On the Description and Comparison of Economic Systems

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1. Introduction

The traditional comparison of economic systems starts from the trichotomy of capitalism, socialism, and communism. It goes from there to recognize a certain diversity of patterns within each of these three prototypes.

The last twenty years have seen a great deal of relatively independent experimentation with organizational techniques and institutional forms within each of the prototypes, and some borrowing of devices and forms between prototypes. In addition, the rather different institutional problems of less developed economies have received greatly increased attention. As a result, a rich and, indeed, somewhat bewildering variety of organizational forms and systems is now spread before us, which defies simple classification according to a few prototypes.

To the researcher the new situation offers a double advantage. Not only is the number of possible comparisons substantially increased, but, at the same time the greater variety of systems provides opportunities for comparison between economies that are alike in most respects and differ notably only in one or two of their critical traits or dimensions—a type of comparison that may permit the tracing of effects of specific traits on outcomes with greater chance of success. For instance, it may be more easily possible to compare the role of market prices and government controls in Belgium and the Netherlands, or of investment policies of Poland and Rumania—in both cases pairs of countries with many common traits—before proceeding to the more complex comparisons of the total systems of countries that are more widely disparate in their institutions, size, and resources.

In general, we believe the new circumstances invite approaches to the comparison of economic systems that altogether avoid prior classification according to the grand “isms” and instead start from comparisons of organizational arrangements for specific economic functions. Among these we should wish to consider the coordination of production activities by distinct organizations, the accumulation and utilization of means of production of new or existing types, the research and development for new
methods and means of production, the distribution of currently produced goods and services among the participants and beneficiaries of the system, the maintenance of aggregate stability, and the protection of individuals from harmful effects of the economic actions of others.

Our decision to shun the "isms" as a basis for classification of observed economic systems does not preclude comparing models of admittedly hypothetical pure systems, representing one variant or another of one of the "isms" or of any other system proposed or contemplated. However, our decision leaves us without suitable terms for referring to categories of observed economies professing allegiance to the respective "isms." Reaching into geography for substitute labels, we shall occasionally and metaphorically use "East" for the diverse group of countries in which a communist party is the leading political organ; "West" for the developed "capitalist" and mixed "capitalist-socialist" countries; and "South" for the less developed noncommunist countries, regardless of their individual locations. It will then be understood that Cuba is in "East," while Australia and Finland are in "West." Yugoslavia, which does not seem to fit with either "East" or "West" in its economic institutions, will be mentioned separately when the need arises.

Although the conference to which this paper is a contribution is attended almost exclusively by economists, the importance of political and (non-economic) social factors, both in the realities of the systems to be compared and in the criteria (or "norms") entering into the comparisons, is apparent to all. Your authors herewith disclaim professional expertise in the sociopolitical sciences, but they have preferred the risk of making uninformed observations to that of not recognizing the crucial political and sociological aspects of the topic under discussion. Even so, our professional preoccupations may well have led us to follow some economic twigs while stopping short on some political limbs.

The main aim of the present paper is to suggest, without particular claim to novelty, one possible framework for the description and comparison of economic systems. For an objective comparison the descriptions of the systems being compared should be couched as much as possible in system-free terms. It is in the nature of this undertaking that definitions and terminology take up an inordinate part of the paper. The ideal is that the primitive (undefined) terms entering into these definitions be few in number and universal in applicability and prior meaning. Preferably they should be drawn from fields such as engineering, psychology, physiology, that have a relatively system-free status. Terms such as "individuals," "preferences," "commodities," "production," "perception," "communication," "constraints on behavior," come close to meeting this requirement. Terms such as "price," "supervision," "organization," "decentralization," "planning," whose meanings may be
system-bound or otherwise ambiguous, should then be defined for the purposes of the comparison, using the primitive terms.

We have not attained this ideal. Within the available time and space we have used more than a minimum of primitive terms in an exploratory attempt to block out what seem to us important aspects of both the conceptual and the statistical problems of system description and system comparison. We may well have neglected or dealt too cursorily with other aspects of comparable importance.

As a test of relevance, we do provide illustrative examples to convey contexts for the definitions and suggest possible uses for the concepts introduced. Finally, we rather liberally insert conjectures of regularities that more systematic empirical investigation might confirm or refute, again to suggest rather than demonstrate possible uses of the concepts.

2. A Conceptual Framework

2.1. Environment and System

Following Grossman\(^1\) and others, we shall think of comparisons of economies or of their systems as being made via models of these economies or systems. That is, instead of comparing economies A and B directly, models \(M_A\) and \(M_B\) are abstracted from our knowledge of A and B, respectively, and are compared with each other as well as with the realities whose salient features they seek to embody. Of course, the choice of the models again depends on the particular purpose of the comparison to be made.

In the models here suggested for demonstration purposes, we distinguish (representations of) the environment, the (economic) system, actions, outcomes, and norms with respect to which the outcomes are evaluated and the systems compared. All of these are defined with reference to a particular time period to which the description or the comparison applies. Briefly, the environment of the economy includes resources, initial technology, external factors (including technology available from other economies), and the impact of random events on each of these. It also includes initial preferences, and incomplete interactions (as of the initial date of the period of comparison).

Resources, in turn, include natural resources proper (including climatic conditions), the initial capital stock (available means of production and goods in inventory or in process at the beginning of the period), and the initial population, its age distribution, health, skills, and education levels. Resources evolve over time by prospecting, investment, conservation or neglect of physical and biological surroundings of man, and also by

human reproduction, medical services, education, learning from experience, aging and death.

Technology (at any time) is thought of as a long list of commodity specifications, together with a long list of descriptions of possible activities. An activity is defined by its inputs (kinds and quantities), by its effects, and, if greater specificity is required, by the kind of repeatable action or sequence or combination of actions that, by the state of the arts at the time, is known to produce the effects whenever the inputs are available. The effects will be outputs (kind and quantity) in the case of production activities of goods and some services, maintenance of states of health or of satisfaction levels in the case of consumption activities, increases in the knowledge or skills of individuals in the case of instructional activities, and so forth. The inputs are efforts, the use of facilities or equipment, and in most cases other goods, services or resources. Technology evolves by the addition of new commodities and activities through research and development or through their introduction from other economies, and by the demise of old ones as a result of disappearance of demand or of requisite skills.

External factors are all traits of the rest of the world, other than of the economy in question, pertinent to economic processes in the economy. This includes the geographical position, resource endowment and purchasing power of important actual or potential trading partners, the existence and proximity of political or military rivals, protectors, or clients, and the systems in operation in each of these.

Random events give rise to uncertainty about the availability of resources, about the outputs (or even about the input or action requirements) of given activities, about the external factors, and may require definition in terms of subjective or objective probability distributions. Other kinds of uncertainty, arising from unpredictable aspects of behavior of economic agents within the economy, are characteristic of the system rather than of the environment.

The initial population has been included with the resources because of its productive potentialities. Its initial preferences must be recorded separately as a baseline from which subsequent preferences evolve. The standard description of preferences (at any time) associates with each individual a preference ordering (possibly represented by a utility function) of all alternative current and future consumption paths of that individual and possibly of his family ("private preferences"). The ordering can be thought extended to express also his "social preferences" concerning the consumption paths of others (living and as yet unborn) as well as more general system traits. The "social preferences" of central planners, for example, may be thought to guide their allocation decisions, which affect the welfare of the future as well as the present population.
However, the concept of preference ordering, whether it applies to individuals, to planners, or to other participants making allocation decisions on behalf of groups of system participants, does not require that the ordering of possible states be complete. How far into the future a decision maker attempts to discriminate among possible states or paths to these states and the efforts he may exert to specify and detail his preferences among these states or paths may also differ from system to system.

The term "utility function" is less appropriate for goals imputed to or proposed for organizations, including the economy as a whole. In those instances, we shall therefore use less specific terms, such as goal function and norm, to be introduced more fully below.

The representation of preferences by a goal function is normally associated with a model of consumers’, citizens’, organizational, or national choice that maximizes goal attainment among available alternatives. Progress in utilizing generalizations of that model to include realistic elements of habituation, of "satisficing," of random behavior, of coping with uncertainty, and of learning from experience has been incomplete and uneven. Whichever model one adopts, the important implication it has for system description is the decision rule describing how consumer's choice or organizational or civic action depend on available opportunities and prospects. In particular, for statistical inter-system comparisons of consumers' behavior, studies of demand functions representative of entire populations or large subsets thereof will usually have to be substituted for a conceptually fuller description of choice. For these reasons, the skeptical reader may want to think in terms of "decision rules" wherever in the sequel we use the term "preferences," or "utility function," or "goal function."

Incomplete interactions include all orders not yet fulfilled (contracts to deliver goods or services, quotas in production plans) and commitments (repayment of loans, payment of pensions) required by, or compatible with, the system, which are outstanding at the beginning of the period to which the comparison applies.

The system is hardest to define because of the widely inclusive nature of the concept and because of the difficulty of separating economy from polity. In greatest generality, the total system includes all political, social

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and economic institutions, organizational structure, laws and rules (and the extent of their enforcement and voluntary observance), and all traditions, religious and secular beliefs, attitudes, values, taboos, and the resulting systematic or stochastic behavior patterns. The total system includes all these phenomena both as initially present and as evolving over the period of comparison through organizational change, new legislation or rulings, or new trends in attitudes and behavior. The provisions for creating or dissolving organizations, modifying relations between organizations, amending the rules, and influencing attitudes and behavior are themselves considered part of the system.

Depending on the comparison to be made, the comparator may feel that he can designate as economic system only that part of the total system, which directly or indirectly affects economic behavior and outcomes in at least one of the systems being compared. So as not to prejudice this issue in general, we shall from here on use the term system in an open-ended way to refer to all or to the economically relevant part of the total system, leaving the burden of proof of nonrelevance with the comparator.

One may wish to extend the concept of the system to include perception of the environment, of the system, and of the interaction of its participants—as distinct from that environment, system, interaction taken by itself or as perceived by the comparator. This view recognizes the system participants' perception of the economy's environment and of their respective individual environments (defined below) as itself a system characteristic. Examples abound: A presumption of racial superiority may prevent an employer from perceiving the skills of a racial minority. A strong attachment to central planning may lead a planner to underrate the impact of random events in such industries as agriculture or fisheries. An entire literature on less developed economies deals with the obstacles that traditions, attitudes, and vested interests place in the way of the perception of technological opportunities.

In these examples the term "perception" is used in a sense somewhat broader than its primarily cognitive connotation in psychological parlance. Especially if we speak of the perceived system, we may think of an image of the system formed in the minds of its participants, which the comparator may infer or extract from expressions of views or opinions by these participants and from modes in which the participants address each other for purposes of persuasion. If we include in this discussion perceptions of one system by the members of another, it will be clear that such images, sometimes even caricatures, are formed under the influence of the observer.

Applying this notion symmetrically to the political comparator who designates as "political system" that part of the total system directly or indirectly affecting political behavior and outcomes, we must expect a very substantial overlap between the political and the economic system.
or critic’s own institutional system and of information emanating from other observed systems. Where information about a system is manipulated by some of its participants for the purpose of influencing fellow-participants or participants in other systems, it is termed propaganda. Another closely related influence on an individual’s perception of his or of other total systems is his ideology, a more or less stable pattern of frequently untestable ideas, symbols, and symbol clusters, usually expressed in widely disseminated printed, broadcast, or televised material, which supply him with a more or less coherent view or explanation of, and a definite attitude to, a broad range of the world’s phenomena.

Actions differ from activities in that they are thought of as taken by a specific participant at a specific time, whereas activities are types of possible actions not dated or connected with a participant (though their possibility may be limited by time of inclusion in the technology or by skill requirements). Generally, an action changes the environment of the economy or of the participants or both in some minor or major way.

Taking actions as the elementary building blocks of economically relevant behavior, we may use the term decisions for commitments to several simultaneous or successive related actions and policies as classes of decisions adopted in order to economize on decision time and effort and, in many cases, made known in order to create stable expectations about future decisions.

The boundary between system and policies is not a sharp one and may depend on the length of the period for which a comparison is made. For instance, a market economy in which the central government follows a fiscal policy of a balanced annual government budget may be considered as a system somewhat different from that of the same economy in which a fiscal and monetary full-employment policy is pursued. If within a longer period the former system is succeeded by the latter, one may alternatively speak of a market system in which a policy change occurred at some point of time.

The policies, decisions, and actions of all participants other than a specific one, together with the outcomes of these policies, decisions, and actions, must be included with the environment of the economy to define the environment of that specific individual. The latter, in particular, includes both the technology available from outside the system and that generated by other participants within the system. That part of a participant’s environment that he actually perceives is called his information set.\(^7\)

Outcomes are all aspects or consequences of the system, and of the policies, decisions, or actions of all participants to which positive or

\(^7\) Note that a participant may know about the existence of a technology, yet the technology itself may not be part of his information set, since it may be protected by patents or restricted by high communication or learning costs.
negative value is attached in at least one of the norms entering into a comparison. This may include any valuable or deleterious man-made changes in the environment during the period involved in the comparison and any "evolutionary" changes in the system that are made or come about in a manner compatible with it. It is also bound to include levels of consumption activities or of satisfactions and changes over time thereof, as well as aggregates, distributions, and possibly other functions of these levels or changes in levels. In Section 3 we give examples of important outcomes (here called "desiderata"), of which some are common to most systems, others are specific to one or more systems. In Section 4 we give examples of important categories of activities, ranging from some that are common to all systems to some others whose character or even existence is specific to the systems in which they occur.

Finally we come to the concept of a norm (criterion). We believe that no meaningful comparison of economies or of their systems is possible without at least the implicit application of some norm. Even a seemingly entirely descriptive comparison must select from a vast multitude of traits that smaller number deemed sufficiently interesting (a value concept!) to be entered into the comparison. A norm may be implicit rather than explicit; it may be limited by the perception of the comparor; or its presence and nature may escape the perception of some or most of his readers. But the conscious and unconscious motivations of the investigator and the natural selection by which individual studies enter into the cumulative record of social science results tend to introduce, and make apparent over time, the underlying norms.

Norms become more visible when observed inter-system differences in various system traits are brought together and weighed against each other. We define an explicit norm (hereafter often briefly a norm) formally as an evaluation function (utility function, goal attainment function) of all outcomes which represents the preferences of some individual or group pertinent to the comparison.

The scientific character of a comparison is enhanced if any underlying norm is made explicit to the extent possible. Furthermore, it is instructive to make the same comparisons in the light of a number of alternative pertinent norms. These may include:

A. A norm perceived as a prevailing norm in any of the two or more economies being compared. This may be a norm explicitly adopted and imposed by a majority or minority enabled by the system to

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8 We choose the word "norm" without the connotation of disapproval of dissenters which sometimes adheres to it. While the term "criterion" is more value-free, it does not contain any hint that the interesting criteria are those to which at least some people attach a normative value.
make it the prevailing norm. If no such group exists, it may be a norm that embraces, or is explicit in, the outcome of the processes of adjustment of diverse interests inherent in the system.

B. A norm attributed by the comparor to groups of the population (minorities or majorities) whose preferences are given little weight in, or overruled by, the prevailing norm, in short, an unavailing norm.

C. Norms adduced by the comparor for purposes of discussion. This category may explicitly include (if he wishes) a norm he himself deems pertinent or even advocates. In regard to economies where a prevailing norm is imposed by a minority, or also where it is accepted by an inattentive and unreflecting majority, the category may further include a comparor's tentative but explicit estimate of a better balance of interests, possibly arrived at with the help of attitudinal surveys, legal documents, and more general past and current social thought. Finally, it may contain norms he explicitly attributes to groups of his readers, or to the intended beneficiaries of his knowledge and insights—regardless of the standing of these norms in the economies being compared.

2.2. Comparison of Economies and Comparison of Economic Systems

Differences in observed outcomes in different economies will in general reflect such differences as are present in all of the components of environment, system and policy we have distinguished. Symbolically, if $e$ denotes environment, $s$ system, $p_s$ policies pursued by the participants under the system $s$, and $o$ outcomes, then we may write

$$o = f(e, s, p_s)$$

for the grand relationships we would all like to know and understand. Even though our actual knowledge is pitifully small compared with the complexity of the relationships in question, writing them out in this explicit way may help in their discussion. The implied assumption is that the laws of physics, chemistry, technology, agronomy, human and animal physiology and psychology—the same fields from which the primitive terms are drawn—circumscribe what can be achieved by any given economic organization, in a manner subject in principle to objective inquiry and explicit description.

A system may be more suited to one environment than to another, in the sense that more desirable combinations of consumption, growth, and national security may be attained by that system in one environment than in another. (It may be argued that some systems may not even be viable unless certain environmental conditions are met.) The interdependence between the environment of the economy and the system is cited by
Wittfogel, who suggests that in certain environments special forms of hierarchic organization, run by bureaucracies with virtually unlimited powers over the participants in their system, may have arisen in response to the need for coping with drought (through irrigation), with floods (through flood control), and with other negative factors in their environment. Another example, much discussed in the literature, is the strong influence of the mere size of an economy on the optimal degree of enterprise specialization. A third example, perhaps more conjectural, is the tendency of a low level of skills in an economy to favor a more centralized system.

But even if differences in environment were not to favor corresponding differences in system, a statistical comparison of systems under some given norm would still require that one allow for the inevitable effect of environmental variables on system performance under the norm. The initial capital-labor ratio, mineral wealth, climate and soil, the geographical location of other nations important for trade, national security or influence, are all examples of environmental variables that codetermine, say, the consumption-growth-security locus attainable with the "best" of systems. The use of observations on economies with markedly different environments for the empirical comparison of systems therefore requires the econometric estimation of the vector function $f$, or at least of the first and possibly second derivatives of important outcomes in $f$ with respect to those environmental variables for which the data present important differences.

A similar problem arises with respect to the policy variables $p$. The very nature (as distinct from the numerical values) of these variables will in general depend on the system. This is particularly true for the policies of ruling organizations. It may well be true also for those of other participants. One may wish to compare systems under the policies actually or typically in use in each system during the period(s) of the comparison. In that case, separating the effects of policies from those of the system raises no new econometric problem. However, the principal reason for the distinction between system and policies is the greater ease of changing policies than systems. One may therefore also wish to compare systems on

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the assumption that in each system, at least on the level of ruling organizations, the policies applied are the best available within the institutional and normative constraints of the system. In addition to estimation of the values \( f(e_0, s_i, p_k) \) of the outcome vectors \( f \) for some standardized environment \( e_0 \) and for the \((s_i, p_k)\) combinations observed in the economies labeled \( i = 1, 2, \ldots, k \), this would require the further estimation of first and second derivatives of important outcomes in \( f \) with regard to important components of \( p_k \) in those countries where policy is deemed clearly nonoptimal.

As in other relatively simpler problems in econometrics, the very limited opportunities for experimentation, the limited number of periods and of economies for which observations are available, and economic history's inherent selectivity in regard to the range of vector variables presented to view in any given economy and period do not permit such estimation without resort to \textit{a priori} assumptions about the properties of the functions \( f \) and about their deduction from underlying, more autonomous, relationships. For instance, the activity-analysis model of production may be used in a first approximation as a source of mathematical constraints on the way in which important environmental variables enter into \( f \). Likewise, ideas from organization theory may be drawn upon to spot crucial system and policy variables and to circumscribe the manner in which they enter into \( f \). In Section 5 we seek to explore some possibilities in that direction with regard to system variables. As a third example that anticipates the "utility version" of the efficiency norm,

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n(o) = n(f(e, s, p)),
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a function of the outcome vector \( o \) to be introduced in Section 3.2, we need to draw on the theory of consumers' choice when faced with given market prices.

Whether these particular approaches are helpful or should be discarded for better ones is not the issue here. The main point is that the principles regarding the use of \textit{a priori} postulates for the identification of economic relationships and for the tracing of causal chains, developed in connection with other fields of application of econometric methods,\textsuperscript{12} also bear, \textit{mutatis mutandis}, on the comparison of economic systems. In fact, in such comparisons, the dependence on \textit{a priori} assumptions is the greater, the more numerous the differences between the economies to be compared.

An ability to trace the effects of differences or changes in environment, system, or policies is crucial to the ultimate purpose of the comparison of economic systems: to find ways of improving the performance of any given economy or system in the light of some adopted norm. The use of models of the economies compared is therefore bound up in the normative character of the comparisons.

2.3. Organizational Structures and System Descriptions

We propose to describe a system for comparative purposes with the aid of the following terms and concepts in addition to those already introduced. We wish to stress that our ultimate purpose of facilitating the comparison of systems lies at the basis of our classification of institutions and of other system characteristics in the taxonomic material in this and in the following sections. We are mindful, for example, that the organizations, activities, actions and messages in a system may be subdivided into much smaller and more homogeneous categories than we suggest in this paper. Alternative classifications of approximately the same degree of "coarseness" also come readily to mind.

To demarcate a system, we specify a set of participants whom we identify as all individuals, and possibly groups of individuals acting with a specific group decision procedure (boards, committees, parliaments), that take economically relevant actions.

Participants’ actions, including messages, may become part of the environment of other participants, who may respond to them if they so desire or if they are obligated to do so. This response is also an action.

We call interaction a set of actions, simultaneous, sequential, or of both kinds such that each participant in the interacting subset of participants directly affects the environment or information set or both of every participant in that subset. The relation is thus symmetrical: If person i interacts with person j, i’s actions impinge on j and vice versa.

Orders are dated messages calling for a specific response (to act or desist) from the participant(s) to whom they are addressed; rules are messages stipulating or constraining the actions of a set of participants for an indefinite period and under specified conditions. The set of participants is explicitly defined in the message but not necessarily by listing them individually.

We conceive of participants as associating in organizations. An organization is defined with reference to a specific set of activities. It consists of a set of persons called members of the organization (which must include at least one participant of the system considered), who regularly interact with each other, by communication and possibly in other ways, in the process of carrying on one or more activities of the set. To be precise, for any two members i, q, of the organization, we require
that there be a chain of interactions connecting them, that is, a sequence $i, \ldots, p, q$, of different members such that $(i, k), (k, l), \ldots, (p, q)$ are interacting pairs$^{13}$ (not necessarily for the same activity or activities in the set). In particular, as we shall see below in Section 5.4.1, all participants form an organization in this sense for the set of all activities engaged in by at least one of them.

It will be convenient to use the word entity for either an individual or an organization.

To differentiate associations, hierarchies, and quasi-hierarchies, the three basic types of organizations we shall deal with in Section 5, we require the concepts of supervision and superordination.

A member of an organization supervises another member if he has the power to issue orders to, and exert significant influence on, the actions of, that member with reference to one or more of the activities in which the organization is engaged or could engage.$^{14}$ If member $i$ supervises member $j$ who in turn supervises member $k$, and so forth, then $i$ is said to be superordinate (or superior) to $j, k, \ldots$, and $j, k, \ldots$, subordinate to $i$, whether or not $i$ actually also supervises $k, \ldots$. Note that a member may be superior to another for one activity and subordinate or neither-superior-nor-subordinate for another activity.

An association for an activity or a set of activities is an organization, none of whose individual members is superior to another member in carrying out any of these activities.

A hierarchy for an activity is an organization with the following properties:

1. For each pair of members of the organization either one member is subordinate (for that activity) to the other or both are subordinate to the same third member of the organization.
2. If one member is subordinate to another in the organization, there is a unique chain of successive supervisors (for that activity) connecting the two.

From this definition it may be inferred that a hierarchy has a unique head and that every other member in a hierarchy is directly supervised by precisely one member. These properties differentiate hierarchies as we have defined them from quasi-hierarchies, the third, residual, category of organizations, in which a supervision relation occurs between at least one pair of members, but where members need not be related to each other by a single chain of supervision, and more than one member may head the

$^{13}$ For an alternative, broader definition of an organization where the necessity for regular interaction within each pair of members $(i, k), (k, l) \ldots, (p, q)$ in a chain is relaxed, see section 5.4.1.

$^{14}$ On the supervision relation, see also below, section 5.3.
organization. (Among modern nuclear families consisting of father, mother, and children such quasi-hierarchies are frequently encountered.) A hierarchy or quasi-hierarchy may itself be a member of an association, or vice versa, if all the members of the member-organization act according to or abide by the decision procedures of that organization.

This classification of organizations will be used in Section 5, where we put forward two conjectures on the efficiency of alternative organizations, including markets (which we conceive of as associations of a special type).

We call ruling organizations for a system certain organizations (usually structured as hierarchies) that have the power to issue rules or orders to some designated set of system participants to which they are addressed; these may include both members and non-members of these organizations. We shall call these rules laws. The legal framework of the economy is the set of all laws pertinent to the economic processes in the system.

We describe a system in terms of the patterns of interaction among its participants and in terms of the rules governing these interactions imposed by ruling organizations. A complete system description presupposes that an information set (see Section 2.1) and either a preference ordering (say, a utility function) or a decision rule can be attributed to each of the participants. If a utility function is attributed, the participant’s motivation is then defined as a function that associates with each course of action open to him the utility of that outcome which, on the basis of his information set, he expects to result from that course of action.15 If his information takes the form of a (subjective or objective) probability distribution of the outcomes of at least some courses of action, the term “expected utility” may be substituted for “utility” in this definition, or another model for choice under uncertainty may be employed.

The motivation for a participant’s decision to comply or not to comply with an order from a supervisor in the organization of which he is a member depends, among other things, on his assessment of the loss or inconvenience he would suffer if he were forced to leave the organization—a possible outcome of failure to comply, once or repeatedly. Although the goals and policies of an organization are likely to constrain the actions of all of its members (with the possible exception of the head of a hierarchy if the goals and policies he is able to impose accurately reflect his personal preferences), we allow for the possibility of actions by members in conflict with the goals and policies of the organization as

15 The behavior model suggested in this paragraph is in the tradition of the economist’s theory of maximizing behavior already referred to in Section 2.1. A psychologist would note that changes in information would receive more attention than unchanged information. An organization theorist would note that the utilities of alternatives quite different from the one presently pursued would receive more attention when the participant’s fortunes are strongly threatened.
interpreted by their superiors, as well as actions by members adversely affecting fellow members in terms of the latters' goals.

We shall find that the notions of price and of ownership, which will be defined when they are introduced in Section 5, can be fitted without strain into the conceptual framework we have set forth.

3. Norms (Criteria)

3.1. Outcomes, Desiderata, Indicators

We have defined outcomes as all aspects or consequences of system, policy, decisions, or actions to which positive or negative value is attached in at least one of the norms entering into a comparison. In turn, a norm was defined as an evaluation function of all outcomes that represents the preferences held by some individual or group pertinent to the comparison. The mathematical definition of a function then permits a norm to depend in fact on only a subset of all outcomes, indicating that the individual or group in question is interested only in some of the outcomes. We shall call desiderata for any given norm those outcomes on which the norm in fact depends positively. (Any odiosa can be transformed into desiderata by a change of sign.)

Before listing examples of important desiderata occurring in pertinent norms, we make a few more general observations.

The insertion of the word "aspect" in the above definition of an outcome entails that any trait of a system or policy can itself be a desideratum in some norm if value is attached to it in that norm, possibly because of presumed noneconomic effects. For instance, decentralization of economic decisions may be valued in itself because it is looked upon as strengthening the self-reliance of individuals. In contrast, in another system centralization may be valued in itself, because it is thought to help maintain central control over political and cultural decisions desired in the prevailing norm. In comparisons the fact that these system traits appear as outcomes valued in opposite ways in different norms must be taken into account.

The inclusion in a norm of, or the giving of extra weight to, a desideratum merely because of its presumed relation to some unnamed, perhaps noneconomic, desideratum introduces into the norm an assumption about causal relationships that may be mistaken. This element of speculation is present, to a smaller or larger degree, in almost all adoption and weighting of desiderata. It is enhanced by the fact that the more ulterior desiderata are often harder to quantify, and therefore proximate desiderata which are more easily measurable must represent the ulterior ends in question. 16

The use of statistical indicators as proxies for desiderata or odiosa raises problems of representativeness and comparability. Two countries may have a desideratum in common but may pursue different proximate goals to attain it. Most societies, for example, wish to minimize economic strife (for reasons related to desideratum \( y_5 \) to be defined in Section 3.2) and to preserve a reasonable degree of stability in the distribution of power and rewards. In some economies where labor is autonomously organized, man-days lost by strikes may be used as an indicator of strife and tension. But no such measure is available for economies in which strikes are illegal.

Another example concerns the volume of unfinished construction, an indicator likely to be relevant for comparing the intertemporal efficiency of alternative systems. Comprehensive data on this variable can only be obtained for the Soviet Union and for the East European economies. In market economies these data, if they are collected at all at the level of the construction enterprise, are generally not aggregated, presumably because neither the decision makers in the governmental hierarchy nor those in any nongovernmental organization have felt or articulated a need for them in reaching their decisions.

### 3.2. Common or Similar Desiderata in Various Norms

We begin our listing with some common desiderata that we believe to be present in the prevailing norms of most systems in the modern world. It is not implied that the relative weights given to the various desiderata are the same in the several norms in which they are held in common. Neither is a desideratum recognized as common necessarily expressible in the same form in regard to different systems. Nevertheless, a list of common desiderata is a first step toward a methodology of comparison of economic systems that may gain acceptance by economists living under different systems.

\( y_1 \) a high level of *per capita consumption* of goods and services desired by or for consumers.\(^{17}\)

Although some individuals have sought a life of austerity and self-denial, as far as majorities of participants go this desideratum has a long history. It is practically universal in the modern world without any signs of an approach to saturation even in the wealthiest economies.

Currently almost as universal is the desire for \( y_2 \) *growth* in the *per capita consumption* of goods and services through technical advances and through accumulation of physical and human capital.

\(^{17}\) The words “by or for” allude to a system difference to be discussed further in connection with desideratum \( y^* \).
This is in part a matter of intertemporal distribution of consumption and of dissatisfaction with present consumption levels, especially in the less developed countries. It is also derived from another desideratum

\[ y_d \]

to maintain or extend one's influence and power in the world,

which we mention here somewhat out of sequence while postponing further comment. Finally, especially in the more affluent countries with private property and enterprise, a given growth of population produces an at least corresponding growth in capital almost painlessly through the desire for continuity of income into the retirement period.\(^8\) Additional sources of technical advance are the desire of the young to acquire skills and knowledge that have market value besides their personal value, the competition between business firms, nation-states, and systems in the technological race, and the pressure from scientists for funds to pursue their intellectual interests. One feels that in these circumstances, given the rate of population growth, a comparable all-over growth rate would have resulted in the most advanced countries of West even if growth had not enjoyed public and official acclaim as a national goal in itself—provided a full-employment policy was successfully pursued.

The three desiderata listed so far introduce the three major contenders for the aggregate use of resources in modern systems. The next three desiderata deal more with the apportioning of consumption by types of goods and by recipients. It is therefore appropriate here to make the point that simultaneous pursuit of the first three desiderata, whatever their (positive) weights in the pertinent norm, implies a derived desideratum of

\[ y_*, \text{ efficiency in the use of resources.} \]

Perfect efficiency of an entire economy, an unattainable ideal, is defined, in the "commodity version" common to East, West, and South, as a choice of the kinds and levels of production activities in use such that within the bounds of the given resource availabilities it is not technologically possible to produce (or secure) more of any good or service (including leisure) desired by some participant except at the opportunity cost of producing less of some good or service desired by some participant. In another more inclusive "utility version," called Pareto optimality, or consumers' sovereignty, and rating higher in West than elsewhere, the definition says instead "...that...it is not possible to increase the utility

of any one individual without decreasing that of another." The former efficiency concept applies just to allocation of resources in production, the latter to distribution to consumers as well. The latter concept expresses the phrase "desired by consumers" in the definition of $y_1$. The former concept is implied in the latter (assuming nonsaturation), but standing by itself needs to be supplemented by a specification of the ratios\(^{19}\) in which goods are "desired for consumers."

Neither the definition of efficiency nor the desiderata implying it go into the difficult organizational problems that are the main topic in the comparison of economic systems: How does one achieve or approach efficiency? Is its attainment harder and less complete if the growth rate is higher? What is its cost in terms of other desiderata yet to be mentioned? It is, therefore, desirable to have a measure of attainment of efficiency. Debreu has proposed such a measure for the utility version, which is not affected by ordinality of the participants' utility functions.\(^{20}\) His "coefficient of resource utilization" is defined as the smallest identical fraction of all actual primary inputs that would still permit attaining the same utility level for each individual by a more efficient allocation and distribution. Even though hard to evaluate numerically, this measure may be a good starting point for the search for more easily determined measures.

*Single-period efficiency* (in either version) is obtained if all the inputs and outputs (or utilities) in the definition refer to one single time period.\(^{21}\) In that interpretation, one must specify in the definition of efficiency that, in comparisons with other allocations (and distributions), the amounts of all goods to be held over for use in later periods be kept constant. *Intertemporal efficiency* is obtained if the same good available in different periods is interpreted as so many different goods, the while holding the initial and (for a finite horizon) terminal capital stocks constant. This concept implies single-period efficiency in all periods in question, but the converse is not true. Hence intertemporal efficiency is the stricter and indeed more meaningful desideratum of the two. For a sufficiently long horizon, it also reflects efficiency in choosing the size and composition of investment. However, it suffers from an implication of perfect foresight as regards technology, preferences, and actual allocation and distribution for $n = \infty$ periods ahead. A suggestion for a more flexible concept is made below.


\(^{21}\)This concept is also somewhat inaccurately named "static efficiency," a term better reserved for efficiency attained in a hypothetical stationary state with all variables constant over time.
While single-period efficiency in some sense implies maximal consumption $y_1$ in that period compatible with the stipulations in its definition, intertemporal efficiency is of course compatible with high or low growth, stationarity, decline, or fluctuation of per capita consumption. The growth desideratum $y_3$ adds to this a specific preference as regards aggregate intertemporal distribution of consumption.

A concern with distribution among individuals is expressed by

$$y_3 \text{ equity in the distribution of the conditions of living, or at least of opportunity in that regard, among contemporaries,}$$

which is more strongly held in East and West than in South. The "conditions of living" include consumption levels (current as well as lifetime prospects), health care, opportunity for gainful employment, protection from adverse working conditions, absence of non-functional discrimination, and dignity in human interactions. We prefer the hard-to-define ethical term "equity" to the more definite term "equality," which ignores differences in need arising, for instance, from different states of health or from different numbers of dependents or providers. It also ignores the socially desirable incentive effect of income responding positively to productive effort. So what we mean is something like "fairness and efficiency modifying a desideratum of equality."

Particularly in West and South, social services and public goods are largely provided by mechanisms different from those by which other consumption goods are supplied. For this reason, we shall recognize a separate desideratum, which is a further stipulation within the consumption desideratum $y_1$.

$$y_4 \text{ provision of social services and public goods.}$$

This desideratum rates higher, by and large, in East than in South and West, in relation to resources. However, the modern emphasis on increasing levels of widespread education, mentioned already in connection with the growth desideratum $y_3$, is almost universal. Likewise, the protection of the physical and biological surroundings of man from the adverse effects of economic activities, which we include under the desideratum $y_4$, is currently gaining strength in both East and West.

The following intertemporal aspect of the conditions of living deserves separate mention:

$$y_5 \text{ stability of employment and incomes.}$$

In West policy makers use monetary and fiscal policy toward this goal. With respect to South, efforts are made to protect the value of exports against price fluctuations and overproduction by arrangements modifying the operation of markets in important raw materials. In East direct
controls over investments and restrictions on short-term credits are used to maintain macroeconomic stability.

There remains the crucial desideratum $y_8$ already mentioned. We extend its definition here.

$y_8$ (national strength) to ensure the continuation of national existence and of national or ideological independence; where possible to extend national or ideological influence, prestige and power.

As between different countries or systems this desideratum is similar rather than common. It has the same definition, except that in each case a different name of country or system is written in.

The economic significance of this largely political desideratum is very great. It competes with all the foregoing desiderata by the absorption of resources in military preparedness and, if the case arises, in armed international conflict. A lesser but noticeable complementarity between $y_8$ and earlier desiderata arises from the benefits to production for civilian consumption thrown off by military research. A definite positive value for some of the other desiderata arises from some primarily nonmilitary activities motivated by $y_8$. This includes the emphasis on rapid industrialization in South and East and ventures in oceanographic or space research in the most highly developed countries.

Another important desideratum, similar in intent but possibly quite different in form of application as between different systems, is

$y_7$ provision for orderly change in a system to permit adjustment to changing circumstances without endangering its essential continuity.

System changes themselves were mentioned among possible outcomes in Section 2.1. Normally, system change desiderata differ considerably within one and the same economy as between prevailing and other contending norms. The prevailing norm tends to favor little or no change, while the contending norms favor a variety of not necessarily compatible changes. We return to these relationships in Section 3.5.

3.3. Desiderata Specific to Various Norms

As alluded to above, West favors and practices

$y_8$ widely dispersed economic decisions through inheritable private property, through individual and corporate enterprise, and through a legal framework enforcing contracts while permitting limited liability of corporations.
To different degrees in different countries of West and possibly South the concern for business enterprise is carried to the point of

\( y_9 \) commercialism, a tolerant attitude toward uninformative competitive advertising, sales pressure, and the influencing of essentially educational and cultural activities by business interests,

in some comparators' norms the tolerance of an odiosum rather than a positively valued desideratum.

The traditional desideratum of East,

\( y_{10} \) centralized decisions and control over the composition of output and consumption,

has been abandoned in Yugoslavia and to a significant degree in Hungary, and is currently under hesitant and partial reconsideration in a few other countries because of its conflict with \( y_9 \).

3.4. Some Possible Comparators' Desiderata

The comparor may wish to improve the formulation of desiderata already recognized or to propose as pertinent some desiderata not previously formulated. An example of the former is

\( y_9', \) a flexible intertemporal efficiency concept capable of recognizing uncertainty about technology at any future date, which will diminish as the date is approached, as well as similar uncertainty about future consumers' or planners' preferences.

The analytical difficulties in the way of such a conceptual refinement are considerable. An exploratory discussion of flexible preferences has already been referred to.\(^{23}\)

An example of a newly proposed desideratum might concern the coexistence characteristics of various mixtures of economic systems. The comparor might wish to propose the study of unilaterally initiated or mutually agreed self-reforms of coexistent systems to

\( y_{11}, \) reduce both the cost of the balance of deterrence and the probability or destructiveness of armed conflict between countries having similar or different systems.

The crucial importance of this (proximate rather than ultimate) desideratum for the future of mankind contrasts sharply with the difficulties of obtaining clarity and, if needed, agreement on policies promoting this desideratum. It is not even clear what bearing economic policies may have on its attainment, except for a general presumption that the increasing

\(^{22}\) Again, "centralization" as understood in East.
\(^{23}\) Koopmans, "On Flexibility" op. cit. (n. 5).
interdependence of economies in the modern world is likely to increase the
timportance of various system characteristics to coexistence problems.

Obviously, our list of desiderata could be extended indefinitely, and
other authors might have regarded some other desiderata more important
than some of those we have listed. Many proximate goals not specifically
mentioned so far can be derived from our desiderata. For example, the
defense of the balance of payments may be motivated by a desire for
stability of employment and incomes, for growth in per capita consump-
tion, for national strength, for equity in distribution, or for a combina-
tion of any of these desiderata.

3.5. Interaction between Prevailing Norms, Other Norms,
and Systems

The very concept of what is a prevailing norm differs between systems.
In a highly centralized system, the prevailing norm is essentially the norm
of those who exercise power in the system. In a pluralistic society, where
interest groups are clearly visible and in explicit competition through
political processes, through collective bargaining, strikes, and threats of
strikes, market strategy, persuasion through various media, demonstra-
tions and other means, what we might call the prevailing norm can only be
inferred from actual policies and decisions, rather than being read in
declarations or programs. In such a society, the rules of the struggle for
influence, power and wealth are an important part of the system. Knowl-
edge of these rules, and of the contending groups and their specific
norms, is essential for an understanding of the prevailing norms and their
change over time. Undoubtedly similar processes take place in the more
centralized systems in a submerged manner escaping any but conjectural
and inferential contemporary analysis.

Systems and norms influence each other in many ways. The most
important example concerns system change, which is itself included among
the outcomes. System change tends to be resisted by those participants on
whom the system bestows wealth, influence or power, a resistance aided
by traditional values and the advantages of stability. The ideology of the
dominant group, which may be spread among the participants through
propaganda, advertising, proselytization, or other vehicles of persuasion,
reinforces these conservative tendencies. It follows from this bias that
comparison between two systems with similar environments on the basis
of the prevailing norm of either will favor the system whose prevailing
norm instructs the comparison. Even if the list of desiderata were to be the
same in the two prevailing norms, any difference in the weights given to the
desiderata in the respective prevailing norms will make either system bend
the outcomes to its own norm, other things being equal. Total system
change nevertheless occurs either when those in situations of power are
dissatisfied with the performance of the system and are desirous of bringing about its reform or overhaul, or when a group of individuals who are not among the top power holders and feel disadvantaged or otherwise dissatisfied with the system can force a modification to give greater effect to their own norms. The pressure for change on the part of persons in and out of power depends on the information generated by the system about its performance, itself a system characteristic. It has been conjectured, for instance, that the amount and quality of information percolating to power holders will vary inversely with the political coercion and restrictions they impose upon society. The change effected in the system is evolutionary if it takes place clearly within the framework and procedures recognized by the system. This requires that the prevailing norm give weight to \( y \), provision for change in the system. A revolutionary change takes place if a group has ways to force a system change according to its norm which supersedes the previous total system outright. These are extremes of a scale, and intermediate forms of system change are frequent. In revolutionary change, the part of the system that changes most is the institutions, organizations, laws and rules. The regular patterns of behavior are not generally capable of abrupt change.\(^{25}\)

As another, final example of an effect of system on norms, we refer to the observation by March and Simon in a discussion of ideas on organizational learning by Robert Merton: that system traits may over time become infused with value through a more or less unconscious process, called "goal displacement."\(^{26}\) The authors cited state that the repeated choice of specific acceptable means to a valued end causes a gradual transfer of the preference from the end to the means adopted. The means itself may be a proximate goal, or an institutional device for reaching such a goal.

Finally, we note that the presence of one desideratum in the prevailing norm of a system may affect the meaning of another desideratum. In any system in which consumers' choice influences the incomes of managers in individual enterprises and in which advertising is a part of business operation, the very consumers' preferences that enter into the efficiency desideratum (utility version) are affected and at times distorted by advertising. To the extent that this happens, the tolerance of commercialism qualifies, and detracts from the merit of, the desideratum of efficiency in the utility version. Thus, the prevailing norm of that system (West) that attaches the greatest weight to consumers' sovereignty at the same time impairs its significance. Corresponding effects occur in the sphere of 


\(^{25}\) There is an analogy here with technological change. Important new knowledge can become available overnight. Its incorporation in new capital stock and a (re-) trained labor force takes much longer.

public goods and services. Observers, such as Eisenhower and Galbraith, have pointed to the influence that producers of military goods exercise on government expenditures.\textsuperscript{27} The latter has also referred to the relative neglect of expenditures on those other public goods and services for which pressure from private producers is less pronounced or absent.\textsuperscript{28}

4. Activities, Interactivities, Custody

4.1. Technological Activities

It will help in the discussion of organization in Section 5 if we insert here three brief, illustrative, and nonexhaustive lists of important categories of activities. The first list leans to the more purely technological activities, which at the same time are the more universal activities across systems. The sequence of categories within any one list is somewhat arbitrary.

A. Categories of "technological" activities.

- Recognizing and locating natural resources (such as water, minerals, soils, forests, game, fish)
- Specifying and/or designing commodities to be produced. We distinguish:
  - Commodities not for final consumption, to be embodied or used up in production of other commodities, and means of production of some durability (including consumers' durable goods)
  - Commodities for final consumption (including the services rendered by consumers' durable goods)
- Producing all commodities of both types, choosing inputs and methods of production from among those available
- Research and development of new methods of production
- Transportation and delivery of output from producer to user or consumer
- Maintaining inventories of storable goods
- Labor force participation
- Human reproduction, care of the young, education and training in the technological activities
- The rendering of health services

With some flexibility of interpretation the activities in these categories can be fitted into the definition of activity given in Section 2.1. In all


\textsuperscript{28} J. K. Galbraith, The Affluent Society, Boston (1957).
economic systems there is some degree of functional specialization among participants in performing the technological activities, which is the more detailed the larger the scale of the economy. This specialization is due to the indivisibility of the human carrier of skill and expertise and to the greater productivity of a finer subdivision of specializations whenever scale permits full use of at least one individual of each specialized skill. The resulting specializations are so similar in different modern economies or systems that, where languages differ, makers of dictionaries have had little difficulty in finding equivalent functional or occupational designations (often derived from the same root).

4.2. Interdependence of Activities

The second list contains activities arising from the technological interdependence of those on the first list. Two or more activities are called interdependent if efficient allocation of resources requires at least one of the following:

i. the activities make use of the same indivisible input(s) (example: different tasks to be carried out on one lathe in the same day)
ii. they contribute to the same indivisible output(s) (building a house)
iii. they must be carried out jointly (one man holds the horse, the other shoes it) or simultaneously (individuals whose travel converges on a common meeting place)
iv. they must be carried out in a certain sequence because an output of one activity becomes an input to another (transferring liquid iron from a blast furnace to a foundry)
v. their levels must stand in a certain proportion, because two of their respective inputs originate from, or two of their respective outputs are required for, a single activity characterized by constant proportions of outputs or inputs.

The interdependencies i., ii., iii. are often absolutes. Interdependencies iv. and v. become a matter of degree if alternative sources of input or uses of output exist at moderate cost differentials. On the other hand, chains made up of pairs of activities whose interdependence is of type iv. or v. create secondary, tertiary, ... interdependencies of similar types that attenuate further as the number of links in the chain increases.

The coordination problems of production, transportation, distribution, consumption take their form in large part from the nature of the interdependencies between the activities involved. We believe that the literature

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29 See, for instance, G. J. Stigler, op. cit. (n. 10). By an indivisible factor of production we mean a factor that is not available for productive use in any quantity smaller than a positive smallest unit.
on activity analysis\(^{30}\) can contribute elements to a formalization of these coordination problems that provides a background against which the solutions offered by different systems can be compared. Sections 4.3 and 4.4 contain further observations toward such a marriage of activity analysis and organization theory.

4.3. Custody and Transfers of Custody

We conjecture that in most modern systems almost any resource,\(^{31}\) means of production, or good in process is at any time in the custody of some entity (operator, foreman, plant department, sales department, owner, manager, trader). In the case of a means of production or resource, the custodial entity controls its use in time and as between claimants. In the case of a material, good in process, or finished good, the custodial entity determines the next disposition of the good, such as leaving or placing it in inventory, continuing its processing, entering it into the next stage of processing, or making it available for consumption, in some of these cases while transferring its custody to another entity.

Transfers of custody tend to occur, for good and rather obvious efficiency reasons, in those stages of each good between processing stages, to be called transfer states, in which one or more of the following applies:

a. the good is capable of being handled (automobiles) and/or stored (steel billets) and/or delivered (electric power) without serious loss of quality,

b. the specifications describing the transfer state are standardized, and

c. the transferrer or the transferee or both can expect to have a choice between more than one transferee or transferrer, respectively, who may belong to different entities engaged in the same production activities, or who may differ in the processing activity that preceded transfer,\(^{32}\) or that is to take place after transfer (coal).

If a custodial entity is an organization, efficiency often requires that it be clear to all concerned to which member of the organization the custody


\(^{31}\) There is one important category of resources not subject to specific custody. This category consists of generally accessible resources, with regard to which the use, the extraction and possible degradation are not easily controlled: air, the ocean and its mineral and biological content, inland water, in earlier periods land, increasingly in modern periods streets and highways. We return below (Sec. 5.4.4.) to the adverse effects on efficiency that may be connected with such absence or insufficient effectiveness of custody arrangements.

\(^{32}\) For a description of an integrated steel plant simultaneously using steel obtained from different processes see T. Fabian, "Process Analysis of the U.S. Iron and Steel Industry," in Manne and Markowitz, op. cit., Ch. 9.
of which good is delegated, even if subject to reversal by a supervisor for the custodial activity in the case of a (quasi-) hierarchy. For goods not in continual use (television set in the family) delegation may extend to all members of an organization on a first-come-first-served basis, again subject to reversal.

In any system in which one or more of the above types of goods or resources are privately owned, custody normally goes with ownership or is delegated by the owner.\textsuperscript{33} For this and other reasons, forms of ownership of resources and of man-made means of production are usually regarded as a major system characteristic.

Transfers of custody or of delegated custody may take place between entities embedded in the same hierarchy or between entities not belonging to the same hierarchy for the activity or set of activities in question. Whether the transfer of a given type of good of similar specification in two systems falls in one or the other of these two cases will in general depend on the system. The relative frequency of transfers within, as against between, hierarchies is indeed an important system characteristic. However, we conjecture that there is a very substantial similarity and overlap between systems in the specifications, not only of finished goods and services, but also of the unfinished transfer states in the production of these commodities. We surmise further that the particular bundle of production activities taking place between two successive transfer states that two systems have in common depends less on system characteristics than on the scale of the economy or of the enterprise and, given a modicum of efficiency, on the environment. Among pertinent environmental factors, the relative scarcities of aggregate basic inputs, such as labor, resources, and capital, to the economy as a whole are particularly important.

We adduce three reasons for these conjectures. First, technology does not stop or change much in character at the boundaries between systems. Acceptability of technology is usually unrelated to the system of origin, and information on advanced technology circulates widely and is given constant attention. The second reason follows from the first. The economies inherent in the characteristics a., b., c. of transfer states listed above are rather apparent, and their perception is not much affected by system characteristics. Finally (the third reason), both scale and factor proportions are likely to enter into the bundle of production activities occurring between successive transfer states, scale because of the indivisibilities of human operators and pieces of equipment, factor proportions because even moderate efficiency demands reasonably full use of available factors.

Although the above reasoning has been given largely in terms of production of goods, similar reasoning applies, mutatis mutandis, to most

\textsuperscript{33} Further remarks on the relation of custody and ownership are given in section 5.
industrial services as well, if performance of a service is substituted for transfer of custody of a good. This includes transportation, in which case only transport-relevant characteristics of the goods shipped need be taken into account.

4.4. Interactivities

We now list categories of activities, the need for which arises from the interdependence of activities in list A (Sec. 4.1). All the actions of which these activities consist are part of interactions and it is therefore natural to speak of interactivities.

B. Categories of interactivities for the assignment and scheduling of technological activities

Assigning, directing, or coordinating tasks for technological activities requiring simultaneous or successive actions by two or more individuals

Arranging the transfer of custody of a specific batch, quantity, or item of a specific good to the next using, processing, or consuming entity, which has a demand for it

Arranging for the use of a given resource or fraction thereof by a specific producer or household, during a given time (Within the household) determining which quantity of which consumption good available to it is consumed by which member of the household at which time.

4.5. System-bound Activities and Actions

Although the activities of list B need to be performed under any system, their character depends on the organizational structure and operating procedures of the system more than do those in list A. However, in most systems the activities in list B are only a part of the organizational activities required by the system. One could, it is true, imagine a command system capable of perfect coordination, in which all the activities exemplified by lists A and B were implemented by commanded actions of individuals belonging to one large hierarchy. In that case, the commanded transfers of custody would themselves define the demands they meet and the supplies from which they are made. In all systems of record, many other activities intervene to determine these demands and supplies and to serve various other desiderata. The nature of these activities depends strongly on the system in which they occur. For that reason we are forced, in listing a few of these by way of examples, to use some terms which while perfectly familiar to the reader have not yet found a place in
the framework of concepts developed so far, because they anticipate essentially organizational concepts to be introduced in Section 5.

C. Examples of system-bound activities
Activities determining capabilities to acquire custody of additional means of production through credit from financial institutions that absorb savings by individuals and organizations or from governmental credit institutions that may obtain their funds from tax revenues.
Activities that spread risk by pooling
Protection of individuals from ill effects of adverse conditions of labor (for instance, as provided by labor unions in interaction with employers)
Education and training for managerial and other system-bound activities
The provision of health services.

Additional more specific system-bound activities of an organizational character are discussed in Section 5, largely in terms of the kinds of actions and interactions they consist of. There is a good reason for this shift in terminology. We have defined activities as kinds of repeatable action, and the term "activity" is most serviceable where the action in question is in fact repeated in a rather routine manner. Organizations, however, the most system-bound aspect of an economy, are primarily concerned with coping with change, with the new and unexpected. An organizational model for a stationary state, if at all conceivable, helps little in understanding the nature of organizational problems in any real-life system. For that reason, the expectation of repetition of an organizational action of precisely the same kind or form is generally much weaker, and the terminology of "actions" and "interactions" is more appropriate in an organizational context.

5. The Organizational Structure of Systems

5.1. Participants and Ruling Organizations
To be precise enough for both conceptual and statistical purposes, the description of each system entering a comparison should specify the set of its participants. For some purposes it may be useful to include in this set all the individuals located within certain geographical boundaries.

This applies particularly to economic organizations. Some other organizations, such as schools, churches, political organizations serve in addition to spread knowledge, faith or power, or to preserve any of these from attrition due to the predictable change arising from human aging and death.
during the period of comparison; another possible definition would include all individuals of a given nationality irrespective of their location; still another would include all individuals associated with organizations incorporated (or having their headquarters) in a certain nation or region. The definition of the set of participants in each system will determine the scope of the interactions that are considered to be “across systems,” to be discussed in Section 6. In comparisons involving nation-states with dual economies, one may wish to treat each “economy” as a separate subsystem and consider the interactions between the subsystems as one would consider the external economic relations of any economy considered to be sufficiently homogeneous to qualify as having a single system.

As we saw in Section 2.2, ruling organizations set bounds to the actions of individuals and organizations. They also facilitate certain interactions, such as transfers of custody in exchange for a compensation, by sanctioning one or more means of payment (legal tender) for discharging all debts and obligations, and by supervising weights and measures used in defining the quantity of certain goods.

In most nations today, the diverse organizations known in their aggregate as the government are the only ruling organizations empowered to issue rules at least nominally binding on all participants in the system. However, the power of these organizations to issue laws may be circumscribed by certain prior rules endowed with a higher status or by certain principles or values which may or may not be codified. Prior rules include compacts, constitutions, treaties, and collective agreements; principles and values include taboos, religious documents, ideological pronouncements and so forth that happen to be accepted as binding or restraining by the dominant group in the total system.

Within ruling organizations modern systems have developed specialized suborganizations for issuing laws, for inducing most participants to conform to these laws, for adjudicating disputes arising from conflicting interpretations of the laws, and for identifying entities that have violated laws and deciding on sanctions.

Whether or not all component organizations under a ruling organization are bound by the laws issued by competent organizations within this ruling organization may be a critical trait differentiating one total system from another. With regard to the economic system, a gain in efficiency is

35 In the United States, Federal, state and local governments, together with the agencies whose powers emanate from them, are the only legally sanctioned ruling units. In the Soviet Union the Party is in practice a ruling unit alongside, and in some respects above, the government. In early modern times, the Catholic Church in Europe was a ruling unit emitting both rules (e.g., prohibition on interest-taking) and general orders (the tithe). Illegal ruling units include racketeering organizations such as the Mafia. In the process of modernization in West, the state gradually suppressed all competing legitimate ruling units.
likely to accrue from the settlement of disputes arising from conflicts of interests according to a regular, well-defined procedure, with the final adjudication conforming to certain durable principles, precedents, or both: Such a procedure will help define the limits within which decision makers may operate without fear of restraint or retribution and will foster expectations of regular behavior on the part of other participants in the system and thus reduce the risks of decision-making.

5.2. Actions and Interactions

To distinguish **informational** from **effective actions**, we require the concept of **message**: information conveyed by one or more participants to one or more other participants. An informational action changes only the environment of some other participants except for interactions associated with the process of communication itself. We call all other actions effective.

Informational actions comprise: 1. offers and acceptances, including, in particular, those concerning the transfer of custody of goods in transfer states, with or without payment in return; 2. rules and orders and responses thereto; 3. **communications**, messages containing information about activities, processes and preferences; 4. threats, appeals, and other messages aiming to exert influence.

Among the principal types of effective actions may be cited the actual transfer of custody of goods and the performance of services, financial transactions, the hiring or conscription of individuals for specific activities, strikes, sabotage, and production actions resulting in pollution (insofar as it affects other entities). An effective action may also carry a message. A gift may be bestowed or a service performed with the aim of creating an obligation on the part of the recipient to reciprocate the favor at some future time. Initiatives of this type are important in promoting commodity exchanges in pre-modern societies and in wielding influence in many modern ones. Similarly the information conveyed to invidious neighbors by the conspicuous display of clothing, furnishings, or cars may prompt them to purchase similar goods for the sake of keeping up.

In general, effective actions, once they have been registered in the information set of the participants they affect, have either a direct or an indirect impact on their utility function. Informational actions, in contrast, affect a participant's welfare only insofar as they influence his expectations of subsequent effective actions.

Effective actions may further be classified according to the presence or absence of mutuality in the interaction of which they are a part. **Complete mutuality** prevails in actions that require the consent of all parties affected (e.g., a sale prepared by an exchange of messages or by a jointly issued message known as a contract). **Partial mutuality** prevails in an interaction
when an individual undertaking an effective action incurs some, possibly temporary, disutility in order (a) to forestall an action by one or more participants which would inflict on him an even greater loss in utility, or (b) to accumulate credits for future benefits, or in recognition of the legitimacy of certain claims. In all such cases, the interacting participants are involved in an ongoing relation, which they consider to be acceptable if not actually desirable (e.g., employees interacting with their employers, taxpayers with government officials). In all remaining instances of interactions, there is no mutuality among the interacting participants.

The same initiating action may belong simultaneously to one interaction, characterized by complete mutuality for some participants, and to another interaction characterized by partial or no mutuality for others. Thus the owners of a landsite near a highway, an advertising agency, and an outdoor display company may all agree to put up a billboard, whose sight may offend motorists traveling along that highway.

A two-way classification of interactions may be made according to the type of actions that initiated them and according to the degree of mutuality that characterized them. A number of instances of interactions are classified according to this principle in Table 1.

The exchange of messages may enable two or more participants to discover the mutually advantageous effective actions they might undertake without exposing them to the risk of the losses that a series of inferior effective actions might give rise to. Bargaining to reach a mutually acceptable price or a wage settlement is an example of such exploratory behavior in a market system. Planning procedures also usually call for exploratory interactions between members of the organization issuing the plan. These preliminary explorations may involve contacts between members of different organizations, especially where the planning organization, as in France, for instance, is only empowered to issue an indicative plan (one which is not even nominally binding on the organizations concerned). Where the plan consists of a set of orders, as in the Soviet Union, the entities to which the plan is addressed normally belong to the same complete hierarchy as the ruling organization issuing the plan.

Evidence about the degree of mutuality characterizing an interaction cannot be used mechanically to infer the presence or absence of Pareto optimality. Although the sale of a good to a customer by a monopolist for example, may be accomplished with the freely given consent of both buyer and seller, the transaction does not lead to Pareto optimality for

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36 These remarks were inspired by Dr. Pavel Pelikán’s comments on an earlier draft of this paper.
37 See below, Section 5.4.3.
38 For a definition of Pareto optimality, see section 3.2.
Table 1
Mutuality Basis of Some Interactions Touched Off
By Various Initiating Actions

<table>
<thead>
<tr>
<th>Initiating action(s)</th>
<th>Degree of mutuality characterizing interaction</th>
<th>Partial mutuality based on legitimacy of claim or punitive sanction</th>
<th>No mutuality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer</td>
<td>Sale of a good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule or order calling for effective action</td>
<td>Payment of check by bank</td>
<td>Subordinate’s compliance with an order in a hierarchy</td>
<td>Conscription of individual for military service</td>
</tr>
<tr>
<td>Communication</td>
<td>Sale of a patent</td>
<td>Repurchase of good by seller upon disclosure of misrepresentation</td>
<td>Unauthorized adoption of a process described in patent</td>
</tr>
<tr>
<td>Threat or other message aimed at exerting influence</td>
<td>—</td>
<td>Wage settlement on threat of strike</td>
<td>Performing forced labor for another individual on threat of life</td>
</tr>
<tr>
<td>Implicit message conveyed via effective action</td>
<td>—</td>
<td>Giving of present or favor in expectation or reciprocity</td>
<td>Sabotage, purchase and use of drumset in retaliation against neighbors’ piano playing</td>
</tr>
<tr>
<td>Unilateral action unheralded by message</td>
<td>—</td>
<td>Traveling in a crowded subway</td>
<td>River pollution, theft</td>
</tr>
</tbody>
</table>

both participants, because there is some income transfer from buyer to seller, accompanied by a reduction in price and an adjustment in the monopolist’s output and supply which would make both better off. An action taken by one or more participants without the explicit consent of the other participants affected is likely to produce a situation deviating from Pareto optimality, whether or not the affected participants are made better or worse off by this action. “Transaction costs” and
institutional obstacles may prevent the realization of the potential gains from mutually beneficial exchanges starting from such a nonoptimal situation.\textsuperscript{39}

The relative importance of the differing degrees of mutuality and conflict underlying effective actions varies widely from system to system with putative, but not always ascertainable, consequences for the relative efficiency and equity of the systems compared. We have only one remark to make on this score: The effective actions based on orders involving partial or no mutuality as well as those based on complete mutuality all entail costs. No mutuality inflicts losses in efficiency due to the lower productivity of services rendered under compulsion (such as slave labor). In general, incomplete mutuality entails costs due to the necessity of assigning scarce labor to data-collecting, inspection, and control to ensure a close correspondence between orders and complying actions (and the morale effects of such control). In the case of complete mutuality, costs are incurred in making personal contacts, in information exchange and negotiations, in the persuasion necessary to achieve mutuality, in the verification of performance, and in actions to challenge nonperformance.

It may be noted that most effective actions based on mutual agreement involve participations in joint actions that are pairs, triples, or \( n \)-tuples of simultaneous and complementary single actions. Examples include transfers of custody within or between hierarchies, with or without simultaneous payment, and all loans and contracts for future delivery or performance. Certain rules issued by ruling organizations are designed to induce contracting parties to adhere to these agreements, even in the face of most random events but not of certain improbable events which, when they do occur, tend to be highly correlated and are therefore uninsurable. (These events are known in West as “acts of God.”)

In modern systems, either transfer prices or exchange prices are an integral part of virtually all contracts. The exchange price offer for a good or service may be defined as an option for transferring to a different entity custody, other property rights, or both of one unit of a good or service against payment of a certain number of units of legal tender at a certain time. A transfer price differs from an exchange price only insofar as the option refers to a transfer between component entities of the same hierarchy or quasi-hierarchy rather than between separate entities, and in that actual payment may not be called for (e.g., bookkeeping transactions).

A message containing a price offer expressed in monetary units for a particular good will not generally call forth an acceptance by another

entity, unless the characteristics of the good have become part of the potential buyer's information set either through direct inspection or because its standardization has led him to expect predictable characteristics. The standardization of commodities effectively widens the intersection (the common subset) of the information sets of potential sellers and buyers and makes it possible for effective interaction to take place with significantly less prior transfer of information. Standardization thus economizes on information costs and facilitates the transfer of goods, irrespective of other rules and patterns of interaction prevailing in a modern system.

5.3. Motivation

In the preceding section we briefly discussed the impact of messages on decision makers in terms of the mutuality that may or may not be required for the interaction to result in an effective action. Consent is, of course, a necessary but not a sufficient condition to be met if the message is to trigger an effective response, especially one consistent with the intent of the sender. Even though, for instance, the legitimacy of a tax law may be recognized, the actual payment may fall short of and be significantly inferior to the amount actually due because of concealment of sources of income. A ministerial order to an enterprise in a centrally coordinated economy may not be carried out, in spite of possible sanctions. Likewise, a contract between two firms in a market economy may not be respected if its fulfillment eventually runs contrary to the essential interests of at least one of the parties. The precise response of a decision maker to an informational action will be conditioned by his motivation, which we have already defined as a function associating with each course of action the utility of the outcome of the probability mixture of expected outcomes.

Each individual in an organization may be presumed to apply his own utility function to the outcome of his actions, but in a hierarchy or quasi-hierarchy the preferences of superiors will tend to constrain the options left to subordinates. Constraints are more likely to be imposed whenever the preferences of superiors and subordinates diverge seriously and the fuller delegation of authority might lead to undesirable outcomes from the

40 In the case of nonstandardized goods, price catalogues containing detailed information are normally circulated by potential suppliers. This routine, which presupposes experience leading to stable expectations on the part of potential buyers with respect to the accuracy of the information contained in these complex messages, also economizes on the costs of inspection and contact.

41 Note, however, that under the hypothesis of perfect competition in a market economy, the entity quoting the price is assumed to be agreeable to any response or lack of response. Hence "intent" may not be strictly relevant in this limiting case.
superiors' point of view. The ability of superiors to impose on an organization such preferences as they hold in common will depend in part on the information they are able to collect about the outcomes of subordinates' decisions, as well as on the effectiveness of the sanctions they may administer to subordinates for deviant behavior. Because of the costs of obtaining complete compliance with orders mentioned in Section 5.2, we are led to suspect that a unique goal function cannot be invoked, let alone constructed, which would satisfactorily account for all the decisions made in an organization. Furthermore, in large complex organizations whose component organizations are engaged in different sets of activities, these divergent sets of preferences are likely to be important enough to engender conflicts between components or members or both. Where the size and complexity of organizations are themselves system coordinates, the presence or absence of these conflicts may be of considerable interest to the comparor.

Nevertheless, we shall occasionally refer to the putative goal function of an organization as if the managers were able to effect decisions on the part of their entire personnel consistent with a utility function acceptable to themselves.

To discuss one broad basis of motivation in organizations we shall need the term *profits*. This term applies when the inputs to an entity's activities are transferred from, and the outputs transferred to, the custody of other entities (for the set of activities under consideration.) The profits of an entity per period are then reckoned as the algebraic sum of the (negative) value of inputs and the (positive) value of outputs, both valued at transfer or exchange prices, whichever apply.

On the basis of rather casual observation or indirect reasoning, economic theorists in West have posited that decision makers—especially managers of “enterprises”—acted in such a way as to maximize the value of some outcome function, such as profits in market economies and the income from bonuses for fulfillment and overfulfillment of plan targets in the centrally coordinated economies.

Other economists have criticized these simple explanations of managerial behavior by pointing to the importance of other motives, which often conflict with profit maximization: Managers may wish to limit the time and effort they put into the job; they may prefer steady growth to higher profits; they may maximize their discounted expected utility accruing over time, a maximand that will not coincide with discounted profits if their utility-of-income function is strictly concave; they may choose outcomes that will be satisfactory without being optimal in any sense (as in the “satisficing behavior” described by Herbert Simon43); in a large hierarchy they may

43 See Simon, *Models of Man*, Ch. 14 and 15, and the introduction to Part IV.
balance their immediate earnings against enhanced chances of advancement in the hierarchy, lowered chances of dismissal or punishment, or both.

To cite only one example, the offer of a license for a new technology is likely to be received differently depending on whether the recipient manager maximizes short-run profits, the enterprise's equity (if the system allows for a capital market), the growth rate of his enterprise, or its share of the market for his products over the next three years.

The rules governing the use and disposition of an economy's means of production—objects of a certain durability, capable of being used in a productive activity—usually place constraints on managers' actions and influence the objectives they pursue. Whether a manager of an enterprise maximizes short-run profits or the discounted sum of future profits may depend, for instance, on whether he owns part of the enterprise's means of production (on his "equity" in the enterprise) or at least on whether his income hinges in some way on their efficient utilization or disposition. Ownership refers to legally sanctioned rights of utilization and disposition by individuals or organizations over resources, goods in process, means of production or consumption goods, or over claims to shares in these rights. These rights may be exclusive, or hemmed in by legal or conventional restrictions, such as laws of entail forbidding the parcelling out of estates or their sale to unauthorized entities; or they may be abrogated under certain conditions in favor of the public at large or of ruling organizations (eminent domain, "fair housing" laws, collection of works of art "owned" by foundations that must make provision for the admission of the public).

Ownership normally implies custody, which may be delegated or separated in the case of organizations or individuals whose legal rights have been curtailed (e.g., due to the mental incapacity of an individual or to an enterprise's condition of receivership). In West the delegation of custody by the stockholders of a corporation to its managers may at times turn out to be irreversible, especially if the latter also own stock in it. In any case, ownership of means of production includes the right of the owner or his custodian to buy and sell them and to draw benefits from their productive use, an aspect with important consequences for equity which we shall not dwell on here.

The efficiency of resource allocation in any system must depend to a crucial extent on both the content of messages (e.g., in a market economy on whether prices reflect relative scarcities, or in a centrally coordinated economy on whether orders correspond to efficient input allotments and output targets) and on the responses of the makers of economic decisions to these messages (maximizing behavior in a market economy, compliance with orders implementing the principal production and allocation decisions
in a centralized economy). In a competitive market economy, in particular, efficiency cannot be attained unless all resources and means of production are in the custody of some participant and are managed by these participants in such a way as to maximize the discounted stream of their future rents, corresponding to nondiscriminating rentals based on efficiency prices.43 Access to resources held in common and not subject to such custody and management—pastures, forests, and even arable land in certain developing economies, crowded highways and city streets in developed economies, fishing grounds especially in international waters—is often not sufficiently restricted for their efficient utilization under a market system without the intervention of ruling organizations. Under unrestricted conditions, pastures tend to be overgrazed, timber overcut, land overworked, roads excessively congested, and species of fish threatened with extinction. In the absence of custodial entities restricting access to these resources or man-made facilities, directly or by an efficient rental charge, potential users are guided by the average costs they must bear—e.g., the average congestion delay on a road—which does not take into account the total additional costs imposed on other users by their decision to share in its common utilization.

5.4. Patterns of Interaction

5.4.1. Organizational graphs. In Section 2.3 we have defined an organization for a set of activities as a set of persons regularly interacting with each other in the process of carrying on one or more activities of that set. The theory of linear graphs offers a convenient device for representing the organizational structure of a system. Each participant is represented by a point (a vertex), each interaction by an arc connecting the vertices of the two interacting participants. For each category of interactions of interest, the corresponding graph contains the vertices of all participants engaged in such an interaction and all arcs representing instances of it. The category may be chosen to be strictly functional, such as making offers, accepting offers, supervising; or strictly substantive, such as interacting in truck gardening; or a combination of both, such as trading in vegetables. Figure I illustrates the device.

A graph is called connected if every pair of vertices in it can be connected by a chain (as defined in Section 2.3) that runs inside the graph. If the graph of all interactions in the system in a category of interest (such as the internal operations of truck gardening anywhere in the system) is not connected, each of its components (maximal connected subgraphs)

43 For further discussion of the role of pricing in attaining efficient allocation see T. C. Koopmans, Three Essays on the State of Economic Science, New York, 1957, Essay I.
Figure 1: Graph for a quasi-hierarchic truck gardening enterprise in open ended association with several markets. Arrows indicate supervision, absence of arrows mutuality.
represents a separate organization (a truck gardening enterprise) by the
definition given in Section 2.3. If the category of interactions is enlarged
(by the inclusion of trading in vegetables, say), a graph previously not
connected may become connected.

By a sufficiently inclusive choice of the category of interactions, the
entire set of participants in any modern system can be regarded as belonging
to one and the same organization as defined. For, every participant is
either a member of one of the following groups of interacting persons or
belongs to a household that contains a member of one of these groups:
1. employees; 2. members of cooperatives; 3. self-employed or un-
employed persons interacting through market relations; 4. institutionalized
persons; 5. persons receiving pensions, gifts, or charities. Moreover, it
may safely be assumed that there does not exist any subset of persons in
the system no member of which interacts in some way with one or more
members not in that subset. Thus we can represent and study every
modern system through a connected graph generated as the union of the
graphs corresponding to a given classification of all pertinent types of
interaction.

Some interactions, such as supervision, are asymmetric. In Figure 1,
this is represented by adding an arrow pointing from supervisor to
supervisee to each such arc. A graph in which all arcs are given a direction
is called a directed graph (briefly, a digraph). In particular, all hierarchies
can be represented by digraphs.

The digraph notion may also be used to define an organization some-
what more broadly than we did in Section 2.3. Suppose that, in the pursuit
of activities of a set \( A \), person \( i \) either interacts with \( j \) or regularly sends
messages to \( j \) without getting messages from him in return. We shall
describe this relation by writing that \( i \) addresses \( j \). We now draw a digraph
showing a directed arc for each “ordered” pair of persons in which the
first person in the pair addresses the second in the conduct of a given set of
independent activities. If both address each other (“interact”), two arcs of
opposite directions join their vertices. (This may, for instance, occur in a
hierarchy if a member imparts information to his supervisor or to a higher
superordinate, at the latter’s request.) Call a directed chain a sequence \( i, k, l, \ldots, p, q \) of members (vertices) such that \( (i, k), (k, l), \ldots, (p, q) \)
indicate directed arcs of the graph. An organization for a set \( A \) of
activities is then represented by a graph such that each pair of vertices, say
\( (i, q) \), is connected by a directed chain. (This implies that another chain for
the pair \( (q, i) \) must also occur in the graph.)

For the study of the internal structure of organizations, especially
hierarchies, engaged in several activities a slightly different interpretation
of the organizational graph may be preferable, and will be used in Section
5.4.3. In this interpretation a vertex represents not a person, but the
pairing of a person with an activity, which we shall call an *assignment*. This device allows the same person to have different supervisors for different activities.

### 5.4.2. Organizational change

If we choose a period of time short enough to be able to disregard change in the number of participants in the system, we may represent the creation or dissolution of an organization merely as a change in the graph for the entire system. A complete system description, however, may have to keep a record of the organizations to which the members of a new organization formerly belonged, because they will contribute to the new organization information that would otherwise be unavailable to its members. For example, the reorganization of Soviet industry in 1957 involved the creation of new assignments and supervision relations and thereby brought into existence a new set of organizations comprising virtually the same set of participants as belonged to the old system. The chains of supervision that used to follow industrial lines (sets of industrial activities) now followed regional lines, at least for directors of enterprises and their superiors in the complete hierarchy for the Soviet economy. The members of the new organizations contributed their experience of previous activities and interactions in another organizational structure. These antecedents may have helped to smooth the transition to the new system.\(^{45}\)

Every description of an organizational change in a system may thus be said to involve two sets of coordinates, one set belonging to the system before the change and one to the new state. The first set describes the procedures for modifying the system and identifies the persons belonging to one or more organizations of the old system who have the power to initiate or to carry out such changes or both. The second set describes the interactions between members of the new organizations and between them and persons still belonging to those old organizations from which they were recruited. Significant differences between systems may be detected in data pertinent to these coordinates. In particular, if the head of a new hierarchy remains subordinate to a member of one of the parent hierarchies, we may speak of the *centralized* creation of new organizations, a system trait with implications for attaining pertinent desiderata.

The creation of new and the dissolution of old organizations is also a crucial factor in the intertemporal efficiency of an economy in any system. New organizations usually are not confined to the activities of the organizations from which their personnel has been recruited. They are a vehicle for introducing new technologies and patterns of organization as

\(^{44}\) The term allows an activity to be self-assigned.

\(^{45}\) This interesting observation was made by Professor Arthur Wright in an informal talk at the Economic Growth Center of Yale University.
well as new modes of interaction with other entities. The dissolution of old organizations often does away with inefficient routines that cannot be eliminated without restructuring existing patterns of interaction. In East, ruling organizations have the exclusive responsibility for creating and winding up "enterprises on cost accounting," that is, economic organizations calculating their costs, receipts, profits and losses, and paying a part of their profits to, or receiving subsidies from, superior entities in the hierarchy. In part because rates of industrial growth are high in this group of countries and new supervisory personnel is systematically trained in educational institutions, the creation of such new enterprises can usually be effected without dissolving old ones, and rarely encounters effective opposition from vested interests. In West (as well perhaps as in Yugoslavia) new enterprises frequently represent a serious threat to existing ones, especially if they compete for the same markets. To forestall such threats, existing enterprises may, and often do, resort to various devices to prevent newcomers from intruding on their territory, often with adverse effects on equity and on consumers' sovereignty. Access to the industry (the set of activities in which existing firms are engaged) may be restricted by the rules and orders of ruling organizations, or by barring potential newcomers either from their markets or from the resources required for their operations with the cooperation of banks, labor unions, railroads, and other organizations enjoying a protected status in their own industry. Attempts to engross trade to protect interests vested in existing organizations are not confined to privately owned enterprises. We conjecture that they will occur whenever 1) the interests of the managers of enterprises, whether publicly or privately owned, are bound up with the financial results of their enterprise's activities, 2) means to restrict unwanted entry exist, and 3) the heads of the threatened organizations do not perceive competition as being in the interest of the larger hierarchy of which they are a part. In Great Britain, for example, nationalized enterprises fend off competition from other nationalized enterprises, especially within the fuels and transportation sectors. Apparently no ruling organization is sufficiently mindful of the interests of the consumers of the products of these nationalized industries to defend them against the successful efforts of these industries to protect their markets.

5.4.3. Hierarchies and quasi-hierarchies. From here on we shall limit ourselves to a consideration of existing organizations, and resume our

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48 Where growth ceases or slackens, as happened in Czechoslovakia in the 1960s, the restructuring of organizations to promote efficiency presents acute problems, especially where it entails the dissolution of organizations in the less developed parts of the country.
discussion of hierarchies\textsuperscript{47} and quasi-hierarchies. We now take the view
that the supervision relation applies to assignments rather than to
members. We stipulate in addition that supervision of a member in an
activity implies that the supervisor is also (at least nominally) engaged in
that activity.

To ensure the comparability of hierarchies embedded in dissimilar
systems, the supervision relation should be broadly interpreted. An
order issued by a supervisor may consist in the delegation of responsibility
for certain tasks to a member of the organization or to a committee; a
supervisor may also settle conflicts by arbitration, parcel out scarce
resources, and so forth. Consultation of experts and mediation of conflicts,
however, would not be covered by the supervision relation, because the
advice or decisions of consultants and mediators usually have suasive
rather than coercive power. In almost all hierarchies, subordinates may,
under certain conditions, appeal to members of the organization standing
above their supervisor for the activities connected with an order if they
consider this order illegal (according to the rules of the organization or of
the ruling organization to which it is subject) or if they deem the order
extremely deleterious to their interests or to those of the part of the
organization for which they hold or share responsibility. Subordinates may
also kick upstairs problems that they are unable or unwilling to solve on
their own. Although the simple conceptual scheme in Sections 2.3, 5.3,
and 5.5 does not make explicit allowance for the right of appeal or for
the referral of troublesome questions to higher ups for final decisions, it
is flexible enough to encompass these variants of the supervision re-
lation.

It follows from statements in Section 2.3 that the organization graph
for the supervisory relation in a hierarchy for a single activity is what is
called in graph theory a \textit{tree}. The tree starts with the head of the hierarchy
and, in the usual reproduction of an organization table, grows downward,
ramifying at every vertex representing a participant supervising more than
one other participant in the activity in question. A hierarchy in which all
assignments involve one and the same activity is called a \textit{hierarchy for a
single activity}. It is called \textit{complete} if 1) every branch of the tree has been
traced down to the last participant supervised in the activity in question,
and 2) if the head has no supervisor in the activity.

A \textit{hierarchy for a set of activities} is a set of assignments and a super-
vision relation on that set, which can be thought of as obtained by joining
(forming the \textit{union of}) two or more hierarchies for a single activity, all of

\textsuperscript{47} For a wide-ranging discussion of hierarchical structures in nature and in
society, see H. A. Simon, "The Architecture of Complexity," \textit{Proceedings of the
which have the same person at the head. This head is then simultaneously engaged as ultimate supervisor in all the activities in which the hierarchy engages. Such a hierarchy is called a complete hierarchy if i) every component hierarchy is itself complete and ii) the hierarchy cannot be enlarged by admitting further hierarchies for additional activities. Under certain restrictions it can be shown\(^{48}\) that, as a logical implication of these definitions, every assignment in the system belongs to precisely one complete hierarchy. (In the case of a self-employed person, this could be a one-man hierarchy.)

Examples for a market economy: The personnel of the blast furnace department in an integrated steel plant make up a hierarchy for activity \(a\) where \(a\) is the making of pig iron. The entire steel plant under one owner-head is a hierarchy for \(A\), the set of all activities involved in the making of steel. The plant will be a complete hierarchy for \(A\) if the head of the steel plant is superior to every employee in the plant, irrespective of that employee’s assignment in \(A\) (such as, for instance, the head of its medical service, whose assignment is an ancillary activity in \(A\)). However, should ownership rest with a body of stockholders supervising the head through a board of directors, then these two collective participants would need to be added before the hierarchy can be called complete for \(A\). Finally, should the same body of stockholders also own and effectively supervise one other manufacturing enterprise, then this enterprise would have to be added in before the hierarchy can be called complete.

In a Soviet-type economy, the set of all persons either in the government supervising economic activities or in socialized economic sectors, together with the Communist Party hierarchy, including the Politbureau of the Central Committee, may be said to form a complete hierarchy. Under the above definitions, however, the use of this term is based on the presumption that no person engaged in a given activity is directly supervised in the exercise of that activity by both a Party member and by a different member of the government hierarchy. In other words, one-man leadership (edinonachalie) is assumed to prevail: Party channels are used to convey orders pertinent to Party activities (including control of the direction of economic activities exercised by members of the government hierarchy) and government channels to convey orders pertinent to the activities of the government hierarchy. To the extent that this principle is regularly violated, we should be dealing with one or more quasi-hierarchies. Yet we suggest that the fit may be close enough to warrant a discussion of the Soviet economy in terms of a complete hierarchy and its component hierarchies.

Before the principle of one-man leadership was established and enforced in the Soviet system in the early 1930's, there were parallel lines of command, and many members of the quasi-hierarchy were subject to the orders of several immediate superiors—typically in the government, the Communist Party, and the trade unions—in the exercise of the same function. The elimination of at least some of the overlapping or criss-crossing lines of command, particularly at lower levels, presumably made for greater efficiency in this case. Where objectives and priority among them are clearly defined for all decision makers, and where actions must be taken rapidly in response to orders, we suspect that quasi-hierarchies are less efficient than hierarchies. In other situations, including research and development activities, the case for a unique line of command is much less evident.

5.4.4. Two conjectures. We now define key attributes of hierarchies to be used in the conjectures. The length of any chain between two members \(i\) and \(j\) of the hierarchy is the number of members in the chain, including \(i\) and \(j\). The height of the hierarchy is defined as the length of the longest chain extending from the head of the hierarchy to a member who is not superior to any other member in the hierarchy in any of its activities. A tier is the set of all persons related to the head of the hierarchy by chains of the same length (the head being the first tier).

The information drawn by superiors in a hierarchy from the information sets of subordinates, from their own environment, or from both depends on the activities that have been assigned to them (control, resolution of disputes within the hierarchy, coordination of interdependent activities, and so forth). To be carried out efficiently, the coordination by a superior of a sequence of interdependent activities requires detailed knowledge of each of the procurement, production, transportation, and transfer activities in the sequence as well as of the possibilities of substituting other activities for some of these wherever this may be efficient. To acquire this detailed knowledge himself, a superior might have to extract from his subordinates virtually their entire information sets. There are, however, limits to this information-collecting process: Information is expensive to collect; the capacity of superiors to process, store, and retrieve information is limited; and information that is not immediately communicated becomes obsolete as the participants' environment changes. With improvements in the technology and equipment for information-handling, these constraints have become less stringent. Nevertheless, whether information has been obtained from samples or aggregated from exhaustive reports, in transferring it from each tier to the next, losses and distortions in content and delays have remained unavoidable.

\[49\] See G. Bierstock, S. Schwartz and A. Yugow, Management in Russian Industry and Agriculture, Oxford (1944) 13 and 35.
A superior in a higher tier desiring to avoid such losses of information may send inspectors to the field (e.g., to the lowest tier) or try to see for himself. As we already pointed out in Section 5.3, however, inspection whether carried out by the highly placed member himself or by other members of his hierarchy is expensive in terms of alternative uses of the personnel involved.

The interdependence between activities may hinge on the circumstances of a given moment, so that a particular assignment may be efficient for certain environments but not for others. In the face of this complexity, superordinates may not perceive the best opportunities for scheduling activities in a concrete situation. Thus the efficiency of assignment of activities, as well as their coordination, depends on the information available in the coordinating tier.

Let us now make the extreme assumption, which will later be relaxed, that no two members of a given hierarchy not in the same chain of supervision and responsible for different but interdependent activities can engage in informational interaction with each other. Coordination is thus effected exclusively through common superiors in the hierarchy. Suppose further that we take as given the quality of supervising personnel, the amount and accuracy of the information required by superiors to make effective coordination decisions, and all other variables affecting the efficiency of such decisions.

One would then seek to assign activities in a hierarchy in such a way that the most highly interdependent activities would be assigned to members with a common supervisor. When this assignment exceeded a supervisor's efficient span of control, it would become necessary to assign some still strongly interdependent activities to members whose nearest common superior was two (or more) tiers up the chain of command. Our presumption is that the number and degrees of interdependences of activities in a modern economy are such, relative to the efficient span of control of supervisors, that even the best feasible assignment of activities from the point of view of efficient coordination through superiors would still leave pairs of activities of substantial interdependence to be coordinated by a nearest common superior many tiers up the chain. (Example: weaving fabrics for the upholstery of automobiles and making automobile bodies.)

Consider two hierarchies $H$ and $H'$, say, two plants initially engaged in disjoint sets of activities $A$ and $A'$ that have substantial interdependence between activities $a, a'$ of the two sets, respectively. We conjecture that the

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59 The high-tier member normally is fully occupied with the information flowing to him through channels; attempts by that member to bypass them in seeking more precise or up-to-date information will usually entail delays in attending to current affairs.
longer the chains (for the interdependent activities) between the two heads of \( H \) and \( H' \) and their nearest common superior, the more likely it is that each of the two plants will initiate activities already belonging to the set of the other. Each will do so, we reason, because it will wish to ensure better coordination with its own activities of some of the activities initially carried on in the other plant. Furthermore, its incentive for this expansion will be the stronger, the more ineffective the coordination by the common superior in the initial situation. This ineffectiveness, we presume, will be the more serious the longer the chains separating the common superior from the heads of the two plants. How many common activities both plants will ultimately undertake will depend on variables other than the economies of information, such as the availability of equipment and other factors affecting costs of production (to the extent that costs matter).

Suppose that in the initial situation the two plants had been permitted and encouraged to interact directly, that is, to exchange information and to coordinate their own activities within certain limits set by their superiors. The incentive for organizational autarky—the phenomenon we have just described—would have been weaker. We conjecture that if complete mutuality were permitted, including the exchanges of goods or services at mutually acceptable prices, specialization between any two hierarchies in the system would be carried further than under a more restrictive arrangement.

We suspect that the phenomenon of autarky among hierarchies that may or may not belong to the same complete hierarchy occurs both in centrally coordinated and in market economies. We suggest that it might be instructive to study whether or not weaknesses in the coordinating functions of markets in these economies show up in the inefficient pursuit of an excessively wide range of activities in existing enterprises.\(^\text{a1}\) Or, to put the same point in a different way, we wonder whether the existence of small, highly specialized enterprises in certain developed market economies is not rendered possible by the presence of smoothly functioning markets for the inputs and the products of these enterprises' activities. In the case of the centrally coordinated economies of the Soviet Union and of Eastern Europe, evidence has frequently been cited of enterprises engaging in a very wide gamut of ancillary activities—such as maintaining inventories, facilities for producing crucial inputs, personnel engaged in procuring

\(^{a1}\) For example, it has been observed that the privately owned and operated railroads in the United States sometimes found it to mutual advantage to do classification work (assembling or reassembling cars into trains) for each other. However, if the need of railroad A for such work by railroad B lacked a reverse need, no trade took place because the practices of the industry did not include making money payments for such services.
inputs, repair facilities for machinery—the apparent or sometimes explicit aim being that of protecting themselves from the vagaries of an undependable centrally supervised distribution system. A verifiable implication of our conjecture is that plants belonging to different ministries would be more likely to take over each other’s activities than those belonging to the same ministry, because their lowest common superior would be further up the hierarchy and there would presumably be less direct interaction between them.

We now set forth a related conjecture involving the conflicting interests of two hierarchies engaged in production activities which possess heads who are in the same tier of their complete hierarchy. We assume that both hierarchies have custody of their means of production and that the remuneration of at least some members with decision-making power in either organization depends on the outcomes of the activities of their respective organizations (such as volume of output, costs, sales proceeds, profits, and so forth).

Suppose now that some members of one of the two hierarchies, in the pursuit of its objectives and without prior agreement with the other, undertake an activity that adversely affects outcomes of the other. Suppose also that the decision makers in the adversely affected hierarchy cannot or may not obtain, through mutual agreement, compensation for the action that is fully equivalent in their preferences to its adverse effect. The action has thus given rise to an “external diseconomy.”

If the heads of the two hierarchies involved on both sides of this action are supervised by the same member of a complete hierarchy, the conflict of interests will normally come to his attention. The common superior may or may not order that compensation be made, possibly depending on the effect of such action on the interests of the component hierarchy which he heads (strictly speaking, depending on the superior’s interpretation of these interests). He will also have to decide whether a repetition of the action should or should not be prevented by a restraining order. If, however, this nearest common superior is several tiers up, the matter will be more difficult to resolve to the satisfaction of either organization, because the common superior will have less accurate information about the interests affected than a supervisor. We conjecture, therefore, that the likelihood of an efficient resolution of conflicts of this type will be the smaller, the longer the chain separating the parties in the dispute from their nearest common superior.

The conjectures on the efficient coordination of interdependent activities and on the efficient resolution of conflicts involving external diseconomies are clearly two facets of the same general problem of optimizing the interaction between two entities in a complete hierarchy when a mutually satisfactory cooperation is precluded by the rules and orders of superiors,
by high transaction costs, or because the interests of the parties cannot be reconciled without such rules and orders (e.g., through mutuality).  

Indeed in a market system an entity inflicting damage on another will generally not feel compelled to compensate the latter for its losses or even to abstain from inflicting further damage. However, ruling organizations, through the issuance of rules restraining the behavior of private organizations, through nationalization orders followed by such restraints, or through the compulsory merger of the conflicting entities, may be in a position to salvage some measure of efficiency in these situations. However, the serious pollution of the air over such cities as Chicago, Los Angeles, and Budapest suggests that those problems cannot easily be solved either in market or in centrally coordinated systems.

6. Interaction Between Systems

Since the boundaries between systems more or less coincide with boundaries between nations, interactions between nonruling entities in different systems cannot be discussed without at the same time considering interactions between governments pursuing political as well as economic objectives. One may take the view that the determination of the fraction of output allocated to military preparedness and other policy decisions that may affect the risk or the probable outcome of armed conflict are exogenous to economic systems but have to be taken into account as important environmental factors in studying both the operation and interaction of systems. One may alternatively regard both the political and economic interactions between systems as interdependent parts of a larger complex and consider the chain of causation from the economic and political traits of these systems, through their political and economic policies and interactions, to their presumed effects on pertinent desiderata such as the level of consumption, the risks of limited or large-scale loss of life, goods and resources, and the risk of impairment of national independence.

Whichever view one takes, the economic interactions between ruling

52 It was argued in Section 5.2 that "externalities" create situations where mutually advantageous transactions are possible provided that all parties affected may freely interact and transaction costs are low. Restrictions on interaction may have complicated the Lake Baikal dispute in the Soviet Union between paper mills polluting the water and the fisheries. There are also frequent cases where negotiations cannot take place because the perpetrator cannot readily communicate with the entities he adversely affects. How can people who would like to swim in a river, if it were not polluted, be compensated?

or nonruling entities belonging to two or more economies with similar or
different systems reflect system traits, or rather traits of constellations of
systems, which are of great interest in the present context.

Over the last century, the economic interactions between entities belong-
ing to different nation-states have become ever closer and more intensive.
These interactions may be classified into three groups. They may involve:
1) the transfer across state or system boundaries of goods, services, patents, licenses, franchises, news and weather information, and the
movement of tourists consuming goods and services; 2) contacts between
members of organizations whose membership or range of activities extends
across these boundaries, including all interactions such as direct invest-
ments, transfers of know-how, and so forth, taking place within multi-
national, privately or publicly owned companies and other international
organizations; and 3) other informational interactions, such as exchanges
of students or scholars in pertinent professions; informal contacts between
members of labor unions located in different countries but not belonging
to the same international union; exchanges of views between business or
government leaders of different states who are not members of the same
complete hierarchies, and others.

These more strictly economic interactions across systems may likewise
affect every desideratum listed in Section 3. They have special relevance
for $y_1$ and $y_2$, insofar as international specialization promotes the efficiency
of allocation in each economy participating in trade and, withal, the level
of living of its nationals and the economy's growth in per capita consump-
tion. Since some of these interactions are often thought to interfere with
$y_6$ (stability of employment and incomes) and $y_7$ (national strength and
prestige), the governments of the nation-states responsible for regulating
these interactions frequently evaluate their decisions in this area of policy
in terms of a trade-off between the advantages they perceive in interactions
across state boundaries through desiderata $y_1$ and $y_2$ and their dis-
advantages due to losses expected through $y_6$ and $y_7$.

The second group of interactions is of special interest in view of our
emphasis on organizations. These interactions nowadays frequently take
place within multi-national organizations, structured as complete
hierarchies, embracing activities carried out in more than one nation or
employing personnel belonging to several nations, or both. The executives
situated at their apex impose more or less uniform rules, procedures, and
patterns of organization over component organizations located in countries
with widely disparate systems and levels of development. This relatively
new phenomenon, together with the accelerated mobility of executives
across national borders and the even more pronounced trend toward
training executive personnel according to certain common precepts of
business efficiency, in West, South, and also in Yugoslavia, has tended to
diminish the differences between the patterns of organization prevailing in those groups of countries.

Private multi-national organizations are normally subject to the laws issued by the ruling organizations of the countries in which they have been founded or incorporated. In some instances, these laws govern the permissible actions of the foreign affiliates of the organization as well as of the components of the organization situated in domestic territory. These circumstances may produce jurisdictional disputes in cases where a component organization is nominally subject to the conflicting laws of two or more nations. It may also enable the ruling organization of one country to extend the reach of its strategic policies beyond its boundaries. For example, the United States has been able to impose certain restrictions on trade with Eastern Europe on affiliates of American enterprises incorporated in Western Europe.

In view of these possibilities, the government leaders of nation-states frequently look askance at the growth in their countries of the affiliates of multi-national enterprises. Among other reasons they fear that their foreign economic policies will be subverted by these organizations, which operate within their territories and thereby escape some of the provisions regulating across-system interactions. The protection of indigenous economic organizations, the advancement of nationals in preference to foreigners in the affiliates of multinational organizations situated on home territory, and the broad diffusion of available know-how and innovations are some of the areas where government leaders and representatives of multi-national companies have come into conflict. When nation-states have been weak, as in some parts of South, it has at times been possible for multi-national companies to influence, if not to dominate, their governments, thereby resolving the conflicts in their favor. Colonialism and the dominant relation referred to in East, South, and some parts of West as neocolonialism are extreme versions of this same phenomenon.

Multi-national enterprises may, on the other hand, mitigate incipient conflicts between states because the web of common interests they have woven cannot be undone without palpable harm to all parties concerned. This statement applies especially to multi-national organizations that are under the joint management of several nation-states, such as the European Coal and Steel Community, or under the supervision of an international organization, such as the United Nations.

Governments in West have usually assumed at least partial responsibility for those economic activities of their nationals which transcend their state boundaries. It is usually up to the branches of the government dealing with foreign affairs to avert or to moderate the conflicts which these

nationals, operating by themselves or within private or public organizations, may engender in conducting their activities abroad. The comparor can only note that the resentments aroused by certain types of economic interactions may not always be fully realized by all the governments concerned. For this reason, we have formulated a separate desideratum bearing on the co-existence characteristics of systems that would evaluate negatively characteristics that may jeopardize the political relations between states.

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