcing a greater specificity upon some generally used concepts, such as growth, stagnation, decline, maturity, and the like, such a stock of measures might also serve to reduce the area of dispute, or at least shift it to more productive fields.

Second, systematic measurement of the growth of total output and of its parts might provide the basis of a search for some commonly recurrent patterns of differentiation accompanying economic growth. Whether or not such invariant common patterns will in fact be found, the available measures should at least provide the basis for more precise formulation of types of economies and economic organization (industrial and non-industrial, free and authoritarian, autarkic and interdependent, and so forth). And they may provide the basis for explaining the differences in magnitude and character of economic growth among nations during any given historical period, if the period is characterized by the spread of a given type of economic system, with or without significant modifications (from its appearance in the pioneer nation to its adoption by others). Perhaps one can best understand the economic growth of nations since the late eighteenth century as a spread of the industrial system, first within the framework of the relatively free capitalist system of England, of this country, and of some others (Sweden, France, and so forth); then with substantial modifications in Germany and Japan; later with even more striking changes of the social system in Russia and, prospectively, in some of its satellite countries.

Third, systematic measurement of economic growth of nations might provide the basis for a search of some stable patterns of change over time. Whether such patterns are to be found only within the limits of a given historical epoch characterized by a fairly homogeneous social structure whose productive potentialities are gradually exhausted, what phases can be distinguished within this unfolding of a given economic order from early days to maturity to decay and to a final breakdown

succeeded by a new type of economic order -- these are questions the specific answers to which depend upon the availability of continuous comparable sets of measures. The 'periodization' of economic history and the phasing of the processes within each distinct period could, one may assume, be made more specific and less controversial with the help of quantitative measures of the type discussed here.

Finally, measures of economic growth can be analyzed and articulated into reflections of the extent to which the national economies serve the basic functions or end purposes that economic activity may be deemed to satisfy. If so used, the measures may provide bases for appraisals of the performance of the economies in different periods and under different conditions of social organization, resources, and skills. As a result, interesting questions are likely to emerge regarding why and how these various units of human societies acted as they did -- so often apparently against their own broad interests as defined in terms of wants, needs, welfare, or power. Some of these questions will be answerable in terms of analysis on the level of economic phenomena proper; others will require a search for factors and forces lying outside the economic sphere itself.

Naturally, the development and use in analysis of measures of economic growth may easily result in successive modifications of the unit of observation, of the particular object of measurement, and of the answers given to the specific questions of the type discussed here and others encountered in securing the measures. It is quite possible that nations will prove to be unsuitable units for analysis even though they may continue to be the most convenient units of measurement or observation

at the first stages of the inquiry, namely, the establishment of the basic economic magnitudes. It is not unlikely that for use in comparisons bridging over periods of national units characterized by markedly different types of economic organization the present definitions of total output or national income will have to be substantially modified. It is possible that in certain types of analysis, for example, those directed at welfare, the market-place estimates will tend to be replaced by measures bound more directly to some experimentally established factors underlying human welfare. This is a trend already observable in the measurement of the satisfaction of needs for food, where nutrition bases and coefficients tend to be used alongside or sometimes instead of economic estimates, that is, in market prices of food production and consumption, in the measurement of power production, where various sources of power are reduced to their energy coefficients and various types of fuel to their B.T.U. contents.[14]

[14]Also, indexes of growth might be accompanied or replaced by indexes of differentiation. The reader will have noted that throughout the discussion growth has been defined as a process of quantitative accretion rather than of differentiation among parts. Were we in a position to establish invariant associations between differentiation and accretion, measures of the former could be used as indexes of growth, and the process of the latter could be identified with differentiation rather than with merely increase in total magnitude. Such a result, or an approximation to it, may be secured by dint of cumulative quantitative study of economic growth as defined here -- study that could deal not only with the total but, as it inevitably must, also with the significant parts of a nation's output.

Such developments are but a natural and desirable concomitant of the growth of any field of scientific research, a result of the cumulation of data and of established interrelations of observable phenomena. Such a cumulation is desirable; and procedures that permit such building on the basis of past knowledge, without too great a loss in the validity of the

latter, are greatly to be preferred to types of study and observation which, because of the lack of determinateness in their formulations, lose most of their validity once the intellectual climate that made them seem relevant and valid has vanished. Quantitative measures may lose part of their value because the object they measure may seem, in the light of objective changes and changes in theory, less strategic than it seemed before. But given persisting importance of the object of measurement, statistical data are susceptible of cumulation to the highest degree. As statisticians so well know, a series that is twice as long possesses more than twice the analytical value -- provided continuity and comparability are preserved. It is this advantage of statistical measurement and research that assures its fruitfulness -- in the face of obstacles imposed by the ever-changing complexity of economic events and by the difficulty of tracing, in the over-all totals of past performance, the habits, drives, aspirations, and conflicts of living men and societies.