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NEUROPHYSIOLOGICAL ECONOMICS

A. B. WOLFE
Ohio State University

Correction of the alleged errors of professional economists has not infrequently been attempted by men little acquainted with economic literature, but the author of this book is not one of these "denizens of the economic underworld." On the contrary, he is distressingly familiar with the theories which he subjects to the crossfire of his involved logic. Out of Yale in 1905, and retired from business, Noyes is now chairman of the National Bureau of Economic Research. We do not know the source of the tremendous intellectual drive necessary to complete a work of such magnitude and difficulty, but it is clear that somehow, somewhere (it could hardly have been at Yale), the author got the idea that the received theories of economic value are illogical, superficial, and unscientifically grounded—and decided to do something about it. He spent seventeen years on the task, including a year in medical school at the University of Pennsylvania. He has digested a mass of neurological literature (down to about 1938) and has evolved his own "system of economic energetics." This is an analysis of motivation in relation to the processes of subjective valuation which must lie back of all economic behavior. The product is a thousand pages of difficult text, plus four hundred pages of technical appendixes, with at least parts of which the critical reader will have to wrestle.

The reader struggling with this book will wonder why Noyes wrote it. What did he hope to accomplish by it? In due course he denies the validity of the idea of natural scarcity, finds the "land" concept totally unusable, and refuses natural resources status as factors of production. The only productive factor is labor—"working"—and the only causes why an economy possesses a fund of man-made material wealth (which he calls "extant product") are "working" and "retaining." All this presages his inten-


2 Evidence of the catholic tolerance both of the bureau and of Noyes, since there is about as much similarity between his analytical approach and the statistical methodology of the bureau as there is between oil and water.
tion to formulate a labor-and-saving theory of value, in which in the last analysis the only "scarcity" involved is the scarcity of the will to incur the effort of working and saving. His over-all purpose is to put subjective valuation back into economic theory. To clear the way for his own theory, he has felt it necessary to demolish diminishing-utility theory, including indifference systems (which he rejects as "indeterminate"), and the general equilibrium concept, along with such ancillary matters as elasticity of demand and continuity of variation in demand and supply.

The attack has nothing in common with the argument of the "objective" economists who hold that a scientific theory of subjective valuation is impossible and, for the purposes of economic theory, unnecessary. The theory prevalent today is a purportedly "scientific" analysis of the behavior of prices, in terms of price, and with supreme uninterest in any inquiry into the nature and modus operandi of the human motives which lie back of the market. It is a logico-mathematical analysis of price mechanics, without the theory of mechanics' basic desideratum, the forces, especially the prime movers, which operate the price mechanism. Noyes wishes this pattern to be discarded. His frontal attack, however, is against the prebehavioristic theorists who evolved diminishing utility as a tool for analyzing subjective valuation. He tries to get away from psychological hedonism. Psychologists themselves have tried to dispense with pleasure and pain as motives, but unsuccessfully; they have ushered them out the front door, only to bring them in the side door under other names. This is inevitable, for, as Noyes sees clearly enough, all organic reaction to environment is seeking or avoiding. But seeking and avoiding, he holds, are only aspects of a more fundamental nature of the want system (motivation), namely, the organism's innate tendency to maintain physiological equilibrium, or homeostasis. What he actually objects to is the hedonistic calculus. It is ironical, therefore, that his own labored analysis is essentially hedonistic not only in a general sense but in that of calculation—calculation in quantitative terms (if only of "more or less or equality") of the comparative intensities of wants and of "sense of effort." Noyes holds in general that only physiological psychology or neurophysiology is strictly entitled to be considered scientific. Behaviorism is a second recourse, but it can observe exterior behavior only, and not the internal mechanisms. So far as possible he wishes to eschew psychological terminology, much of which he thinks is mere "word magic." He therefore essays the construction of a theory of economic motivation—wants and their satisfaction—in terms of physical, organic states and reactions, in the belief that "the deeper the level of analysis to which we reach, the more secure the foundation."

Man's ability to satisfy his wants depends basically on his control over his natural environment—a control conditioned by physical laws and the neurophysiological functioning of the individual human organism. Biological behavior is independent of social behavior, but fundamental to it. Analysis of socioeconomic behavior must be based on, or at least be compatible with, what is known of neurophysiological processes. It is therefore necessary hypothetically to isolate the individual from all social controls and cultural influences and to assume an individual, or "direct," economy, in which "the relatively unchanging organism, man," stands in direct relation to the natural environment. Ac-
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Eventually, a direct economy never could exist, as Noyes takes pains to note (pp. 9–13, 1905). Undeniably there are difficulties with the concept. Nevertheless, it is a permissible heuristic assumption. The whole book is based on it, although Noyes at times seems to attribute to his isolated man behavior possible only through cultural conditioning.

Economic behavior is resolvable into three basic categories—wants, efforts, and satisfactions. Noyes divides wants into two broad classes, present wants and future wants. Since present wants do not involve production of the means of satisfaction, the long analysis (chaps. i–iv) devoted to them is concerned primarily with the internal neurological mechanisms by which they “energize” the process of consumption. The satisfying of the bodily physiological wants, which are the only type of wants to which neurological analysis can be applied with much confidence, is held to be a spontaneous, effortless, involuntary, and in the main an unconscious process. Future wants (chaps. v–vi), on the contrary, induce the production of external means, require subjective valuation of resources, whether natural or artifactual, and involve the cost of effort. The productive process involves skilled, learned behavior—highly “conditioned” responses, cortical direction—and volitional drive. Volition always involves effort; and effort, whether physical or mental, constitutes the only real cost of production. Productive behavior thus boils down to the expenditure of effort, required by the “resistances” of the natural environment, to produce means for the eventual satisfaction of future wants (p. 700).

Because of space limitation, unfortunately, we cannot review Noyes’s analysis of the nature and mechanism of wants, although the three chapters devoted to present wants are by far the most informative in the whole book and should be not without interest to economists. The neurophysiological chapters are difficult reading for a layman, but the reader who skips them will find himself handicapped in understanding the author’s economic analysis, particularly his attack on diminishing utility; for, while the neurological premises there seem to recede almost out of sight, they are still in the background.

We can, however, say this much: Every organism is internally active and externally responsive to its environment. It is continually expending energy. It is also continually replenishing its energy by intake of food, water, oxygen, etc. It utilizes those parts of its environment which meet its needs and avoids those which threaten its security. It thus maintains itself as a going concern. Organic economy is a continuous process of refueling, repair, replacement, and disposal of waste. It is a neurophysiological process in which bodily needs (“wants”) are the prime movers to activity.

By these processes the healthy organism maintains itself in a state of physiological equilibrium; but it is an unstable dynamic equilibrium, subject to continually recurring tendencies to disequilibrium. The disequilibrating factors are the organism’s wants, or needs. Their correction or removal constitutes “satisfactions.” This notion of organic equilibrium—or, as Noyes, following W. B. Cannon, prefers to call it, “homeostasis”

Thus economists are not the only ones who have taken over the equilibrium concept from physics. The physiologists have done so for obvious reasons. The psychologists have found it a good base line in their investigations of motivation. H. A. Murray, for example (Explorations in Personality [Harvard Psychological Clinic, 1938; reprinted 1947]), goes so far as to subsume the process of needs satisfaction under the Second Law of Thermodynamics.
—is the starting point of the whole analysis of the nature and mechanism of wants.

In chapter iv Noyes develops the concepts essential to his "system of economic energetics"—the competition between wants, their relative "force" or intensity, and the "order of priority" among them. Here also we find his argument for "satiation," which he later calls the "all or none" principle, and the initial steps in his attack on marginal-utility theory.

Noyes's system of thought requires that all present wants, or rather the emotional states to which they give rise, must at some point be quantitatively comparable, at least roughly, in terms of more or less or equality. They must have some common characteristic in respect to which they are homologous (pp. 177 ff.). This is the intensity of the want, or "the force with which it acts." The relative intensities determine the "order of priority" of the respective wants—a sort of waiting list or protocol arrangement. The most intense want, standing at the head of the priority order, is the "prepotent" want. It is the strongest want and gets itself satisfied against the competition of other wants. And thereby hangs a tale. This matter of priority and competition of wants, says Noyes, is "by far the most important modification in the economic theory of wants and the process of satisfying them—especially for marginal utility theory—which our physiological approach has made necessary" (p. 185).

It seems to be an established physiological generalization that, with few exceptions (e.g., breathing and walking), an organism does only one thing at a time, though it may shift activities very rapidly and frequently. This is accounted for by the phenomenon known as "spreading" or "irradiation." It is inadequately explained, but it is in accord with psychological "field theory," namely, that any organized or integrated response to a stimulus is a response of the whole organism. A layman has no choice but to accept this idea, though he may have mental reservations. The prepotent want is a ruthless monopolist. Until it is satisfied, all other wants go back and sit down. Such is the neurological basis for the assumption, held throughout the book, that there can be only one prepotent want, and hence only one satisfaction in process, at any one time.

The next step in the exposition is that the prepotent want is always (or at least normally) satiated. All the later highly involved logical attack on diminishing-utility theory (in chaps. vii, viii, xiii, and xiv) rests on this thesis. The only evidence (apart from logic) offered for it is that "an activity in process" tends "to complete itself," and that it accords with introspective data, a point with which most readers probably will disagree. Later, Noyes remarks that the satiation thesis has not been proved and that "probably it cannot be proved from physiological evidence" (p. 444).

"Normal" satiation, however, does not always occur, as he is quick to note (pp. 227–32, 402–3). In the first place, a minor want in a constellation may fail to be satiated. Inasmuch as nine-tenths or

4 Quoting from R. S. Woodworth, Psychology, 1921.
more of our wants appear in constellations, this should be noted as a sizable exception. Secondly, a "sporadic" want may interfere and take the place of the want in process of satisfaction. If we extend the rubric "sporadic wants," as we may legitimately do, beyond the sudden, externally induced physiological disequilibria to which Noyes confines them and include the many sudden and unpremeditated impulses and desires which appear in any normal human being (if not in the isolated economic man), "interference" becomes a very common phenomenon. In fact, it is so common, as any reader must know from his own experience, that it is practically fatal to the "satiation" thesis. Third, a want may fail of satiation and be only partially satisfied because of deficiency of objective means. (This is treated in Part IV in terms of "capacity," which is made to depend, in the last analysis, on willingness to work longer hours.)

The fact that a want may fail to be satiated, for any one or more of these reasons, causes Noyes much trouble. His first reaction is to dodge the issue. He avers:

Over a considerable period of time there is little reason to admit that these influences will produce the phenomenon of lasting incomplete satisfaction. In the long run the final determinant of the number of present wants satisfied would depend upon the capacity to secure and provide means rather than upon the interferences, etc. Our thesis [now!] is that all wants within that reach [capacity to provide means] are usually completely satisfied as they recur or occur during some considerable time [pp. 402-4; italics supplied].

Here is a complete ignoratio elenchi. Diminishing-utility theorists, to be sure, have never made it quite clear just how much time is to be allowed for the satisfaction of a want; but it is fairly certain that they have never allowed enough time for the want to recur, and to recur again and again, until through sheer persistence it finally gets itself satiated. The problem of comparative intensities of present wants is that of their relative positions in the order of priority now and whether the prepotent want maintains prepotency long enough now, at "one sitting," not when it recurs tomorrow or next week.

In the case of future wants, it appears that limitations in capacity may cause deliberate segmentation—that is, it may be deliberately planned to provide for only the partial satisfaction of certain wants, especially those whose intensity is so low that they barely come within the limits of capacity. This is the only significant exception he admits to the satiation rule. He expresses skepticism as to segmentation of any simple present want, and he would obviously be happier if there were no deliberate segmentation of future wants. "The great bulk of the examples I have examined appear not to involve segmentation at all. They seem to be cases where certain members of a constellation remain unsatisfied... If so... for each individual want the satisfaction is on an all or none basis" (p. 922). Thus he escapes a logical difficulty by taking refuge in the constellation idea. It raises the question whether there is such a thing as a simple, independent want.

However convenient we may find marginalism as a method of idealizing the interplay of demand and supply, most of us do not worry overmuch about the problem of subjective and objective

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As is evident in his treatment of "segmentation" in Part IV and Appendix VI, C, D, and F.
quantities. We are content to take the correlation between wants and means as more or less intuitive and do not conceive that in actual life it must be meticulously quantitative, logic or no logic. For Noyes, however:

Fundamentally, the question resolves itself into this: what magnitude upon the want side can be related to what magnitude upon the means side so that the two necessarily correspond and the means can be presumed to have conferred upon it that certain subjective value which only arises from the want [p. 414].

The motif of his whole complicated argument against diminishing-utility analysis lies in his contention that its "magnitudes" are obscure, indeterminate, and logically inconsistent. Only his own all-or-none hypothesis (satiation) provides reliable and easily understandable measurement of intensity of wants and quantities of means (see p. 432).

His magnitude on the want side is the "customary maximum" or "normal" intensity of the want. This intensity remains constant until the want is satiated, when it drops abruptly to zero. He now needs some measure of means, in terms of which they can be quantitatively compared (regardless of their differing objective units—pounds, yards, etc.) and be made commensurable with the subjective measure of intensity of the want. This common denominator he finds in his concept, "usefulness," which he regards as nearly equivalent to Adam Smith's "Value in use." "Usefulness" is the capacity of an object to satisfy a want. All objective units of a given means have the same quantity of usefulness during the process of satisfaction. Whereas in diminishing-utility theory total satisfaction is represented, roughly, by a triangle, in Noyes's satiation theory it is represented by a rectangle.

But what is the "unit" of usefulness? We now get an adroit bit of logical maneuvering. Back in the neurological analysis, the intensity of the want (emotional state) was measurable by such manifestations as palmar sweating and blood pressure (p. 191). This obviously will not do for the purposes of economic analysis, so now Noyes introduces a new concept, a "full measure" of means. "An organism will soon learn what is the full measure of usefulness of a particular means measured in objective units—pounds, yards, etc.—necessary to complete the process" of satiation (p. 415). In other words, one does not know directly from one's own feeling when one has had "enough" raw oysters; that knowledge comes only from perception that one has eaten a half-dozen or whatever one's habitual quota is. A full measure is thus both the required unit of means and the indicator of satiation, the basic unit of intensity. (The same line of analysis is applied to "part measures." ) By measuring the intensity of the want by the amount of "usefulness" which satiates it, we have found commensurability between the want and its means, because "quantitatively as well as qualitatively the relation of usefulness, once established, remains unchanged if the means remains unchanged" (p. 432). We can now arrange available means in the order in which we shall utilize them (order of preference). Marginal utility, or "significance," has no application in the "satiation" hypothesis, because in the latter all units of the means have the same utility, and the only "margin" is at the point of satiety. In diminishing-utility theory, decreasing intensity of the...
want makes it impossible, he argues, to locate a definite unit of means.

In chapter viii (with Appendix IV) Noyes swings into the main attack. Within the “conglomerate assumption” which he ascribes to diminishing-utility theories (p. 438), he is unable to put his finger on the theory and therefore sets up two interpretations. He thus has three alternative hypotheses (including his satiation theory), which he puts to the test of logic in his final analysis of the order of preference among means (chaps. xiii, xiv, Appendix VI):

1. The intensity of the want does not decline during the process of satisfaction (the satiation thesis).

2. Intensity declines, and “remaining intensity” (the unsatisfied part of the want) determines the subjective valuation of the means. The intensity of the want is the driving force, as in the satiation theory, but now the magnitudes to be compared among competing wants are their intensities at the point at which each want in turn has a marginal intensity just equal to the initial intensity of the next want in the order of priority (p. 523). “Remaining intensity” thus appears to be equivalent to the potential total utility of the quantity of unused means which will completely satisfy the as yet unsatisfied part of the want.

3. Intensity declines, but now the driving force is not the unsatisfied part (a static magnitude) but the feeling of pleasure during any given phase of satisfying the want (a dynamic magnitude). This is the “reduction of intensity” hypothesis.

These three hypotheses are carried through two hundred pages of reasoning so complicated and at times so obscure that one has extreme difficulty in following it. His object, of course, is to establish the superior reality of his satiation theory by proving the virtual impossibility, both logical and psychological, of any precise quantitative relation between wants and means under any form of diminishing-utility theory. The ultimate objective is a tenable theory of the psychological process by which the economic man arranges his choice between means —his order of preference (chaps. viii, xiii).

One thing in diminishing-utility theory which troubles the author almost as much as its lack of identifiable magnitudes and its failure accurately to define its concepts is the fact that under the assumption of declining intensity no want could ever be completely satisfied, that is, satiated. No marginal-utility theorist will question the validity—in pure logic—of the “no satiation” inference. Under the assumptions of diminishing utility and of diminishing productivity (and of limited capacity) it is the logical principle of all economical allocation of resources. It is the basic logic of “maximization” and general equilibrium. But to carry the pure logic of an ideal-type analysis to its logical conclusion is not always warranted. No one in his senses has ever taken general equilibrium or the continuous curves of marginal analysis as precisely representative of reality. Noyes himself characterizes the real man as “a rather mild guesser . . . guided only by a certain amount of ‘common sense’ derived from experience, as well as by ‘hunches,’ in making his best-laid plans” (p. 1004). If Noyes is permitted to soften the hard logic of his own “satiation” thesis, surely the diminishing-utility and indifference-systems theorists should be granted a similar saving grace.

Noyes argues that “the basic concept of marginal-utility theory, if significance (utility) derives from anything that occurs during phases of the process, rests
not only on the assumption that the intensity of the want declines during satisfaction but also that it declines at a *continuously diminishing rate*" (p. 484). One could not find a more striking example of a theorist misled into a logical absurdity by his penchant for over-refinement; for Noyes’s "curves of significance," which plot not the whole utility of each successive unit of means but the differences of utility yielded by any two successive units, are worse than meaningless. We should have to conclude from them that the total utility of a means is no greater than that of its first unit. Later he forgets these curves of "significance," but his ingenuity in constructing them does not increase the reader's admiration for his logical ability.

In the end, of course (chap. xiii, pp. 864 ff.), Noyes rejects both diminishing-utility hypotheses—"remaining intensity" and "reduction of intensity"—clearing the way for his "all or none" principle of satiation as the only true doctrine. His main grievances against diminishing utility are (1) its implication that no want can be completely satiated, (2) that it is contrary to experience (introspective), (3) that it is beset with insuperable "magnitude" difficulties, (4) that it requires of the economic man a capacity for calculation which is psychologically absurd.

An interesting feature of the attack on diminishing utility is his captious criticism of continuous curves and functions. He holds that change of intensity, either of demand or supply, is steplike—like a staircase, not like a ramp—and the steps must be big enough for the economic man to discriminate. It is not permissible to employ the differential calculus. For if decline were continuous in each of two competing wants, A and B, the marginal intensity of want A would at some point be precisely equal to the initial intensity of want B, and no choice could be made between them. "The apparatus would be on a dead center" (p. 500). Noyes interprets the calculus as a doctrine of absolute continuity of change. He takes the conventional continuous curves too literally, failing to note that they are convenient idealizations, not meant to be precise representations of reality. He evidently thinks that he is proposing a fundamental conceptual reform, since he likens his staircase (discontinuity) theory to the quantum theory in physics (p. 979). Actually, he asks us to scrap the most useful and convenient tool ever devised for deductive economic analysis.

After all, however, Noyes’s final view of the behavior of demand and supply does not differ *essentially* from the conventional marginal analysis. For a social economy, Noyes admits as much:

Elasticity and demand curves . . . might begin to become appropriate as the number of individual demanders becomes very large . . . . The all or none effects of each might be arranged in so close-ordered a series . . . that, in the aggregate, the direct effects would iron themselves out into the appearance of continuity [p. 986].

There is no difficulty about present wants. They are simply emotional states which stimulate consumption behavior, utilizing available present means. Future wants, on the contrary, can eventually be satisfied only if the necessary consumption goods have previously been produced. Provision for future wants restricts present consumption (the more so

11 See pp. 446–47, 483, 508, 984–85 for dubious interpretations of both the differential and the integral calculus.

12 Any instructor knows that it is easier to draw a continuous curve than to draw a columnar diagram, though he usually draws the latter first, to show that the continuous curve is a conventional smoothing-off of the tops of the columns.
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if we class leisure with consumption, since production lengthens the "working day" and reduces the "consuming night" (p. 563). What causes man to slave and save for wants which he will experience as actualities only with the passing of time?

We should expect Noyes's answer to be in line with his previous mechanistic neurological approach, but it is not. For the analysis of future wants, "any sure physiological footing has slipped from beneath our feet" (p. 262), and he feels "compelled to impute some unknown and purely hypothetical agency to account for the observed results" (p. 265). Production involves labor ("working") and the existence of the product when wanted requires saving or waiting ("retaining"). Both working and retaining, without exception, involve effort and the sense of effort, which has to be overcome in some way if provision for future wants is to be made despite the competition of effortless present wants. The author's thesis, developed at great length, is that the sense of effort can be overcome only by volition, will power, which, to avoid the odor of faculty psychology, he chooses to call "secondary neural energy of response."

Voluntary behavior, as distinguished from "involuntary" or "spontaneous" responses, connotes conscious, purposeful choice between presented alternatives, in this case between present and future wants. In my opinion, however, it is unscientific and wholly unnecessary to bring in the old facultative entity, will, to account for choice. The alternatives presented are imagined activities. Once in consciousness, they are compared and evaluated by a process of reasoning—or of rationalization—with regard to their possible results. The logic of this rational process is the logic of hypothesis—if this, then that. If I sow wheat now, I shall have bread in the future; if not, I shall go hungry. My choice may be directed by "cybernetic" reason, but it is motivated by desire or interest. In the last analysis, my "will" is only my strongest desire, whether actual present want or a present surrogate derived from imagination of the future. Like virtue in "The Lone Ranger," the strongest want always wins out. The strongest desire does its own reinforcing. A future need produces a present disturbance of emotional equilibrium—desire for security, including peace of mind, freedom from fear—which can be satisfied by taking the proper steps now (production of means for future use) to insure the satisfaction of the future want when it becomes actual. Again and again Noyes seems on the point of arriving at this interpretation, but he always shies away. His previous consideration of conditioned behavior (pp. 129 ff.) should have led him to the obvious explanation of the ability of a future want to motivate present production in the face of all the effort the latter involves. The future want simply occasions a present replica want and a surrogate stimulus to present behavior. Noyes could have found ample psychological authority for this view. He rejects it, however, and devotes a hundred and fifty pages to expounding "volition."

Since some future wants take precedence over some present wants, and vice versa, all wants are arrayed in a combined order of priority. This combined order determines how the economic man divides his time between his "working day" and his "consuming night." The question now is: What limits provision for future wants and the length of the

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13 His time, not his efforts; since present wants are effortless, all effort is connected with future wants.
working day? Limitation on a present want is simple: it is satiation. Provision for a future want ceases when there is objective evidence (chiefly ocular) that “adequate provision” has been made for it. But judgment as to this is influenced—for all but the “great prior wants” (see pp. 878, 881, 953–54, 993, 1386)—by considerations of cost. Again we have the key idea, economizing of energy and therefore of effort. Production has to be against resistances, imposed respectively by (1) the natural environment (chap. xi), (2) desire for leisure, (3) the effort of working, and (4) the “interval effort” which Noyes attributes to “retaining” (waiting, saving) between the completion of the product and the date of its consumption (pp. 638 ff.).

Future wants are projections of memories, but degree of pastness has no influence on the intensity or vividness of a memory. Therefore degree of futurity can have no effect on the presently felt intensity of future want (p. 1346). This leaves us in a quandary, for how explain decrease in the effectiveness of the future want in the absence of any decrease in its intensity? Noyes’s answer is simple enough, though its elaboration is not. Instead of diminishing the force of the want, degree of futurity increases the resistance—the “interval effort” of retaining. This resistance is added to that of “duration effort,” that is, the effort required to overcome aversion to present working.

Surprisingly, however, degree of futurity does diminish present estimate of future effort. This tends to postpone working and to curtail provision, though it would economize effort to do the work now. Incidentally, this leaves us in another quandary, for sense of future effort is also based on memory; so, on the one hand, futurity diminishes the estimate of future effort but, on the other hand, has no effect on the intensity of the want. Noyes does not explain this inconsistency.

Noyes does well to point out the effect of the various resistances in limiting provision for future wants, but he does not dispose of the effect of futurity on the intensity of the want. All the resistances may operate while the intensity of the future want itself is being discounted. The idea that degree of pastness does not diminish the intensity of the want is open to serious question. If it is invalid, there is no ground for rejecting the accepted theory of time discount.

Neither nature nor capital produces anything. Land and capital, as physical objects, disappear from the analysis. All man-made wealth (“extant product”) is regarded as congealed labor plus “retention.” Labor, or “working,” requires effort, physical and/or mental; and labor effort is the only real cost of producing. Noyes does not perceive that the sense of effort may practically disappear, first, because in moderation we like to work and, second, because we get satisfaction in the anticipation of the future enjoyment of the fruits of our labor. The liking for work probably has its root in the fact that any living organism is inherently active. Despite all the talk about the irksomeness of labor, most of us would be miserable without work to do and virtually dead if we could not look forward to the future. (After all the evils, including the necessity to work, had escaped from Pandora’s box, Hope remained.) In his desire to build a logically consistent system of economic energetics, based on

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14 See the discussion, difficult to follow, of conscious memory and time, pp. 278–91.

15 Except the cost of the small amount of “duration” retaining necessary during the transformation of raw material into finished product.
real costs, Noyes gives scant recognition to these traits of human psychology.

Production involves not only the direct effort of working but the sacrifice of leisure time for rest, play, and consumption. Forcing one's self to work requires self-constraint. Refraining from leisure in order to work—choosing the effortful instead of the effortless—involves self-restraint. Self-constraint is necessary to counteract fatigue and maintain the effort of working. Self-restraint is necessary to counteract the pressure of present wants. The first is real cost, the second is sacrifice (pp. 569-73). Sacrifice of leisure, one aspect of what others call "opportunity cost," is not a productive force; it only permits production. Working is doing something; sacrifice is merely not doing something else. No tenable theory of real cost, he believes, can be based on opportunity-cost doctrine. Naturally there has to be some limit to working time. Noyes therefore sets up the assumption of a "working day" and a "consuming night" (p. 563). Working has two dimensions, duration and intensity, but basically the working day is limited by intensity. (This is true enough, but the fact that intensity cannot be measured [p. 564] is certainly inconvenient for Noyes.) The working day terminates when "the requirement of secondary energy to overcome fatigue" rises above "the capacity of the marginal future want to mobilize it"—which is only saying what Jevons said in 1871 in simpler terms.

There is no uniformity in the ratio of either effort or sacrifice to product. Consequently some heroic standardization is required. Defining "work" as the effect (product) of working, the unit of work, \( W \), is the quantity of "effect" which some standard worker can produce in one hour.\(^8\) (The unit for "working" is work divided by time, \( WT^{-1} \)). In addition we have the idea of a "standard lot." The amount of work in any lot must be measured in terms of the amount represented in the lot taken as standard. Thus, for the sake of trying to treat quantitatively processes which are qualitatively highly variable (working, real cost, effort), we are forced into devious logic and arbitrary concepts. If all this seems unrealistic, Noyes is nevertheless merely doing aboveboard what other theorists habitually do under the table. His standard "work," \( W \), for example, is no more arbitrary than Marx's simple undifferentiated labor, Keynes's labor unit, or the accountants' "standard cost." Standardization is inherent, indeed, in all input-output analysis. It must be heroic conceptual abstraction until and unless even mental labor can be reduced to ergs or foot-pounds.

The actual fact is that neither the real cost (sense of effort) of working nor the sacrifice of present wants (with its accompanying sense of abstaining) is determinate.\(^9\)

The other element in real cost is the effort involved in retaining\(^{10}\) the product until it is consumed. Nothing can be re-

\(^8\) Working is regarded "as all activity other than consuming and playing," which are classified as leisure (pp. 554, 562).


\(^{10}\) This assumes a given technique, and homogeneity of all working done by a given worker. Noyes does not attempt to say how such an assumption can be justified for an indirect economy but argues that the isolated economic man's labor must seem homogeneous to him because he has no external standard with which to compare it (p. 557, n. 15).

\(^{11}\) For the author's reason for substituting this term for "saving" or "waiting" see pp. 601-3.
tained but physical product. Product, however, is Janus-faced. One face is its labor cost, the other its usefulness. Since these two faces may not be of the same size, Noyes encounters further “magnitude” difficulties. He chooses to measure retaining in terms of real cost and through a bit of subtle dialectic (p. 610) concludes that “nothing but real cost is retained, or needs to be retained.”

He distinguishes between “duration” retaining and “interval” retaining. The former applies to goods in process; the latter is keeping the finished goods until their consumption is completed. Each phase of retaining involves both real cost (effort) and sacrifice (abstaining from present consumption). Although retaining “appears to consist almost wholly in refraining from consumption” (p. 601), we are asked to believe that the real cost and the sacrifice of retaining are somehow different. (The reasoning is obscure.) In the abstinence theories, the only cost of saving is the sacrifice of present consumption. But Noyes feels impelled to make out a “positive” real cost in addition to this merely “permissive” sacrifice; hence the hypothetical entity “interval effort,” the nature of which he can hardly explain. But interval retaining and its real cost (effort) are continuous, from the finishing of a product to the completion of its consumption (p. 662). Labor makes the product, but this continuous interval retaining conserves it. It is difficult, however, to see how the cost of this conservation can be anything other than the sacrifice of abstention.

This conservative function of “interval effort” is the main theme in his discussion of “extant product” (pp. 660–92), the fund of man-made material goods, including all durables. These man-made artifacts are properly regarded as means and means only. They exist because they are “retained,” at the cost of interval effort. Thus the magnitude of an extant product includes retention as well as work. The real cost of interval retaining is a rate per unit of time, measured on the magnitude of product retained—work plus duration retaining. It is \((W+R)KT^{-1}\), where \(K\) is a constant (the interest rate). For compound retaining the real cost becomes \((W+WK)K\). For short periods, he says, retaining is only a minute fraction of cost, even when compounded. At 5 per cent, retaining one hour’s work one day is equivalent, as he says, to only \(1/7300\) of the hour’s work. But we should note that in twenty years this would double the cost of the hour’s work—and in the life of many durables that is a short period. At the low rate of 1.73 per cent continuously compounded, doubling would take only forty years. Even at 1 per cent the accumulated cost of a long-lived durable like Brooklyn Bridge would be astronomical by the time it was ready to be scrapped. The fact is that compounding the cost of “interval effort” is a thing that just is not done, at least outside certain financial institutions. It is fortunate that most persons do not count even simple interest in the cost of holding durable consumption goods. If we figured retaining at compound interest, the cost of even simple living would be appalling. Noyes’s analysis of retaining is badly out of psychological focus. It is an example of how far a theorist can get from reality if he does not constantly curb his logic with common sense.

This applies also to his discussion of the cost of replacements. The essence of a stationary economy is that its fund of wealth is kept constant by replacement of items subtracted by consumption or lost through depreciation and waste. Noyes erroneously represents the classi-
cal abstinence theories as holding that the abstaining is all done at the time the original capital is accumulated. He holds, as classical theory did also, that every replacement involves a new, conscious, voluntary, and effortful choice. The owner does make replacements as a matter of course, but, Noyes argues, he can choose not to do so. In other words, he can kill the goose that lays the golden eggs. This is good classical doctrine, as opposed to J. B. Clark’s idea of the immortality of capital, but it is poles removed from psychological verity. It completely misreads the businessman’s real psychology.

The “potential means” provided by the natural environment, “sites” (room to live and work),21 raw materials in situ, and natural energy sources are not free gifts; they can be utilized only at the cost of labor, to overcome the resistance of “distance,” of “depth” (in the extractive industries), and of the refractoriness of natural materials. Technique is properly treated as a dodge by which natural powers can be played off against one another, to some extent neutralizing resistances and thus reducing the amount of labor per unit of output (pp. 809–18). Nature also imposes another type of resistance, which economists have ignored, namely, conditions inimical to life and health, the dangers and discomforts of the elements, and so on.22 The notion of nature as a factor of production, he holds, is wholly incapable of grasping this dual role.23

It would be difficult, Noyes avers, to conceive of an idea “more utterly false” than the notion that natural resources are scarce. To be sure, there is a finite limit to each resource, but that limit is never reached.24 So long as there are reserves of any resource, however inferior in quality, which are not being exploited, that resource is not scarce. Scarcity is not in the natural environment but in man himself.

The rejection of scarcity is mainly verbal, since he recognizes it, in effect, under the term “resistance.” Of course, resources of inferior quality and/or location offer more resistance. Noyes ignores the fact that the necessity of meeting the greater cost of this resistance is due to the limitation (scarcity) of the better grades and locations. “Adhering rather closely to the Ricardian tradition,” as he says (p. 754), he reduces all limitations to terms of “capacity,” which is defined in terms of intensity of effort of the marginal hour of working. “The ultimate cause of scarcity is the real cost of the product.” But if we must go in for dialectics, it is just as logical to say that the cause of real cost is the scarcity of resources.

21 This is the essence of the land concept, which he says he has found entirely unmanageable after several decades of struggle with it (p. 999).

22 Most economists, perhaps, have simply taken these negative values for granted. At least one, however, Erich W. Zimmermann, has given them considerable attention in his extended study of natural resources (see his World Resources and Industries [1933] and, more specifically, his “Resources—an Evolving Concept,” Texas Academy of Sciences Proceedings, Vol. XXVIII, September, 1945).

23 It is unfortunate that there is no antonym to “resource” in English or in German. The terms “resistance” and “obstacle” are inadequate, since they connote a mere passive something in the way, whereas that something may be virulently active. We should do well to coin a new word, however barbarous it may be, and call these negative values “desources.”

24 There is enough land area, he asserts, to provide every family with sixty acres of “living space,” but to get this figure he includes the Polar regions, deserts, mountains, and swamps. “Crowding is ultimately due to human preferences and not in the least to physical limitations.” We need not worry about food supply, for (on the basis of 1924 estimates) the four chief wheat exporting countries could add three times as much tillable acreage to that now in use; and so on in the same vein for other resources. He overlooks the competing uses of land.
sources. Still there is this much truth in Noyes's view: even if the best quality of easily accessible resources were unlimited, relative to man's desire for them, they would still offer "resistance," and their utilization would still require effort, since they all require "channelization" and processing. Since there are many good ideas in chapter xi (the only chapter relatively easy to read) we need not be too much concerned about his intransigence toward scarcity.

The most significant aspect of subjective valuation, in Noyes's "final synthesis," is its effect on the order in which means are utilized—the order of preference. Is choice of means arranged according to the intensity of wants or according to the comparative costs of the respective means? (In an indirect economy this reduces to the budgetary problem.) What role do comparative real costs play in the subjective valuations of goods?

It takes Noyes 150 pages (chaps. xiii and xiv) to arrive at an answer. His conclusions are understandable; the logic through which he arrives at them is, if possible, more labored and involved than ever. The equilibrium between demand and supply is determined (at the margin of "capacity," or willingness to incur real cost\textsuperscript{25}) by the "order of ratios," of cost to utility, or of effort to satisfaction. The order of ratios is determined by weighting each satisfaction with its real cost. This sounds good, but it involves an "insuperable" magnitude difficulty. "What measure of each means would be used in establishing this system of comparative real cost?" (p. 845). Unless means are measured quantitatively, "the notion of an influence of real cost is meaningless."

While the "size" of a means is determined by the real cost embodied in it, there is no rational, objective basis for making a more-or-less comparison between different means. No order of preference can be developed from the influence of real costs standing alone (p. 847). Hence, real costs can be regarded as only a modifying factor in the order of preference, and that only at the critical point or near the margin, where there is approximately a one-to-one ratio between intensity of the want and of the effort involved. The order of ratios does not apply to the prior wants, that is, the "necessities." Until all necessities are provided for (satiated), no subordinate wants get consideration. Later (p. 928), he admits that some necessary wants whose real costs are very high may be segmented and the order of preference be based on part measures and partial satisfactions.

In fine, and to put our generalization in the most succinct form that seems possible, we hazard the hypothesis, though we cannot prove it, that man's successive consideration of his wants remains always chiefly in terms of his order of priority—crudely stated, how much he wants something. . . . Step by step along the order of priority, and of consideration, by reason of diminishing intensity of wants [not of a want] and therefore greater attention to their real costs, as well as in consequence of the insertion of deferred wants, the order of ratios comes to interfere more and more effectively. . . . At the limit it governs completely and always has [p. 881].

This generalization, he says, "has the advantage of corresponding broadly to the facts of life—whereas diminishing utility theory does not."

Changes (chap. xiv) in real cost due to technological advance or to increasing

\textsuperscript{25}Since working and retaining are both elements in real cost, it is necessary to have a common measure for them. Noyes manages this by commuting the interest rate into terms of (standard) working time saved by working now. At 5 per cent, working sixty minutes now will save sixty-three minutes of labor a year hence. The extra three minutes are the cost, in terms of labor effort, of retaining one hour's work one year.
natural resistances (scarcity) also affect the order of preference only at or near the margin, the point at which the change suffices to include or exclude near-marginal wants.

In the end, we have come a long and circuitous way through the forest tangle and have arrived at what seems to be a familiar landmark: the equilibrium of demand and supply, or, in subjective terms, of declining comparative intensity of wants and the increasing real cost of their satisfaction. Noyes feels, however, that this pattern has been established in economic literature only in the most general terms and that "what is needed is a precise—even if purely abstract—statement of the magnitudes compared, their dimensions and their quantitative relations" (p. 964). We have evolved two systems of valuation ratios, "each equally valid." The two are incommensurable except at the margin (the limit of capacity). There, however, he holds that they become theoretically comparable in quantitative terms. One has difficulty in following the ball in the logical legerdemain (pp. 966–68) by which he establishes this abstract commensurability, but it involves a "full measure" as the objective criterion of the intensity of the want and, as the magnitude of real cost, the number of units of standard working time required to produce the "full measure." Variations in the intensity of effort in working during the day are disposed of by taking the last hour as a standard. Thus the intensities of both wants and labor are reduced to a single magnitude: working time. Again, we arrive at what is practically the Jevonsian equilibrium between marginal utility and marginal effort or sacrifice and can but wonder what has been gained by the author's lengthy discussion.

While the chapters on the neurophysiology of present wants are by far the most informing in the book, it must be noted that the only wants considered at length are the bodily wants or organic needs. No theory or program of welfare which does not, first of all, include consideration of these wants will bear examination, since their satisfaction is essential to health and life. Noyes evidently thinks that for the isolated economic man they are the only wants. For the actual man, however, they are only the subbasement foundation on which an imposing edifice of other wants and complex interests is erected by the learning processes and cultural pressures inherent in the social mode of living. We have to agree with the author that a valid theory of economic motivation must be in accord with what is known about the nature and neurological mechanism of the biological needs, but it is highly doubtful whether knowledge of such mechanism can throw much light on the culturally derived desires and interests which constitute the vast bulk of our psychological drives and are the main motives to most of our economic behavior.

In brief, even were it possible—as it is not—to describe the neurological mecha-

26 With, of course, the modifications which seem to Noyes so crucially important: the satiation and full-measure concepts, the rejection of diminishing utility, and the cavilling at the continuity of demand-and-supply curves.

27 Since Noyes is concerned exclusively with the behavior of the isolated economic man, he is justified in not dealing with these cultural wants. He is aware, however, of their significance in a social economy. "They seem particularly intangible and subjective, so much so that it is difficult to conceive that they have a physiological (peripheral) basis at all" (p. 238). He also recognizes "for what a short distance the satisfaction of his basic material wants serves as explanation, in any advanced economy, of man's actual selections and valuations of the goods and services among which his power to demand is distributed" (p. 245).
nism of these drives, it is questionable whether that would be more "scientific" than analysis in terms of purely psychological concepts. No doubt the behavior of Mr. Fairless and Mr. Murray at the collective-bargaining table is sometimes evidence of hypothalamic excitation, but for practical purposes that is saying nothing more than that the behavior momentarily escapes the inhibition of cold reason and becomes emotional.

The author warns us that the analysis of future wants cannot be based on neurological data and that his method must now be behavioristic—with occasional but reluctant appeal to introspection. Actually, as has been suggested, he reverts to the old faculty psychology, with its quasi-metaphysical will power and volition. His discussion of future wants is interesting reading but is far from convincing. Did one not perceive that he is influenced by his desire to re-establish a Ricardian real-cost theory of value, one could hardly understand how he could reject the surrogate motivation of future wants and stake everything on "volitional effort."

His extensive economic analysis, including his attack on diminishing utility, is still less convincing. While he prides himself on his "inductive" method, the further he goes, the more he departs not only from his neurological base but from inductive data of any kind and the more he relies on intricate, finespun, and, on occasion, shifty logic. One is reminded of Keynes's quotation, from some undesignated source: "The wild duck has dived down to the bottom—as deep as she can get—and bitten fast hold of the weed and tangle... and it would need an extraordinarily clever dog to dive after and fish her up."

While Noyes nowhere claims to be saying the last word and usually shows courtesy enough toward those with whom he disagrees, the whole of his economic analysis exhibits "the controversial spirit apt to be found in those who have new thoughts on old subjects." As J. M. Clark remarks, "An economist's theory may become an end in itself to him, to be refined at the expense of realism, rather than as a guide to understanding the world." In his intricate refinements Noyes comes near to regarding theory as an end in itself. Moreover, in his attempt to formulate a system of objective magnitudes for subjective valuations, he is essaying the impossible.

It is possible that highly specialized economists, skilled technicians in pricesystem mechanics, innocent of any neurological knowledge and not noticeably conversant with present-day psychology, will feel that Economic Man is hardly a timely book—that it represents, in fact, just so much lost labor. But it is also possible that such evaluation would be lacking in insight. The book has very considerable significance, not in its hunt for "objective magnitudes" or in its tiresome logical involution and not merely because it was high time that someone brought subjective valuation back into economic theory but, more broadly, because of its attempt to rescue economic theory from sterile isolationism. It is a step, however small, toward the integration of the social sciences which is essential to the development of all of them if they are to help a neurotic world to recover its balance. It is a step toward the adoption, by the social sciences collectively, of the Gestalt or field-theory approach which is now the dominant trend in psychology.

30 Alternative to Serfdom, 1948, p. 54.
How are resources allocated when a share of the total product is paid for the use of a particular physical asset, such as farm land or a retail store? This is an important practical question because three-fourths of all rented agricultural land is leased under share contracts and they are becoming increasingly prevalent in the retail field. It is also an interesting theoretical issue that has not been adequately treated in economic literature.

A share-rent contract usually requires the tenant to pay the landlord a specified proportion of the farm's produce or of the gross sales of a retail store. The crop-share lease, which calls for payment of a certain proportion of the crop to the landlord, is the commonest share lease in agriculture. In the cotton areas the true sharecropper pays a share rent not only for the use of the land but for the seed and fertilizer and the use of capital equipment, including work horses or mules.

If resources are to be allocated in an optimum manner, certain marginal conditions must be satisfied. In the factor markets, all factors of comparable nature tend to receive the same marginal return. Within the firm, resources must be so employed that the value of the marginal product is equal to the marginal cost of the factor, and the marginal cost of the factor must equal its price. The stipulations of the crop-share lease create circumstances in which both the tenant and the landlord, when each views his interest separately, consciously attempt to violate the marginal conditions required for maximum output. Under a crop-share lease, if the landlord's share of the crops is half, the tenant will apply his resources in the production of crops until the marginal cost of crop output is equal to half the value of the marginal output. The same tenant, however, will conduct his livestock operations, where important costs are borne by the landlord and the receipts are not shared with him, in the usual manner. The landlord will not invest in land assets unless the value of the marginal product is twice the marginal cost.

It is at once obvious that, if both the tenant and landlord act as though the interest of one is distinct from the interest of the other, the net product of the farm will be less than it could be. The tenant will farm extensively, and the landlord will refuse to make improvements that would pay under a more rational method of pricing land. Before John Stuart Mill, the well-known English economists condemned share leases on these grounds. Adam Smith argued that the tenant would be extremely reluctant to employ his own capital on the farm, inasmuch as the landlord would re-
receive a large part of the resultant prod-

Arthur Young, in his Travels, de-
cribed the metayer system in France and roundly condemned it: "There is not
one word in favor of the practice, and a
thousand arguments that might be used
against it." He ascribed the low rent of
land in France as compared to England
to the metayer system, because it led to
inefficient farming.

Richard Jones, in his An Essay on the
Distribution of Wealth and on the Sources
of Taxation denounced the metayer sys-
tem on two related grounds. First, "The
divided interest which exists in the produce
cultivation mars almost every attempt
at improvement." His second objection
was more subtle. The argument was as
follows: The metayer system results in a
very meager productivity of agricultural
labor because numerous obstacles to im-
provement inhere in this system. If agricul-
tural productivity stays at a low level,
there will be no change in the relative
numbers of agricultural and nonagricul-
tural population. The strength of a na-
tion is derived from the size and wealth
of the nonagricultural population, while
the nonagricultural population can be
numerous and productive only if farmers
produce much more than is required to
feed themselves. This represents a rath-
er modern conception of the process of
economic progress and is relevant to the
present discussion because of the role

Not only did Smith object to share renting, but he proposed that taxes be used to induce landlords
to use other leasing arrangements: "Some landlords,
instead of a rent in money, require a rent in kind, in
corn, cattle, poultry, wine, oil, etc. Others again
require a rent in service. Such rents are always more
hurtful to the tenant than beneficial to the landlord.
They either take more or keep more out of the pocket
of the farmer, than they put into that of the latter.
In every country where they take place, the tenants
are poor and beggarly, pretty much according to the
degree in which they take place. By valuing... such rents rather high, and consequently taxing
them somewhat higher than common money rents,
a practice which is hurtful to the whole community
might perhaps be sufficiently discouraged" (ibid.,
p. 783).

Arthur Young, Travels during the Years 1787,
1788, & 1789 [in the] Kingdom of France (Dublin,
1798), II, 241.

Ibid., p. 239.
given to "the nature of the conditions under which land is occupied."

McCulloch also discussed the share renting of land, though he apparently had not studied the problem in detail, and his analysis was similar to Smith's. He wrote: "The practice of letting lands by proportional rents . . . is very general on the continent; and wherever it has been adopted, it has put a stop to all improvements, and has reduced the cultivators to the most abject poverty."

Mill took a much more favorable view of the metayer system. He was well acquainted with the literature referred to above and recognized the important point made by Smith. Mill, however, argued that most of the defects pointed out, particularly by Young, were due to imperfections of the metayer system as practiced, not to the operation of a perfect system. Mill apparently felt that insecurity of tenure was the major defect of metayage in France and that, if this were overcome, the metayer system would function well. Mill came to this conclusion from two bits of evidence. First, he attributed the poor state of the

IRISH COTTIER TO INSECURITY OF TENURE AND THE SETTING OF RENTS BY COMPETITION.

Second, relying upon descriptions of metayage in Italy, where security of tenure existed, he concluded that agricultural improvement would take place if the tenant were secure. Mill also relied upon evidence presented by Sismondi, a landowner and a metayer landlord, who favored the system. In Tuscany, where Sismondi owned land, metayers had security, not by law but by custom. Sismondi described the life of metayers in romantic terms, quite contrary to Young's description.

There are several errors in Mill's argument. This is particularly true of his contempt for competitive rents and his belief that all that was required to perfect the metayer system is security of tenure. Under certain circumstances security of

J. R. McCulloch, Principles of Political Economy (Edinburgh, 1843), p. 471. His analysis was stated as follows: "The widest experience shows that tenants will never make any considerable improvements unless they have a firm conviction that they will be allowed to reap the whole advantage arising from them. It is in vain to contend that, as the tenant knows beforehand the proportion of the increased produce going to the landlord, if the remainder be a due return to his capital, he will lay it out. No one tenant out of a hundred would so act. There are always very considerable hazards to be run by those who embark capital in agricultural improvements; and if to these were added the obligation to pay a half, a third, or a fourth of the gross produce arising from an improvement, to the landlord, none would ever be attempted by a tenant, or none that required any considerable outlay, or where the prospect of return is not very immediate." (p. 470)


Ibid., pp. 307-8.
tenure would improve the lot of the tenant; but, as I shall show below, the share system can function effectively, under American conditions at least, only when tenure is of short duration. However, it should be noted that Mill took a more reasonable position than some of his predecessors, by arguing that the low incomes of metayers should not be attributed to the metayer system. Mill argued that it was the "operation of the population principle" that largely determined the economic status of farm people. "A multiplication of people beyond the number that can be properly supported on the land or taken off by manufactures" was possible under any land-tenure relationship.

Mill supported small holdings with fixed tenure on the ground that this system was most likely to engender population restraint and agricultural improvement.

Marshall brought to the discussion of share contracts not only a superior analytical framework but his great insight into the operation and effects of institutions. Marshall added to the precision and generality of the argument, while at the same time he considered the types of adjustments that landlords could make to avoid certain of the disadvantages of share contracts.

Recently Schickele and, more particularly, Heady have rather fully developed the possible deviations in resource allocation that can result from the share contract. Heady concluded that the crop-share contract can be perfected under the following condition: "The cost of variable factors (where one such factor as land is fixed) must be divided between the landlord and tenant in the proportions that hold for the division of the product." He does not indicate whether he would include the sharing of the labor factor by the tenant and the landlord. If he did, the share going to the tenant would be very small, though this need not reduce his income. However, if the landlord paid the tenant for half his labor, the nature of the lease would be drastically altered.

II

There are two important problems relating to the share contract that have not been considered adequately by the writers whose work was described in the previous section. These writers seem to have considered the analytical problem solely in terms of the tenant allocating his resources on a given farm. As a result, economists have neglected the interesting theoretical issue of how the tenant determines the amount of land to rent.

One might conclude from the previous work on share contracts that they inevitably lead to misuse of agricultural resources, low crop yields, and meager land improvements. Though the crop-share contract has probably induced some misuse of agricultural resources, the nature of the deviations from optimum are quite subtle and are not immediately obvious from a cursory examination of American farms operating under different types of

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14 Heady, op. cit., p. 673.
tenure arrangements. Consequently, the second problem that we shall consider is the type of adjustments that landlords and tenants have made in their mutual relations to make crop-share tenancy function reasonably well.

III

A crop-share tenant, like any tenant, must decide how large a farm he will lease. If the lease were a cash lease, economists would say that the amount of land to rent was determined by the point at which the marginal return from the last acre of land rented equaled the rent. Presumably, the crop-share tenant makes his decisions in the same way. If he does, he continues to rent land until the value of the marginal product of the last acre rented is zero. This is surprising, but it can be proved readily.

Let us assume that the tenant combines only two resources—labor \((n)\) and land \((z)\)—and that no restriction is placed upon the tenant by the landlord other than the payment of the stipulated share of the product. The wage rate \((w)\), the price of the product \((P)\), and the share proportion \((\frac{2}{3})\) are constant. We therefore obtain the following equations:

\[
X = f(n, z) \quad \text{(the production function)}; \quad (1)
\]

\[
Y = XP - mw - \frac{1}{3} Xp \quad \text{(the profit or income equation)}; \quad (2)
\]

\[
\frac{\partial Y}{\partial n} = P \frac{\partial X}{\partial n} - w - \frac{1}{3} P \frac{\partial X}{\partial n} = 0; \quad (3)
\]

\[
W = (P - \frac{1}{3} P) \frac{\partial X}{\partial n} = \frac{2}{3} P \frac{\partial X}{\partial n}; \quad (4)
\]

\[
\frac{\partial Y}{\partial z} = P \frac{\partial X}{\partial z} - \frac{1}{3} P \frac{\partial X}{\partial z} = 0; \quad (5)
\]

\[
(P - \frac{1}{3} P) \frac{\partial X}{\partial z} = 0; \quad (6)
\]

\[
P \frac{\partial X}{\partial z} = \frac{1}{3} P \frac{\partial X}{\partial z}; \quad \frac{\partial X}{\partial z} = 0. \quad (7)
\]

Equations (3) and (4) prove what was discussed above and by the other writers mentioned earlier—that labor will be employed until the wage rate is equal to the value of the marginal product to the tenant, which is two-thirds (in this example) of the actual value of the marginal product. These equations can be generalized to include all other factors except land.

Equations (5), (6), and (7) show that the tenant will continue to rent additional land until the marginal physical product is zero. This result may at first seem strange, but it can be demonstrated without the above equations.

When a tenant adds an additional acre of land, its marginal cost is one-third the value of its marginal product. The renter will equate his marginal return from the land to the marginal cost of the land. This equality will exist only when the value of the marginal product is zero; for it is a simple truism that a third of a variable can be equal to the value of the variable only when the variable has the value of zero. Consequently, the tenant can reach a position of maximum profit only when an additional unit of land adds to neither his costs nor his receipts.

The case that we are considering represents an interesting example of a falling supply curve under conditions of apparent competition. Rent per acre is a linear function of the average product of land, and, since the average product is falling, the supply price of land must also be a falling curve. The marginal cost of land, which is not equal to the average rent paid per acre, is equal to one-third the value of the marginal product of land, which is also a decreasing function. The case is depicted graphically in Figure 1.

Linear functions are shown in Figure 1 for simplicity; the example can be gen-
eralized for any type of average-product function. The average-product curve ($CS$) represents the average product per acre to be obtained by renting additional land, which is measured along $OS$. The marginal-product curve ($CT$) is derived directly from the total-product curve. The average-rent curve ($BS$) is one-third the average product, since the share rent is one-third the total product. The marginal-supply price ($BT$) is one-third the marginal product, since the additional rent per acre is one-third the additional product resulting from the use of additional acres. The marginal-supply price must be falling if the average-product curve is decreasing.

The marginal return to the tenant from employing land is equal to the average rent per acre at a price of $OR$ and a quantity of $OX$. However, the tenant is not influenced by the average-rent curve but by the curve indicating the marginal cost of land as shown by the curve $BT$, marginal-supply price of land. Thus in a competitive situation it seems that a falling supply price might emerge.

The share contract results in a curious violation of our usual conception of economic rationality. Under the conditions assumed in our example, the marginal return from land to the farm operator (tenant) is zero. This means that the marginal return to labor is at a maximum and that, if labor is paid the value of its marginal product, the total product will be exhausted by payment to labor. Yet the tenant is willing to pay the landlord a third of the total product for the use of the land, which, at the margin, returns nothing to him. This apparently inconsistent result is possible because labor actually receives only two-thirds the value of its marginal product. The return to labor, after payment of the rent, is equal to its wage and presumably the value of its marginal product in alternative uses. This fact, of course, explains why labor is willing to accept less than the value of its marginal product in its present employment.\footnote{What is argued here means nothing more than that the tenant considers the leasing of the farm as a single opportunity to be compared with not farming or with farming under a cash lease. The supramarginal returns on early labor inputs counterbalance the submarginal returns on later labor inputs.}

The implication of the crop-share contract to the landlord is that the land is being combined with small (relative) amounts of other factors. If these factors get a return equal to earnings in alternative employments, the landlord cannot be receiving as much rent from a specific piece of land as he could under a fixed-rent contract. Under such a contract more labor and other factors would be applied to each unit of land, since labor and other factors would be used until their prices equaled the value of the respective marginal products. Consequently, there would be a larger total product and a greater share (residual) available for payment to land.\footnote{The above reasoning indicates that landlords cannot solve the problem by setting the rental high
IV

Will landlords permit a tenant to use land until the marginal product is zero? By definition, the total amount of land that bears a price is in limited supply relative to existing demands. All such land is presumably capable of producing a marginal product greater than zero in some use. Though there may be some empirical evidence that share-rented farms are exploited less intensively than cash-rented farms in the same area and of the same general type, there are no empirical data which indicate that the marginal product of land has fallen to zero where crop-share contracts prevail.

If the share proportion going to the landlord were variable, it would be easy to see how the share-rent market could establish renting conditions that would achieve a relatively efficient allocation of resources. The landlord always has the alternative of renting for a sum of cash independent of current output. This presumably represents the minimum aggregate amount of rent that he will accept for the farm. Hence, if the tenant follows an extensive program of farming, the landlord will ask for a larger share of a smaller average output. If the share proportion were a function of the amount of the other factors applied per unit of land, the tenant would find that he was confronted with a very different marginal-cost curve for land (though it still might be falling) than if the share were independent of the amount of other factors applied to the land.

The equilibrium conditions can be indicated from the following set of equations. A new rent equation (8) has been added, and this equation indicates that the share proportion decreases as the labor inputs per unit of land are increased and vice versa.

\[ R = g \frac{n}{z} XP \]  
\[ X = f (n, z) \]  
\[ Y = X p - mw - g \frac{n}{z} X p \]  
\[ \frac{\partial R}{\partial n} = g' \left( \frac{1}{z} \right) XP + g \left( \frac{n}{z} \right) P \frac{\partial X}{\partial n} \]  
\[ \frac{\partial Y}{\partial n} = P \frac{\partial X}{\partial n} - w - g' \left( \frac{n}{z} \right) XP - P \frac{\partial X}{\partial n} \]  
\[ \frac{\partial R}{\partial n} = w + PX \frac{\partial r}{\partial n} + rP \frac{\partial X}{\partial n} \]  
\[ \frac{\partial R}{\partial z} = g' \left( \frac{-n}{z^2} \right) XP + g \left( \frac{n}{z} \right) P \frac{\partial X}{\partial z} \]  
\[ \frac{\partial Y}{\partial z} = P \frac{\partial X}{\partial z} - PX g' \left( \frac{-n}{z^2} \right) - g \left( \frac{-n}{z^2} \right) P \frac{\partial X}{\partial z} \]  
\[ \frac{\partial R}{\partial z} = PX \frac{\partial r}{\partial z} + rP \frac{\partial X}{\partial z} = \frac{\partial R}{\partial z}. \]

Equation (13) indicates that the tenant will use labor until the value of the marginal product is equal to the wage rate plus the marginal change in rent resulting from the marginal input of labor.
The quantity $\partial R/\partial n$ may be either negative or positive, since $\partial r/\partial n$ is negative and $\partial X/\partial n$ is positive. If $\partial R/\partial n$ is positive, the tenant will use less labor on a given piece of land than he would if he rented it for cash at the same average rent ($R/\bar{z}$).

Equation (16) shows that the tenant will use land until the value of the marginal product equals the marginal cost of land, which is reflected in the change in total rent resulting from renting an additional acre of land. Thus it is apparent that the tenant will not continue to rent land until its marginal product is zero.

Is it likely that a tenant operating under these conditions will allocate his resources in exactly the same way that he would if paying a cash rent independent of the actual output? The answer is apparently in the negative. There is only one average rent per acre for which the resource allocations will be the same under a variable-share proportion and a fixed rent per acre. And there is no reason to believe that this particular rent would emerge under competitive conditions.

There is no evidence that the rental share varies with the intensity of cultivation. Evidently landlords have not availed themselves of the possibility of varying the rental share (in the manner described above) as a means of increasing the rent.

V

I have stated earlier that the crop-share lease has not resulted in the gross misallocation of land that would have occurred if the tenant had actually combined so few nonland resources with the land as he would have if he had not had to consider the landlord's interest. The evidence we have on the actual rents paid under crop-share and cash leases substantiates this thesis. Though admittedly inadequate, the available evidence indicates that the crop-share contract yields at least as much, if not more, rent per acre than does the cash lease on comparable farms. Since the crop-share landlord bears a large proportion of the uncertainty confronting the farm firm, he must receive a larger rent to compensate him.

How has the landlord protected his interest and achieved a reasonable level of rent? Three techniques are available to the landlord for enforcing the desired intensity of cultivation. The first is to enter into a lease contract that specifies in detail what the tenant is required to do. A second is to share in the payment of expenses to the same extent as in the sharing of the output. The third is to grant only a short-term lease, which makes possible a periodic review of the performance of the tenant.

The landlord can enter into a contract that specifies in considerable detail what the tenant must do: the amount of labor to be used, the methods of cultivation, the application of fertilizer, and so on. Though this is apparently done in Europe, it is uncommon in the United States. I have estimated net rents on crop-share-rented farms in Iowa from 1925 through 1946. From 1925 through 1934 net rents on share-rented farms averaged perhaps a dollar per acre less than on cash-rented farms. From 1935 through 1939 the net rents were roughly the same. From 1940 through 1946 net rents were at least four dollars an acre more on share-rented than on cash-rented farms. These data are not presented as conclusive evidence, partly because of the roughness of the statistics and partly because it cannot be proved that the lands rented under the two lease types are comparable (for data on cash rents see H. R. Johnson, *The Farm Real Estate Situation*, 1946-47 [U.S. Department of Agriculture Circ. No. 780], p. 29).

A description of existing metayer contracts in Italy by Giacomo Giorgi is in point here. Among the conditions which the tenant accepts is the following: "to cultivate rationally the farm in accord-
States. However, there are certain conditions in this country under which the landlord has a reasonable assurance that the land will be farmed with the appropriate intensity. One set of conditions is illustrated by wheat farming in the Great Plains. Technological conditions are such that a given level of intensity of cultivation is best adapted to the region. Either lower or higher levels of intensity provide appreciably smaller marginal returns to the variable factors. Since the farmers are uncertain as to the exact effect of modest variations in inputs, most farmers follow a fairly traditional input level.

The sharecropper situation in the South represents another case in point. Here the landlord assures himself of the appropriate intensity of cultivation by supplying seed, fertilizer, and most or all of the equipment. By keeping the size of the individual unit small enough, the landlord can force the sharecropper to apply more labor per acre than the sharecropper would if he were free to choose the size of his farm. If the unit is small and the sharecropper is restricted in outside earnings, he must apply his labor and that of his family until he has achieved at least some minimum level of income. He might continue to work until the marginal satisfaction derived from his share is equal to the marginal disutility of work; but, if the land area is kept small enough, the marginal utility of income will be very high. In this way the sharecropper will be forced to farm as intensively, if not more so, as he would if he rented for a cash payment.

In the two cases described, the problem of achieving the appropriate degree of intensity is fairly easily solved. However, where the tenant supplies all the (nonland) capital and labor and these resources may be combined with land in continuously varying proportions over a wide range, the bargaining process must be somewhat more subtle, as well as more complex. In the Corn Belt the crop-share contract is widely used; yet the tenant can apply his capital and labor to a greater or less degree in his livestock enterprise and slight his crop enterprises.

By sharing certain expenses, the landlord can induce a more rational allocation of resources. In this case the tenant and the landlord will make the decision jointly and can arrive at the best allocation of resources. However, within the framework of the crop-share lease, the possibility of sharing expenses is limited in scope. The most complete sharing is in the livestock-share lease, but this involves a fairly radical departure from the crop-share basis.

It seems unlikely that either of the alternatives discussed is sufficient to prevent the tenant from “exploiting” the landlord. A much more powerful restraint upon the tenant must prevail. In my opinion this restraint is the short-term lease. This type of lease is alleged to be a serious shortcoming of American tenure institutions; but, without it, there seems little likelihood that the crop-share lease would lead to a reasonably efficient use of land. The crop-share contract has fallen into disrepute throughout western Europe, and a major reason is that the

2 Even in this case, the tenant has some freedom of action. He may own capital equipment which he rents to other farmers and may neglect his own farm as a consequence.
tenant generally has permanent tenure. If the tenant cannot be dispossessed, it is difficult for the landlord to enforce a given intensity of cultivation.

With a short-term lease renters are obviously aware that landlords have the alternative of renting their land for a cash rent independent of current output. Consequently, the tenant must plan to produce an average output per acre that will provide a rental payment, if yields are average, equal to the possible cash rent plus any additional payment required to compensate the landlord for the uncertainty that he bears.

If the renter does not give certain assurances that the degree of intensity of cultivation will be such as to provide the appropriate rent, he will be unable to find a farm. Once he has found a farm, he may fear that his lease will not be renewed unless sufficient rent is actually paid. Since the cost of moving is substantial and his previous production performances are likely to affect his ability to locate a new farm, he will have an incentive to farm in a fashion that will provide the necessary rental payment.

The tenant’s position may be illustrated by Figure 2. In this diagram it is assumed that he is renting a specific farm and is applying his labor to it. He owns 10 units of labor, and its price in alternative employments is $5.00 per unit. If the tenant maximized his income for the given year, he would utilize 5 units of labor on the farm and sell the rest of the labor. His income would then be $56.50 for the year. If he applied all his labor on the farm, he would receive $50. This would be true whether he rented for a fixed cash payment equal to Ricardo’s residual or for a 50 per cent share.33

The tenant’s action in this case will depend upon what he thinks “he can get by with.” Looking at the alternative, as a whole, of farming this particular farm, he loses nothing by applying all 10 units of his labor to the farm. The loss on the last 5 are just counterbalanced by the “rent” on the first 5.24 The tenant might try to use only, say, 9 units of labor on the farm and 1 unit elsewhere, on the assumption either that this would not be detected by the landlord or that it would not be resented if it were. The latter assumption hardly seems justified, and the landlord is undoubtedly sensitive to the first circumstance.

The loss to the landlord is very considerable if the tenant applies only 5 units of labor to the land. The landlord

33 The example has been chosen in this way to illustrate a riskless situation. In actual cases the share rent seems to be in excess of cash rents largely because of the risks borne by the landlord.

24 Schickel argues—incorrectly, I believe—that whenever a farmer uses more inputs than indicated by the equality of the marginal return and the cost to the tenant of the input, “he is paying a hidden privilege rent to the landlord for being permitted to stay on the farm” (op. cit., p. 193). Actually if the tenant does not apply more inputs than is indicated by this criterion, the landlord is being exploited.
will receive only $31.50 instead of $50.00—a loss of roughly one-third the rent.

The example chosen above assumes that, if the tenant applied the same quantity of capital and labor to the farm as he would under a cash lease, the landlord's share would exactly equal the rent, defined as the value of the marginal product of the land. Since the crop share is uniform for large areas, including land of diverse productivity, the correspondence between the landlord's share and "true" rent is not likely to be achieved so readily. One possible way of attaining it is to vary the cash rent for hay and pasture land and for buildings. Some cash rent is paid on most crop-share farms, though not on all. If the land productivity of a particular farm is relatively high compared to other farms with the same share rent, the cash payment may reflect this difference. If the share rent on land of the lowest productivity is sufficient to equal the possible cash rent, the exaction of higher cash rent for land used for nonshare purposes will not create additional distortions in resource use. This will be true even if the cash payment for pasture and hay land and buildings is above the value of their marginal product. One of the conditions which the landlord generally imposes upon the tenant is that a certain proportion of the farm be devoted to hay and pasture. Once this decision is made, the cash payment for this land becomes a fixed cost and affects the tenant's decision only with regard to renting the farm or not. The extra payment would not affect current input decisions and would not create any additional impediments to rational resource use.

If the share proportion were too high on land of low productivity, it would be hard to visualize how the crop-share lease could function. One would expect that, if the share were too great, either the land would lie idle or it would be farmed very extensively. For example, some hitherto cultivated land of poor quality was actually left idle during the thirties in the North Central and Great Plains states because tenants could not be obtained to farm it on the prevailing share arrangement.

The process by which the landlord and tenant enter into a lease is not well understood. The price system does not function in the normal sense, for land is not necessarily rented to the tenant offering the highest rent payment. However, there is only a difference of modest degree in the role of price rationing in the share-rental market and in the cash-rental market. When a man sells a bushel of wheat, he has no interest in the use to which the wheat is put and is consequently willing to sell to the highest bidder. However, when a man sells the use of land, he has a real interest in how the land will be used. Consequently, the choice of tenant is never made without considering what the impact of the tenancy will be upon the value of the asset. The crop-share tenant is presumably chosen in terms of explicit or implicit notions concerning the level of output that he will produce on the farm. Any agreement that is reached is enforced by the short-term condition of the tenure rather than by a detailed lease contract.

VI

The material in this paper leads to the conclusion that the short-term lease serves a useful purpose in creating conditions within which the crop-share

\[\text{Cf. Heady, op. cit., p. 674.}\]
results in a reasonably efficient utilization of land. Most students of farm tenure strongly disapprove of short-term leases but have failed to recognize its advantages.

But it must be admitted that the conclusion rests on a premise that has not been adequately verified. The premise is that crop-share tenants do not combine nonland resources with land in nonoptimum proportions to a greater degree than do cash tenants. Yet the evidence on the equivalence of rent under the two lease contracts is consistent with only one other hypothesis: namely, that crop-share tenants have lower incomes than cash tenants. The latter hypothesis assumes that crop-share tenants are exploited by the landlord, while the conditions of the crop-share lease lend credence to the opposite view.

Admittedly, the short-term lease has numerous disadvantages. One of its main disadvantages is that it reduces the expected value to the tenant of the marginal product of semidurable inputs. This can be remedied in part by providing for

compensation for unexhausted improvements, which can be suggested more readily than it can be accomplished. But the most serious disadvantage, from both an economic and a social viewpoint, is the high mobility of tenants inherent in the short-term-lease system. The cost of moving is important, but perhaps more important as an economic cost is the loss in productive efficiency due to unfamiliarity with the physical characteristics of the land during the first year of tenancy. The relatively low social status of the tenant can be attributed to his actual or assumed temporary residence in the community.29

VII

Almost sixty years ago Alfred Marshall wrote: "There is much to be gained from a study of the many various plans on which the share contract is based."30 This same statement can be made today.31 The interests of farmers, politicians, and agricultural and land economists have all been so diverted by the value presumption of farm ownership that all too little attention has been given to analysis of the effects of rental contracts upon resource use. There are certain exceptions to this generalization, including the articles by Heady and Schickele referred to above. But even in these cases the analysis is not based upon data that indicate how the rental market actually functions and how share leases affect the use of resources.

From the conclusions of this paper it

27 A comparison of the relative efficiency with which resources are used on farms leased under crop share and cash rents can be made without too much difficulty. It involves only two things: first, an estimate of the income of comparable tenants under the two leases (the most important element of comparability is the capital position of the tenants) and, second, an estimate of the net rent paid per acre of comparable land. A rough test can be made by comparing the net output of farms of approximately the same size.

28 It is difficult to understand why the short-term lease has persisted for cash-rent leases. One reason may be that American landlords are always ready to sell their farms if a capital gain can be realized. A long-term lease would make it difficult to sell to an owner-operator. Another reason may be the fear that tenants, because many of them want to be owners, will exploit a rented farm as a means of accumulating capital. A short-term lease is a protection to the landlord. Finally, it is extremely difficult to adjust rents under a long-term lease. And if rents are to be established competitively, failure to agree over the rent bargain must be left as a condition for terminating the lease.


31 In making this comment, I have relied mainly upon the survey of research in this field given by Leonard Salter, A Critical Review of Research in Land Economics (Minneapolis: University of Minnesota Press, 1948), chap. vii.
is unreasonable to presume that the resource use on farms with crop-share leases, for example, depart as far from the optimum as is suggested by the analysis of what the tenant would do if he were left free to do as he chooses. He is, of course, not free to do exactly as he pleases. In fact, under certain circumstances the share contract would not result in any loss in resource efficiency. Yet we do not have the empirical information which would permit us to say whether the actual functioning of share leases results in little, much, or no misuse of resources. I hope, however, that the issues have been so formulated in this paper as to permit an empirical verification of certain of the more important effects of share leases upon resource allocation.
THE MONETARY MECHANISM SINCE THE WAR

EDWARD C. SIMMONS
Duke University

Because it is composed of a large number of banks operating on the fractional reserve principle, the banking system of the United States is inherently unstable. The bank failures that used to provide continuous evidence of the system's instability have been almost unknown in recent years. But other symptoms persist. To the extent that its structural characteristics promote monetary instability, the system continues to operate unsatisfactorily. This has important implications for economic stability. With the economy's stock of money subject to fluctuations because of structural deficiencies in the monetary and banking apparatus, the task of achieving economic stability becomes more difficult than it need be. Efforts to employ monetary policy as a stabilizer may be thwarted by the tendency of the system to produce autonomous changes in the money supply. This paper surveys the deficiencies of the mechanism as revealed by its functioning since 1945.

The fundamental cause of the difficulty is that the monetary control mechanism represents an adaptation of a device that was created for a quite different purpose. Reserve requirements were originally imposed for the purpose of keeping banks liquid. Inevitably the effect of this action was to limit the power of the system of banks to expand bank liabilities. From time to time federal and state laws governing bank reserves have undergone modification. Some changes have been motivated by the idea that legal reserve requirements are for the purpose of preventing bank failures. Others, such as the 1935 redefinition of net demand deposits, have been directed at improving the power of the authorities to control the size of the money stock. A thoroughgoing reconstruction of the apparatus of monetary control is needed if the potential usefulness of monetary policy is to be realized. The process of adaptation and piecemeal reform has not produced a control apparatus adequate for its purpose.

The Federal Reserve authorities are currently studying reserve requirements with a view to proposing a substantial reform. Recently they proposed that

1 There is more than a remote possibility that bank failures may again become numerous. The suspension of only five banks, all of which were non-insured, in the period December 31, 1945—June 30, 1949, is not conclusive (cf. Annual Report of the Federal Deposit Insurance Corporation for 1947, pp. 17-18).


3 This study is a joint undertaking of the Board of Governors of the Federal Reserve System and the Federal Reserve banks. The committee's tentative recommendations were released on May 27, 1948 (see Hearings, Joint Committee on the Economic Report, April 13, 16, May 12, 13, 27, 1948 [Washington: Government Printing Office, 1948], pp. 131-32). These recommendations are not to be confused with various temporary proposals to deal with inflation by raising bank reserve requirements, or with the Board of Governors' proposal that banks be required to hold special reserves in the form of government securities. The latter proposal is outlined in the Federal Reserve Bulletin, XXIV, No. 1 (1948), 10-23. The Board of Governors has
(1) the present threefold classification of member banks and twofold classification of deposits be replaced by a threefold classification of deposits into demand, time, and interbank deposits with initial reserve requirements of 20, 6, and 30 per cent, respectively; (2) the Open Market Committee be given power to raise or lower these ratios within limits; (3) vault cash be counted as legal reserves; and (4) net demand deposits be redefined with only cash items as a deduction.\(^4\)

Although a revision of member-bank reserve requirements along these lines would improve the monetary control mechanism, the inherent instability of a unit banking system constructed on the fractional reserve principle would persist.\(^5\) Reserve requirements, at which the Federal Reserve proposals are primarily directed, are unsatisfactory, and, moreover, the volume of reserves available to the banks for satisfying the requirements fluctuates unnecessarily. At least some of the instability in the system may be eliminated by modifying those features which are not inevitable consequences of permitting banks to operate on the fractional reserve principle. Only the absolute abandonment of the fractional reserve principle will entirely remove the inherent instability of the system.

With the present type of monetary and banking mechanism, both the volume of money and the volume of funds made available to borrowers by banks are capable of undergoing violent concomitant variations. Major emphasis should be placed on the former un-stabilizing factor, because its effects are far more pervasive than those assignable to the latter. It is deplorable that the provision of the medium of exchange has become almost inextricably confused with the provision of capital funds, but, short of a complete reconstruction of our monetary and financial institutions, the dualism will persist. This paper does not consider ways of separating money-creating from money-lending. Its scope is limited to a description of the manner in which reserve requirements and bank reserves have recently functioned as control devices to govern the volume of the means of payment. To the extent that the monetary authorities consciously have endeavored to produce changes in the community's stock of money, they have been hindered by the structural peculiarities of the system. But there is some evidence that they have not employed this manifestly imperfect mechanism with a very high degree of skill. No apparent effort has been made to compensate for autonomous changes in reserve ratios. The volume of reserves available to banks has been allowed to vary spontaneously.

To appreciate the nature of the difficulties, it is necessary to examine briefly the principal structural features of the monetary system. Our medium of exchange consists of a mass of specialized debt instruments in the technical form of promises to pay money, which institutional developments have endowed with the capacity to serve as money. The primary element is the demand deposits, or demand debts, of commercial banks. The secondary element is hand-to-hand money, which exists as central-bank debt and government debt. Institutional de-
developments have also provided a mass of debt instruments such as time deposits and government securities, which, while they do not circulate, are close money substitutes. The volume of those specialized debt forms serving as money has been brought under control by requiring the obligors on these specialized debts to hold fractional reserves against their liabilities. These reserve requirements, cash balance have substantial effects on reserves and hence on the volume of bank deposits.

The existence of differential reserve ratios for the several money-issuing agencies greatly complicates management of the money supply. Ideally, all forms of debt which serve as a means of payment should be subject to the same reserve requirement. Even if that is not feasible

| TABLE 1* |
| SELECTED RATIOS EXPRESSING RELATIONSHIPS AMONG SIGNIFICANT ELEMENTS OF THE MONETARY STRUCTURE |

<table>
<thead>
<tr>
<th>Ratio</th>
<th>December 31, 1945</th>
<th>December 31, 1948</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency outside banks to adjusted demand deposits of all banks</td>
<td>34.9</td>
<td>30.4</td>
</tr>
<tr>
<td>United States government deposits in commercial banks to adjusted demand deposits of all banks</td>
<td>32.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Adjusted demand deposits of central reserve city member banks to those of all member banks</td>
<td>28.4</td>
<td>26.7</td>
</tr>
<tr>
<td>Currency outside banks plus adjusted demand deposits of all banks to monetary gold stock</td>
<td>19.6</td>
<td>21.7</td>
</tr>
<tr>
<td>Adjusted demand deposits of all member banks to those of all insured commercial banks</td>
<td>85.9</td>
<td>85.7</td>
</tr>
</tbody>
</table>


however, are not uniform. The effect of the diverse practices authorized for the several types of money-issuing agencies is to create a situation in which the volume of money is partly determined by the form in which money is held. If demand deposits shift about among the three classes of member banks, the effect may be to cause reserve deficiencies or to produce excess reserves, because three different reserve ratios are prescribed. If demand deposits shift between member and nonmember banks, a similar but more complex effect is produced. If the composition of the money stock changes as between demand deposits and currency, excess reserves or deficiencies in reserves are brought about. And, since the national government maintains accounts both with the central bank and with commercial banks, changes in its within the present structure, the present complex of reserve ratios is capable of some simplification; and measures can be devised that will compensate for changes due to structural features which cannot be eliminated.

The magnitude of the shifts which take place among the elements comprising the money stock is indicated by the ratio comparisons presented in Table 1. The changes in most of the ratios in the period 1945-48 are not large, but even small changes in such ratios are significant. For example, the decline in the

6 This condition could be realized under the 100 per cent plan. An alternative would be to restore the power of note issue to commercial banks and to have the national government keep its checking account in these banks. The 100 per cent plan seems to be only a remote possibility. The alternative mentioned would probably create an even less satisfactory situation than the present one.
relative importance of currency had the effect of increasing the coefficients of expansion of the monetary mechanism. The practical consequence of shifts such as these is that the monetary authorities cannot determine the amount by which bank reserves must be changed to bring about a desired alteration in the aggregate money stock. The way in which changes in bank deposits are associated with changes in bank reserves may be illustrated conveniently by comparing the rate of change of bank reserves with the rate of change of bank demand deposits as in Table 2. In each of the six half-year intervals, one observes that changes in reserves and deposits were consistently in the same direction. However, the rates of change of these two presumably closely related elements do not correspond. Changes in excess reserves do not account for this, since they moved only through a narrow range. The raising of legal reserve requirements of member banks in 1948 complicates the matter, but, even if allowance is made for that, words, that movements in aggregate demand deposits and aggregate bank reserves would be more nearly in proportion.

The establishment of uniform reserve requirements for all commercial banks, rather than for member banks, would remove part of the difficulty. Changes in firms' and individuals' holdings of currency relative to bank deposits are also responsible for nonproportional move-

In anticipation of the objection that movements of adjusted demand deposits of all commercial banks should not be compared with movements of legal reserves of member banks, it may be said that the latter is or should be controllable by the monetary authorities and that the former is the principal element of the money stock. The method used in comparing the rates of change of the two variables is admittedly crude. However, the technique used suffices to illustrate a fundamental deficiency of the existing mechanism.

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**Table 2**

<table>
<thead>
<tr>
<th>Period</th>
<th>Percentage Change in Member-Bank Reserves</th>
<th>Percentage Change in Adjusted Demand Deposits of All Commercial Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 31, 1945—June 30, 1946</td>
<td>+ 0.6</td>
<td>+ 4.8</td>
</tr>
<tr>
<td>June 30, 1946—December 31, 1946</td>
<td>+ 0.1</td>
<td>+ 4.8</td>
</tr>
<tr>
<td>December 31, 1946—June 30, 1947</td>
<td>− 0.2</td>
<td>− 1.4</td>
</tr>
<tr>
<td>June 30, 1947—December 31, 1947</td>
<td>+11.1</td>
<td>+ 6.0</td>
</tr>
<tr>
<td>December 31, 1947—June 30, 1948</td>
<td>− 2.8</td>
<td>− 5.0</td>
</tr>
<tr>
<td>June 30, 1948—December 31, 1948</td>
<td>+17.0</td>
<td>+ 3.4</td>
</tr>
<tr>
<td>December 31, 1945—December 31, 1948</td>
<td>+29.0</td>
<td>+12.6</td>
</tr>
</tbody>
</table>


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7 Coefficient of expansion is defined as the ratio of deposits and currency to reserves. It provides a measure of the amount of money that can be created on a given volume of reserves. There is a family of such coefficients.
ments of reserves and deposits. Such effects cannot be prevented under existing arrangements where hand-to-hand money is a liability of the central bank (or to a minor extent of the government) and deposits are a liability of commercial banks. Only under the 100 per cent plan could this feature of the system be eliminated. Changes in government deposits are also responsible for the nonproportional movements of reserves and deposits. These changes will be examined in detail in a subsequent section, but at this point it may be observed that, since the government maintains a fluctuating cash balance, reserves and deposits are made to undergo marked short-run changes.

Bank reserves support not only demand deposits but also time deposits. Part of bank reserves are therefore occupied in providing liquidity for persons who find it convenient to hold part of their wealth in this kind of near-money. Fortunately, time deposits are quite stable in the aggregate and do not cause significant short-run disturbances. During the three-year period 1945–48, time deposits of all commercial banks increased from $30,241 million to $35,921 million, with the bulk of the increase in the early postwar period. Monetary management would be simplified if time deposits were eliminated entirely, both because they absorb reserves and because they are a close substitute for money. However, so drastic a reform is probably not to be considered. The growth of time deposits in the postwar years had the effect of absorbing reserves which would otherwise have been available to support an expansion of demand deposits. Such absorption may easily be offset by open-market operations if that is appropriate, but no policy has ever been established for this matter. Consequently, changes in time deposits tend to produce autonomous changes in demand deposits.

Interbank deposits shift in amount and location with consequent effects on bank reserves. They are also subject to nonuniform reserve requirements. Because of their special treatment in the formula by which required member-bank reserves are computed, the impact of variations in interbank deposits on required reserves is somewhat reduced. However, the neutralization is not complete. Excess reserves appear and disappear as banks decrease and increase their correspondent balances.

In the three years since the war, interbank balances have declined. Balances with domestic banks held by member banks fell from $7,117 million on December 31, 1945, to $5,674 million on December 31, 1948. Interbank deposits in member banks held by domestic banks declined from $12,333 million to $10,098 million between the same dates. Although part of the reduction is explained by nonmember commercial-bank withdrawals, which amounted to $493 million, member banks evidently withdrew interbank deposits from one another. The reduction in interbank deposits following the war is not surprising. Banks were increasing their earning assets rapidly. Since expansion was not uniform throughout the system, some banks must have been hard pressed at times to meet reserve drains. They had built up their interbank balances during the 1930's and during the war as excess reserves fell into their possession, and these balances are one of the leading means of covering reserve drains.  

War-loan drives had the effect of increasing the amount of interbank deposits because government deposits in commercial banks had been exempted from reserve requirements. Consequently, as public purchases of new securities took place, the amount of required reserves declines. Efforts of the Federal
When banks utilize interbank deposits for this purpose, the amount of required reserves alters. Consequently, excess reserves are affected. The required reserves of the bank making the withdrawal are actually increased slightly, although the over-all effect is to reduce required reserves. This comes about because demand balances held with domestic banks are deducted from gross demand liabilities in establishing a member bank’s net demand deposits. An illustration may help to clarify this point. A country bank which transfers $100,000 deposited with its city correspondent to its Federal Reserve bank finds that its net demand deposits have increased by the same amount. If its required reserve ratio is 14 per cent, it has gained $86,000 in excess reserves. Simultaneously, the city correspondent finds its net demand deposits reduced by $100,000, and its required reserves reduced by $22,000, on the assumption that its required reserve ratio is 22 per cent. Although the country bank now has $86,000 of excess reserves, only $22,000 of required reserves have been released elsewhere in the system.

The remainder of the excess reserves gained by the country bank must be drawn from other banks and presumably is obtained through the liquidation of earning assets by its city correspondent. The important point, however, is that the transfer has had the effect of immobilizing only $14,000 of the $22,000 of required reserves previously held by the city bank. This effect arises because the city bank and the country bank are subject to different reserve ratios.

Similarly, when a country bank transfers excess reserves to a city correspondent, some excess reserves disappear. For example, if a country bank transfers $100,000 to its city correspondent, it finds that its required reserves have declined because its net deposits have fallen by the amount of the transfer. This releases a further $14,000 of excess reserves, which may also be shifted. In all $116,279.03 theoretically could be shifted by a succession of diminishing transfers. The city correspondent, however, gains only $90,697.64 of excess reserves, because of its having to meet a 22 per cent reserve requirement. In this example, approximately $10,000 of excess reserves have disappeared because of a difference in the reserve ratios of the two banks.

Although the application of a uniform reserve ratio to all banks would eliminate the effects on required reserves described in the foregoing example, the Federal Reserve committee has devised an alternative procedure which would serve the same purpose. Since interbank deposits are utilized as operating reserves by member banks and as legal reserves by nonmember banks, and since an abrupt change to a uniform demand-deposit reserve ratio would create large excess reserves for some banks and large deficiencies for others, it is proposed that interbank deposits be subject to a higher reserve requirement than demand deposits of firms and private persons. To eliminate the effects of changes in interbank deposits on required reserves, these deposits would be treated by the “reserve credit method.” That is, a bank holding a

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Reserve authorities to persuade banks to utilize Treasury bills to absorb excess reserves so generated were only partly successful.

The use of a net deposit liability concept in computing reserve requirements dates back to the national banking system era (Rodkey, op. cit., pp. 88-89). Prior to 1935, deduction of “due from banks” was conditional, depending on the size of “due to banks.” The change made in 1935 was recommended by the 1931 Federal Reserve System’s Bank Reserves Committee. On the effects of the pre-1935 formula see L. B. Currie, Supply and Control of Money (Cambridge: Harvard University Press, 1934), pp. 71-74.
deposit with a correspondent would deduct from required reserves the amount of reserves held by the correspondent against that particular deposit. The depositing bank would, of course, no longer be permitted to deduct “due from banks” from gross demand deposits in computing net demand deposits. The reserve credit method meets the requirement of neutralizing shifts in interbank deposits. It permits differential reserve requirements to be applied without opening the way, as at present, to creation and destruction of excess reserves when interbank deposits change.

In effect, for the banking system as a whole, the “reserve credit” method of treating those deposits would release them from reserve requirements entirely, although this would not be the effect on any one bank. Existing practice partly releases interbank deposits from reserve requirements in an over-all sense. Today a bank which holds balances with correspondents in effect is permitted a reduction in required reserves equal to the product of its own reserve ratio multiplied by the amount of these balances. Correspondent banks, however, tend to hold larger required reserves than the allowed reduction, because their required reserve ratios are higher. Increases in interbank deposits have the effect of increasing aggregate required reserves as the system now operates. It is possible, however, to devise means by which the aggregate reserves of the commercial banking system may be unaffected by changes in the amount of interbank deposits, even with different reserve ratios for demand and interbank deposits. The proposed change in reserve requirements is desirable. Had it been adopted prior to 1946, the postwar decline in interbank deposits would not have had the result of creating excess reserves in a situation where exactly the opposite action was called for.11

There are certain consequences of fractional reserve banking on monetary fluctuations which are seen only when one examines the impact of reserve requirements on individual commercial banks or small groups of banks. Even if reserve requirements were uniform and if the total volume of legal reserves of all banks were constant, the stock of money would be subject to short-run variation as deposits shifted about from one bank to another. Only if the number of banks were constant and if each bank held an unchanging fraction of the total volume of deposits would there be complete stability. In the presence of nonuniform reserve ratios and fluctuating aggregate reserves the tendency toward instability is intensified. Furthermore, to the individual bank, its legal reserve ratio and its legal reserve balance do not appear to be monetary control devices but rather devices which limit its money-lending capacity. What is more, from an operating point of view its legal reserve balance seems little different from several other assets which it utilizes in its day-to-day operations in covering reserve drains.

Considering the banking system as a whole, obviously the aggregate volume of bank deposits is determined by the reserve ratio and the aggregate volume of reserves; but the control function of reserves and of the reserve ratio is not apparent to the individual banker. The amount of a bank’s reserves is governed, as the banker sees it, by the net inflow or outflow of deposits which in turn limit him to a passive role in making loans and

11 One should perhaps observe that the effect of increasing member-bank reserve requirements since 1936 has been to widen the spread between the ratios of the three classes of member banks. This has intensified the effects of shifts in interbank deposits.
investments. In meeting the reserve requirement imposed by law, the banker must retain a considerable portion of his assets in nonearning form. It is because reserves are required in proportion to deposits that over-all control is possible, but to the individual banker this remote social purpose is of no consequence. He is concerned with remaining solvent and making profits.

Legal reserve requirements must be so designed that control of the aggregate deposits of all banks may be effective and also that commercial banks may operate as profitable business enterprises. From the control point of view, the ideal situation would be one in which invariable uniform reserve requirements applied only to demand deposits and primary reserves consisted only of legal reserves. From a business point of view the ideal situation would be one in which the individual banker kept only such reserves as his judgment dictated and in whatever form he found convenient. Existing arrangements represent an unsatisfactory compromise of these two divergent points of view.

Member banks are required by law to maintain an average minimum legal reserve against net demand deposits and time deposits in the form of a deposit balance at the central bank. In practice banks carry, in addition to their balances at the central bank, reserves in the form of cash in vault and deposits with other commercial banks, as well as secondary reserves in the form of readily salable income-producing assets. They are permitted to utilize their legal reserves without penalty to meet drains imposed upon them, so long as these reserves average out to the required percentage of their net demand deposits and time deposits. If a bank’s reserve ratio is declining, it must replenish its reserves, which may be done in a number of ways, such as shipping vault cash to the central bank, drawing on its balances with correspondents, selling secondary reserve paper and investments in the financial market, calling loans, and borrowing from the central bank or from correspondents. Although all these avenues produce new reserves for the individual bank, only in those cases in which the central bank expands is there an increase in the aggregate reserves of all banks together.\(^\text{\textsuperscript{16}}\)

A fractional reserve banking system thus has an expansionary bias, once expansion has continued for a time, because the individual bank seems to be able to command large quantities of reserves to meet possible future drains. If the central bank takes steps to absorb some of the banks’ aggregate legal reserves, all banks are not instantaneously constrained to adopt a less expansionary attitude. Only after a time is the impact transmitted throughout the system; and, if the central bank does not act with caution, it may induce a wave of contraction of panic proportions.

If it were feasible for banks to be guided in their day-to-day operations by their legal reserve positions, the system would work more smoothly. Given our traditional banking structure, we trust that the central bank, in generating and destroying legal reserve funds and by infrequently altering legal reserve ratios, can induce thousands of banks smoothly to expand and contract the money stock.

\(^{16}\) To the extent that the individual bank deals with its own depositors, as in calling loans which are paid off by the borrower’s use of his deposits in the same bank, new reserves are not realized. Then the bank improves its position only to the extent that the decline in its deposits released some of its previously required reserves, which are only a fraction of the deposits canceled. If all banks together attempt to gain reserves, a similar effect is produced for the system, unless the central bank generates new reserves.
Changes in aggregate legal reserves should be brought about at a slow and uniform rate, but this has not been the practice followed in the postwar period.

How the legal reserve mechanism works may be seen by examining briefly the sequence of events when deposits shift from bank to bank as payments are made between persons who carry accounts in different banks. A bank gaining deposits receives checks on other banks which it proceeds to collect through a local clearing-house or through the out-of-town collection facilities of the central bank. To some extent the checks are offset against items moving in the opposite direction, but a bank which is gaining deposits is collecting more checks than it is paying. After a brief delay necessitated by the collection time lag, the collecting bank gains legal reserves, and other banks lose legal reserves.

This necessitates a shift in earning assets, since under the fractional reserve principle a bank which loses deposits will find that its reserve ratio has fallen below the minimum. The bank which gains deposits can and usually will expand its earning assets because its reserve ratio has risen above the minimum. A multiple contraction of deposits will be induced by the efforts of the bank with deficient reserves to restore them. At the same time a multiple expansion of deposits will be started by the bank with excess reserves.

These deposit movements are of a multiple type because the fractional reserve principle provides the bank losing deposits with only a portion of the funds required to cover the checks which it must pay. Unless it adjusts its reserves by calling loans made to its own depositors, which is unlikely, its effort to obtain reserves will induce sales of earning assets, and this will cause other banks to contract in turn. Elsewhere in the system, however, a multiple expansion has been started, because the bank which gains deposits acquires earning assets, releasing its excess reserves to other banks, which in turn expand. Literally thousands of such waves of contraction and expansion go on continuously in a unit banking system with fractional reserves. Both types of waves are damped, and, since they are mutually offsetting, ordinarily no difficulty arises. Each day some banks are obliged to dispose of small portions of their earning assets, and other banks are able to add to their holdings.

If the assets disposed of by contracting banks are precisely the assets sought by expanding banks, the shift may be made smoothly. For example, if all banks held Treasury bills exclusively as earning assets, deposit shifts among banks would be accompanied by shifts of legal reserve balances and Treasury bills. However, where the contracting bank calls local loans in, say, an agricultural region and the expanding bank makes local loans in, say, a metropolitan community, the effect will be to produce a shift in the public’s asset holdings. In order to facilitate the transfer of assets among banks necessitated by deposit movements, each of the unit banks should hold a substantial fraction of its assets in the form of some readily shiftable asset such as Treasury bills. This practice would allow shifts in deposits among banks to take place with-
Member banks are actually not obliged to adjust their reserve positions as rapidly as the foregoing illustration suggests. Their required reserves are determined by their average deposits for weekly or semimonthly intervals. Thus, they may allow their actual reserve ratios to fluctuate above and below the required percentages. It is apparently quite general for banks to operate with a reserve deficiency in the early part of the reserve computation period and to acquire the necessary reserves toward the end of the period. The averaging technique was adopted under the Federal Reserve System to relieve the banks of the difficulties created by the absolute minimum requirements of the old National Bank Act. Unless banks are permitted to use their legal reserve funds in the short run in meeting reserve drains, they must hold excess reserves continuously. Reserve management cannot be conducted with such great precision that deficiencies will never develop. Even if a bank holds excellent secondary reserve paper, it cannot realize upon it without some delay.


Section 19 of the Federal Reserve Act does not specify that an averaging technique be employed. This section grants the Board of Governors wide latitude to specify actual procedures. Regulation D is the vehicle through which these powers are implemented.

One week is now accepted as the shortest period within which banks can respond to changes imposed upon them and maintain their reserves at the required level. Until 1942, banks in cities where Federal Reserve banks or their branches are located were on a three-day averaging period, but their difficulties in meeting reserve requirements, in the face of wartime reserve fluctuations, resulted in the extension of the period to one week, which had been the period authorized for most reserve cities. The semimonthly period authorized for banks in the smaller centers is justified on the ground that they require a relatively longer time to obtain additional reserves by borrowing or by liquidating earning assets. Possibly it need not be double the length of the period for city banks. The averaging period should not be made longer than is absolutely necessary to prevent banks from being penalized unreasonably for reserve deficiencies. If a three-month averaging period were to be used, for example, a pronounced intraperiod deposit movement might develop or the end of the period might be marked by a wild scramble for reserves.

Even with existing weekly and semimonthly reserve computation periods, there is some evidence that window-dressing takes place. Member-bank borrowing apparently increases at the close of the computation period. This may result in time if all banks adopt the practice of maintaining a secondary reserve of short-term government securities.

The lengthening of the computation period from three days to one week for banks in larger cities reflects the turbulence of recent years in bank reserves. Under certain limited conditions the period may now be extended beyond the specified number of days (New York Times, October 20, 1949, p. 49).

This is not readily demonstrable from published data, although there is some evidence of a two-week cycle in the discounts and advances of Federal Reserve banks. This may be accounted for by actions of banks on a semimonthly period.
dressing is not likely to develop the proportions of the operations conducted by the London clearing banks prior to 1947. Nor is it necessarily a serious matter unless it results, as in England, in a dissipation of effort. Unfortunately, the necessary data are not published to permit one to reach a conclusion as to the importance of window-dressing. The use of average ratios encourages the practice. If the reserve computation period is kept very short, there is no danger that window-dressing will become troublesome. The recent tendency to extend the length of the computation period should be restrained. Fluctuations in reserves which make it difficult for banks to maintain their required ratios may be themselves preventable. Therefore, relief in the form of a longer averaging period may not be the most satisfactory way to meet the problem.

When one examines the behavior of aggregate member-bank reserves during the postwar period, he is impressed by their rapid expansion and their short-run instability. The over-all increase in the three years ending December 31, 1948, was $4,564 million, which carried member-bank reserve balances to an all-time high of $20,479 million. Increases in legal reserve requirements came belatedly in 1948 and in fact caused a final spurt in growth. The postwar expansion followed a net increase of $3,465 million in the previous four years. During the first six months of 1949 member-bank reserves have been extinguished to the extent of $2,225 million through open-market operations, but reductions in legal reserve ratios in May, 1949, partly offset this unprecedented decline. Evaluation of the consequences of this abrupt reversal of the long upward trend must await further developments. The manner in which member-bank reserves were permitted to expand until 1949 and then to fall suggests that little monetary management has been attempted in the postwar period. Open-market policy has been dominated by the Reserve banks' commitment to maintain orderly conditions in the government securities market.

The postwar period is also distinguished by exceptionally severe short-run fluctuations in member-bank reserves. Consequently, the money market has frequently been the scene of feverish activity as banks have endeavored to adjust their reserves to rapidly changing reserve levels.

The factors responsible for the 1945-48 expansion of member-bank reserves are systematically arranged in Table 3. The primary causal factor was growth of our gold stock. A secondary factor was a reduction in Treasury cash, which also may be attributed to our failure to manage the ultimate reserve of gold that governs the volume of the debt instruments composing the money supply. Our monetary gold stock increased steadily following the war. If this were the only factor affecting member-bank reserves, they would have shown a corresponding steady increase. By the close of 1948 the full effects of the gold inflow had been


21 Treasury cash was reduced as funds were transferred to the International Monetary Fund and International Bank in payment of the United States subscriptions. These funds were the gold devaluation profit of 1934, which had been immobilized in the Stabilization Fund. The technical details of this operation are covered in Monthly Review, Federal Reserve Bank of New York, XXIX, No. 3 (1947), 28-29. There is a taint of irony in the use of the inflationary gold profit to intensify the postwar inflation in the cause of international monetary stability.
realized. However, member-bank reserves did not expand in step with the monetary gold stock. The trend was upward because of the gold inflow, but there were a series of marked upward and downward movements in the course of the three-year period. Movements of

TABLE 3*

FACTORS PRODUCING INCREASES AND DECREASES IN MEMBER-BANK RESERVES
DECEMBER 31, 1945—DECEMBER 31, 1948
(Millions of Dollars)

<table>
<thead>
<tr>
<th>Factors an increase in which increases member-bank reserves:</th>
<th>December 31, 1945</th>
<th>December 31, 1948</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary gold stock</td>
<td>$20,065</td>
<td>$24,244</td>
<td>$4,179</td>
</tr>
<tr>
<td>United States securities held by Federal Reserve banks</td>
<td>24,262</td>
<td>23,333</td>
<td>- 929</td>
</tr>
<tr>
<td>Discounts and advances</td>
<td>249</td>
<td>223</td>
<td>- 26</td>
</tr>
<tr>
<td>Other Federal Reserve credit</td>
<td>580</td>
<td>542</td>
<td>- 38</td>
</tr>
<tr>
<td>Treasury currency outstanding</td>
<td>4,339</td>
<td>4,589</td>
<td>250</td>
</tr>
<tr>
<td>Total factors of increase (net)</td>
<td></td>
<td></td>
<td>$3,436</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors an increase in which decreases member-bank reserves:</th>
<th>December 31, 1945</th>
<th>December 31, 1948</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money in circulation</td>
<td>$28,515</td>
<td>$28,224</td>
<td>-$ 291</td>
</tr>
<tr>
<td>Treasury cash</td>
<td>2,287</td>
<td>1,123</td>
<td>- 962</td>
</tr>
<tr>
<td>Treasury deposits in Federal Reserve banks</td>
<td>977</td>
<td>1,123</td>
<td>146</td>
</tr>
<tr>
<td>Nonmember deposits</td>
<td>1,368</td>
<td>1,180</td>
<td>- 119</td>
</tr>
<tr>
<td>Other Federal Reserve accounts</td>
<td>495</td>
<td>590</td>
<td>95</td>
</tr>
<tr>
<td>Total factors of decrease (net)</td>
<td></td>
<td></td>
<td>-$1,131</td>
</tr>
<tr>
<td>Total member-bank reserves</td>
<td>815,915</td>
<td>20,479</td>
<td>$4,504</td>
</tr>
</tbody>
</table>

* Source: Federal Reserve Bulletin. Small numerical discrepancies are due to the rounding of figures.

member-bank reserves were the resultant of the interaction of the gold inflow and the several other factors set forth in Table 3. The more important of these will be considered presently. Before turning to that matter, the marked upward movement of member-bank reserves in 1948 must be considered. This took place in conjunction with the raising of legal reserve ratios.

During the postwar years the Federal Reserve authorities repeatedly requested power to increase member-bank legal reserve ratios, and a very limited grant of power for a nine-month period was finally made by Congress in the summer of 1948. Unfortunately, member-bank legal reserve ratios stood almost at the maximums permitted by the Federal Reserve Act at the beginning of the postwar period. Only the reserve ratio for demand deposits of central reserve city banks was capable of increase, the requirement in force being 20 per cent and the maximum permitted being 26 per cent. The requirements of these banks were increased on February 27, 1948, and again on June 11, 1948, bringing the required ratio to 24 per cent. In September, 1948, under the temporary authority noted above, the family of ratios was raised from 24, 20, 14, and 6 per cent to 26, 22, 16, and 7 ½ per cent, or roughly halfway to the temporary upper limit.

This brought about a sudden increase
in member-bank reserves and left excess reserves virtually unchanged. Member banks sold United States government securities to obtain reserves to meet the increased reserve requirements, and the Federal Reserve banks purchased government securities in almost equal amounts in pursuing their policy of supporting the government securities market. Announcement was made September 8, 1948, that increases in reserves would go into effect over a ten-day period beginning September 14, 1948. Between September 8 and September 29, 1948, weekly reporting member banks reduced their holdings of government securities by $2,062 millions. During the same three-week period, the Reserve banks' portfolio increased by $2,042 millions. Excess reserves of all member banks increased from $926 millions to $940 millions. The action of the Reserve authorities was therefore completely nugatory, unless one regards a slight increase in short-term money rates as an effective counterinflationary development. Moreover, between August 25 and September 29, 1948, adjusted demand deposits of all commercial banks expanded by $100 million, and in the following month they increased by $1,200 million.

The growth of member-bank reserves was never effectively checked in the three years following the war. The newest of the weapons of central banking, the variable reserve ratio, proved unequal to its task when it was finally utilized under conditions which doomed it to failure.

The behavior of member-bank reserves is not fully described in terms of their pronounced upward trend during 1945-48 and the sharp reversal of that trend in the first six months of 1949. One observes frequent short-run increases and decreases for which Treasury operations are partly responsible. Federal reserve float has been a contributing factor. Finally, purchases and sales of government securities by the Reserve banks in connection with the support of the government securities market have caused short-run fluctuations in member-bank reserves. Although short-run variability occurred in member-bank reserves in prewar years, the magnitude of the movements has been greater in the postwar period. For several years prior to the war excess reserves were large and widely distributed, and under these conditions short-run variations in total member-bank reserves were of no consequence. Since the war, excess reserves have been relatively small and have not been generally distributed among banks. Therefore, short-run instability in member-bank reserves has had the effect of requiring banks to devote considerable effort to maintaining precariously balanced reserve positions.

Treasury operations are a significant factor in the money market. This is not a new development. Both the federal government and the state and local governments have increased their balances with banks as compared with prewar levels. This reflects the decline in the purchasing power of money and also the increased role of government in economic affairs. State and local government funds are carried as deposit balances in commercial banks. Thus, the effects of receipts and expenditures at this level of government are much the same as the effects of private persons' activities. Inflows are perhaps more concentrated than business receipts because of the tendency of certain types of tax payments to be made within brief time intervals, but on the

In an earlier paper I presented an analysis of the prewar situation (see E. C. Simmons, "Treasury Deposits and Excess Reserves," Journal of Political Economy, XLVIII, No. 3 [1940], 325-43).
whole no noticeable disturbance results from state and local government fiscal operations.

Federal government operations, however, do create disturbances. The amounts involved are large, and the federal government disburses funds by drawing checks on its deposit balances at Federal Reserve banks. These balances are built up by direct deposit of revenues in Federal Reserve banks and by transfer of funds from some 10,700 commercial banks serving as "special depositaries," where they accumulate through the deposit of withholding tax receipts and proceeds from the sale of certain types of government securities to commercial banks or by commercial banks to their customers. Calls are made upon these banks from time to time as Treasury needs demand, and transfers of deposits follow automatically after a brief lag.

In the postwar period Treasury deposits at commercial banks have varied through a considerable range. The final war-loan drive resulted in a large accumulation in these so-called "War Loan Accounts," which were continued in their wartime reserve exempt status until July 1, 1947. During 1946 these balances were reduced from a level of about $2.4 billion to about $1 billion, principally by Treasury debt-retirement operations which had the effect of canceling government deposits against government debt. Bank reserves were little affected by this operation. Since that episode, government deposits in commercial banks have ranged from about $1 billion to about $3.5 billion. When transfers of funds from commercial banks are made, member banks suffer a reduction of legal reserves; but, since Treasury disbursements typically are made at approximately the same time, member banks promptly gain back the lost reserves. Even so, particular banks are not unaffected, because Treasury disbursements are not necessarily made to persons who deposit government checks in the same banks which have transferred government deposits to Federal Reserve banks. At the high level now typical of national government expenditures, such operations are not a negligible cause of shifts in reserves among banks.

The disturbance to the reserve position of member banks resulting from these sporadic calls may be moderated by careful planning of receipts and outlays of the Treasury, and this has sometimes been done. There are opportunities for utilizing government deposits in commercial banks as a monetary control device, since their increase serves to absorb member-bank reserves and their decrease to release them. However, there is doubt that the traditional means of monetary control are so inadequate that reliance need be placed on this device. Use of commercial banks as depositaries is possibly not required at all. The British Treasury operates without such depositaries. On balance, bank reserves are likely to be more subject to disturbance if a large number of commercial banks act as depositaries than if only the central bank is used. Only very careful and complex planning can serve to avoid difficulties; and since, in any event, Treasury deposits in Federal Reserve banks

23 The use of commercial banks as depositaries is described in Monthly Review, Federal Reserve Bank of New York, XXXI, No. 8 (1949), 89-91.

24 Ibid., p. 91. 25 Ibid.
26 If the government's cash balance is carried wholly at the central bank, means must be employed to maintain a high degree of stability in this balance. This can be done by combining short-term overdrafts at the central bank with open-market operations to eliminate fluctuations that remain after the timing of receipts and expenditures has been synchronized to the maximum.
must be managed, the entire burden of compensatory action might well be concentrated at this level.

The operating balance of the Treasury is maintained in the form of deposits with Federal Reserve banks. These Treasury deposits have varied through a wide range in the postwar period. Changes in this item tend to produce inverse movements of member-bank reserves. Accordingly, because Treasury deposits exhibited substantial variation in the years since the war, member-bank reserves were subjected to large disturbances. On several occasions Treasury deposits have changed by $1 billion in a four-week interval. On May 18, 1949, Treasury deposits amounted to $1,026 million, but on June 15, 1949, they had fallen to $9 million, which appears to be the lowest level in a very long period. One week later the figure was $508 million. Again, between February 23 and March 16, 1949, the decline was $1,000 million. Similarly, during the three weeks following February 25, 1948, Treasury deposits were reduced by $979 million. Another example is the decline in the four weeks following February 26, 1947, which amounted to $1,659 million. Frequently, the money market has been dominated by this factor.27

The management of the Treasury deposits in the postwar period compares unfavorably with the record of the war years. In prewar years week-to-week changes were held within comparatively narrow limits, notably during the eighteen-month interval centered in mid-1937, when Treasury deposits were held remarkably steady at the level of $200 million. The large variations which adversely affected member-bank reserves in the postwar period need not reoccur. The earlier practice of maintaining short-run stability is desirable. Otherwise, unnecessary turbulence is generated in the money market.

Movements in Federal Reserve float have also been a short-run disturbing factor in the postwar money market. Float arises when checks are collected less rapidly than called for by Federal Reserve collection schedules. Collecting banks are credited with reserve funds as specified in these schedules, but the reserves of the bank from which collection is made are not debited until items have actually been presented. Thus, when bad-weather conditions delay air shipments, on which reliance has been placed since 1946 in the effort to reduce required collection time, or other events delay the forwarding of transit items, large elements of float appear in the "Other Federal Reserve Credit" factor. Prior to 1939, float was negligible, but with a revision of collection schedules in that year it rose to about $50 million. Subsequent growth in the dollar volume of checks, together with further shortening of scheduled collection time with the shift to air shipments, has had the effect of raising the level of the float to about $400 million and causing it to oscillate rather violently about that level, particularly near the end of the year.28 Week-to-week changes have frequently amounted to $200 million and have occasionally exceeded that figure.29

Float itself is of no consequence be-
cause it is simply an alternative to other methods of generating member-bank reserves. Short-run changes in float, however, have the effect of causing spontaneous alterations in the level of member-bank reserves. Efforts to reduce the volatility of this item would be repaid by greater stability in member-bank reserves. Whether actual collection time exceeds scheduled collection time is not important, but if collection schedules are so constructed that float is stable only if transportation schedules are perfectly adhered to, it may be desirable to revise the collection schedules to reduce the variability of the float.

Federal Reserve bank operations in the government securities market reached a very large volume in the postwar period. Space does not permit a complete analysis of changes in Federal Reserve portfolios during the three and one-half years since December 31, 1945, but some consideration must be given to the effect of the Reserve banks' security transactions on the reserves of member banks. The total portfolio fell from $24,262 million on December 31, 1945, to $19,517 million on June 29, 1949. The decline has not been uniform. On December 31, 1948, the amount was $23,333 million, to which it had risen after falling to $20,098 million on May 19, 1948. In 1946, 1947, and 1948 a rough seasonal pattern is observed with a low early in the second quarter of the year and a high at the end of the year. There are, in addition, pronounced short-run variations of as much as $1 billion within intervals as brief as one week. This pattern of activity of long- and short-term movements stands in sharp contrast to the prewar pattern. From late 1933 to early 1942 the portfolio remained almost constant at a level somewhat above $2 billion. The postwar movement reflects the support activities of the Federal Reserve banks. Only to a minor extent did considerations of monetary policy enter into the management of the portfolio.

Changes in the aggregate portfolio do not reveal the full extent of the transactions entered into by the Federal Reserve banks. There have been substantial changes in the composition of the portfolio. Until late in 1947 only a small volume of Treasury bonds was held, but this component thereafter increased by over $10 billion in the next twelve months and then declined steadily to about $7.8 billion by the end of June, 1949. In 1946 and 1947, however, operations were conducted wholly in short-term securities. Since primary concern in this paper is with the net effects of these operations on member-bank reserves, it is sufficient to note that the operations conducted by the Federal Reserve banks were frequently large and that they had the effect of bringing about increases and decreases in member-bank reserves.

What was accomplished by these operations from the point of view of public debt management is open to a variety of interpretations. The level and pattern of yields on government securities has undergone substantial changes during the postwar period. The yield on long-term government securities has not been held at a constant level, although this is sometimes assumed to have been the case. Yields on short-term government securities have also fluctuated, even if they have sometimes been held steady at a given level for periods of several months at a time. They have also risen relatively to long-term yields.

How the prices of government securities would have behaved in the absence of the support activities of the Federal Reserve banks is indeterminate. Whatever was accomplished in the direction of
stabilizing the price of government securities must be set off against the instability that was generated in member-bank reserves and the practical destruction of the power to absorb reserves generated by the postwar inflow of gold.

The instability of member-bank reserves is indicated by sporadic fluctuations in member-bank borrowing at Federal Reserve banks, by spurts of activity in the market for federal funds, and by the volume of member-bank transactions in short-term government securities. In adjusting their reserve positions, member banks tend to use all three of these methods, choosing among them on the basis of the relative cost of reserve funds and the quickness with which reserves may be obtained.

The federal funds market, which is a mechanism for one-day borrowing of legal reserves, produces additional legal reserves very quickly, but they are lost again as the cashier's check issued for their purchase is collected. Since the rate on federal funds has frequently risen from very low levels almost to the level of the rediscount rate, banks have evidently found themselves in a position where they require additional reserves promptly for brief periods.

Borrowing at a Federal Reserve bank also produces legal reserves promptly, but the reserves are not lost again until the bank repays its indebtedness. Since its reappearance late in the war period, member-bank borrowing has been highly variable. It has not reached $1 billion in the postwar period, but it has been continuous and has changed rapidly. The pattern of borrowing suggests that member banks have had to meet sudden changes in their reserve positions. It is not of the type indicating that banks are under continuous pressure to meet a steady drain on their reserves.

The larger metropolitan banks have utilized sales and purchases of Treasury bills extensively as a reserve adjusting device. After the termination of Federal Reserve repurchase arrangements in the summer of 1947, a sale of Treasury bills was no longer capable of producing reserves almost instantaneously. It is estimated that approximately two days are required to obtain funds through the liquidation of government securities.

Even so, this method of adjusting reserves has continued to be used extensively. A rough measure of the instability of reserves is given by the fluctuations in the volume of Treasury bills held by banks. During 1948 and the first six months of 1949, for example, Treasury bill holdings of weekly reporting member banks show a rough inverse correlation with Treasury deposits at Federal Reserve banks.

This raises an interesting point. Possibly, what has happened is that the banks, in adjusting their reserve positions by means of purchase and sale of Treasury bills, have obliged the Federal Reserve banks to engage in support operations in the government securities market. This chain of events could be eliminated were the Treasury to achieve a greater degree of stability in its cash balance. Although it may be expected that bank transactions in government securities will continue to provide a substantial volume of business in the government securities market, the greater the short-run fluctuations in their reserves which arise from Treasury operations and from Federal Reserve banks' transactions in securities.
securities, the more activity there is likely to be in this market.\footnote{On June 28, 1949, announcement was made that subsequently Federal Reserve transactions in government securities would be directed "with primary regard to the general business and credit situation." Maintenance of orderly conditions in the government securities market is not, however, to be neglected (Federal Reserve Bulletin, XXXV, No. 7 [1949], 776). This policy may reduce transactions in government securities, but the full effects of the announced policy will not be apparent until the policy statement is given meaning by actions. The short-run effect of the new policy was to allow yields on long-term government securities to fall sharply. Absorption of member-bank reserves has continued as Federal Reserve holdings of Treasury bonds and Treasury bills have continued to decline.} One may hope that policies will be adopted which will limit transactions to the amount really needed to permit the financial mechanism to function. No general economic gain results from actions which generate changes in bank reserves, which in turn cause banks to buy and sell securities.

For the postwar period as a whole the monetary and banking mechanism has operated with only tolerable stability. Banks have shown a good record as business enterprises. There have been very few failures and rather handsome bank profits. Money rates have remained so low that neither the Secretary of the Treasury nor business borrowers have had occasion to complain about the usurious proclivities of bankers. Fortuitously, the inflationary pressures of an expanding gold reserve and of expanding member-bank reserves have been moderated by the curious workings of our system of differential reserve ratios. On the whole, we may regard ourselves fortunate in that our badly designed monetary and banking mechanism has worked as well as it has. One may, however, be sobered by the thought that events might have worked out quite differently.

The experience of the postwar period suggests that it would be wise to undertake a rationalization of the monetary mechanism in the interests of employing monetary policy as an economic stabilizer. Possibly there might be a greater disposition to rely on monetary policy if the mechanism were improved. It is not now possible to demonstrate positively the consequences of actions which produce changes in member-bank reserves. If the spendable funds of the general public were affected in a precise fashion by such changes, the authorities might come to have a greater awareness of the consequences of their actions. They might also develop confidence in their ability to use their powers for achieving a greater measure of economic stability.
PATENTS AND TECHNICAL PROGRESS—A STUDY OF TELEVISION

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Massachusetts Institute of Technology

IN RECENT years there has been a mounting volume of criticism of the American patent system. The critics have maintained that it has been grossly distorted from its original purpose; that it has become a tool of the giant corporations which operate large patent factories primarily to bolster their monopolistic position; and that it no longer serves to stimulate invention but frequently has the reverse effect. Accordingly, a whole series of governmental investigating committees have started out with freshness and vigor to force reform. But “the system” has so far proved stronger than the reformers. The investigators have become lost in the complex ramifications of the patent process, and legislators have ended by shrugging their shoulders and turning to more pressing or more tractable matters.

Having pored over many of the hearings and reports of these committees, I feel that what is needed now is a somewhat simpler approach. The history of certain key innovations may enable us to see more clearly how the system works. This should then give us a basis on which to discuss the relation of patents to technical progress.

Television, one of the most important new industries to emerge since the war, affords a significant exploratory case. Sales of television sets are estimated at $500 million for 1949, exceeding the dollar sales of all other types of home radio receivers. The product is highly technical—the result of years of costly research and development—and it is covered by an exceedingly formidable patent structure. Patent-wise, the key company is the Radio Corporation of America; and no concern, so far as I know, manufactures television sets today without paying a royalty to R.C.A.

Let us see briefly how R.C.A.’s patent power was acquired.

THE FORMATION OF R.C.A.

During the first World War, radio communications had proved their military importance, and each of the three


2 See, e.g., U.S. Congress, House Committee on Patents, Hearings (72d, 74th, 75th, 76th, 77th, 78th, and 79th Cong.); U.S. Congress, House Committee on the Judiciary, Hearings before Subcommittee on Patents, Trademarks and Copyrights (80th Cong.); U.S. Congress, Senate Committee on Patents, Hearings (70th, 71st, and 77th Cong.); U.S. Congress, Temporary National Economic Committee, Hearings (75th and 76th Cong.), Parts 2 and 3: Patents; Walton Hamilton, Patents and Free Enterprise, Mono. No. 3; U.S. National Patent Planning Commission, Reports, 1943 and 1945.

3 For a more complete technical treatment of the historical development of the radio industry since the 1890’s see my Invention and Innovation in the Radio Industry (New York: Macmillan, 1940).
leading electrical firms in the United States—A. T. & T., G.E., and Westinghouse—had manufactured considerable quantities of radio apparatus for the American and European governments. All three companies were anxious to expand their postwar wireless activities, but none of them controlled the key patents. For example, both G.E. and A. T. & T. had been devoting major research attention to the vacuum tube, and this was leading to many patent interference cases between the two companies. The most famous of these was the Langmuir-Arnold "high-vacuum" case, which ultimately went to the Supreme Court and included depositions by some of the leading physicists of the day.

Westinghouse, in its turn, had purchased Edwin Armstrong's important patents on the regenerative and superheterodyne circuits, giving it a strong independent position. Therefore, when Owen D. Young of the General Electric Company proposed that a Radio Corporation of America be formed to purchase the American Marconi Company and that G.E., A. T. & T., and Westinghouse sign cross-licensing agreements giving the new company rights to all their present and future radio patents for ten years, the suggestion was accepted with enthusiasm.\(^4\)

R.C.A. thus acquired an exceedingly strong patent position on all phases of radio-broadcast receivers. It was some years, however, before a suitable licensing policy was evolved. One special reason for delay was that R.C.A.'s patent position had not been thoroughly tested in the courts. Several companies thought that they could avoid paying royalties by getting licenses from patent-holders outside the A. T. & T.-G.E.-Westinghouse axis. But they were sued for infringement; and in the final judgments R.C.A. was upheld in virtually all cases.

It was not until 1927 that R.C.A. succeeded in obtaining, through court action, undisputed patent control of the industry. The management then proceeded to offer licenses with various restrictions. The royalty rate was fixed at 7.5 per cent of the net selling price, and licenses were to be offered only to customers who would pay a minimum royalty of $100,000 a year.

There developed subsequently a continual struggle between R.C.A. and some of its principal licensees over the nature of the restrictions. The most drawn-out and bitter of these took place between R.C.A. and Philco in a lengthy court suit over the method of calculating royalty rates. Philco adopted the subterfuge of setting up separate manufacturing and sales companies in the same building and paying royalties only on the direct costs of manufacturing. And the court finally sustained its position, forcing R.C.A. to reduce its rate to the whole industry.

In this fashion the type of competition which R.C.A. had hoped to avoid by a restrictive licensing policy gradually emerged. The R.C.A.-G.E.-Westinghouse group was too unwieldy to maintain the advantages of its original lead. The new capitalists who entered the industry, in such companies as Philco, Zenith, and Emerson, were hard-hitting and aggressive. The managements of these firms were quite different from those in the corporate giants of electrical communications. G.E. and Westinghouse, in the 1920's and 1930's, had developed large empires in which stable customer relations were being cultivated. Research and quality were stressed, and price competition was avoided. Philco,

\(^4\) This was done in two steps, G.E. and A. T. & T. signing agreements in 1920 and Westinghouse in 1921.
Zenith, and Emerson, by contrast, were dominated by entrepreneurs who were primarily sales-minded.

The comparative position of the leading firms in the industry in 1940 is indicated in Table 1.

<table>
<thead>
<tr>
<th>Company</th>
<th>No. of Sets (Thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.C.A.</td>
<td>1,700</td>
</tr>
<tr>
<td>Philco</td>
<td>1,675</td>
</tr>
<tr>
<td>Zenith</td>
<td>1,050</td>
</tr>
<tr>
<td>Emerson (mostly midget sets)</td>
<td>1,050</td>
</tr>
<tr>
<td>Galvin</td>
<td>950</td>
</tr>
<tr>
<td>Colonial (for Sears, Roebuck)</td>
<td>650</td>
</tr>
<tr>
<td>Belmont</td>
<td>550</td>
</tr>
<tr>
<td>Noblitt Sparks</td>
<td>400</td>
</tr>
<tr>
<td>G.E.</td>
<td>350</td>
</tr>
<tr>
<td>Crosley</td>
<td>350</td>
</tr>
<tr>
<td>Stewart-Warner</td>
<td>250</td>
</tr>
<tr>
<td>Simplex</td>
<td>250</td>
</tr>
<tr>
<td>Electrical Research Laboratories</td>
<td>250</td>
</tr>
<tr>
<td>Sonora</td>
<td>200</td>
</tr>
<tr>
<td>Wells Gardiner (for Montgomery Ward)</td>
<td>200</td>
</tr>
<tr>
<td>Detrola</td>
<td>175</td>
</tr>
<tr>
<td>Farnsworth</td>
<td>100</td>
</tr>
<tr>
<td>Sparks Withington</td>
<td>100</td>
</tr>
<tr>
<td>All others</td>
<td>1,584</td>
</tr>
<tr>
<td>Total</td>
<td>11,834</td>
</tr>
</tbody>
</table>

* I believe that these figures are approximately correct, but there are no official statistics published. The estimates include exports, and I believe that R.C.A. had larger exports than Philco and that Philco outsold R.C.A. in the domestic market.

The appearance of G.E. as a separate seller of sets was a result of antitrust action instituted by the Department of Justice against R.C.A., G.E., and Westinghouse in 1930, alleging unlawful combination and conspiracy in restraint of trade in both domestic and foreign commerce. The original complaint also named A.T. & T.; but this was later dismissed, presumably because the Telephone Company had already disposed of its stock in R.C.A. and had withdrawn from entertainment broadcasting. The defendants were said to control more than four thousand patents on radio apparatus, which enabled them to “dictate by agreement among themselves the terms upon which any competitor or potential competitor may use the patents.” After eighteen months of negotiations, the parties accepted a consent decree, by which G.E. and Westinghouse agreed to dispose of their stockholdings and managerial direction to R.C.A. Cross-licensing agreements, however, were continued, as shown in Figure 1.

This concludes our background description of the industry from which a major new innovation—television—has recently sprung. It shows the way in which monopolists attempt to don the protective armor at their disposal and, viewed by itself, is not particularly edifying. But the significant issue is what the monopolist does with the security and the profits obtained in this fashion. I want to focus attention on this because I agree with Professor Schumpeter in saying:

In capitalist reality, the competition which counts is the competition from the new commodity, the new technology, the new source of supply, the new type of organization...

... There are superior methods available to the monopolist which either are not available at all to a crowd of competitors or are not available to them so readily... There cannot be any reasonable doubt that under the conditions of our epoch such superiority is as a matter of fact the outstanding feature of the typical large-scale unit of control, though mere size is neither necessary nor sufficient for it. These units not only arise in the process of creative destruction... but in many cases of decisive importance they provide the necessary form for the achievement. They largely create what they exploit.  

1 A.T. & T. had sold its station, WEAF, to R.C.A. for $1 million in 1926.
TELEVISION RESEARCH BY THE R.C.A. GROUP

a) MECHANICAL TELEVISION

Television, I believe, is an excellent example of Schumpeter's thesis. The earliest significant American research on a complete system of television transmission and reception was undertaken by Dr. Herbert E. Ives, of the American Telephone Company. His work developed from research on telephoto transmittal in 1923 and 1924—a project which led to the wirephoto service now in use throughout the country.

In 1924 mechanical scanning showed greater promise for immediate commercial operation than did electronic methods (which are now used). Ives worked, therefore, on a mechanical scanning system. He had a sizable research staff assigned to him, and the project, over a period of years, cost about $250,000. Through this research, mechanical scanning was significantly advanced. In 1927 Ives was able to report in his logbook: "This afternoon at about three o'clock connection was made by wire (from New York) to Washington ... the first viewing of human beings at a distance of hundreds of miles." Yet, despite these advances, the images remained crude; and the interest aroused was primarily curiosity. By the 1930's it had become apparent that electronic, rather than mechanical, television offered a more promising approach.

b) ELECTRONIC TELEVISION

The principal original contributors to electronic scanning in the United States were Zworykin and Farnsworth. Zworykin had received his basic training in electrical engineering in Russia, coming to America after the revolution. By then (1919) he had already evolved in his mind a method of transmitting, as well as receiving, television images, using the electron beam as a scanning device.
as receiving, television signals by electronic means.10

The major difficulty in perfecting an electronic camera tube was the low light sensitivity of photoelectric cells. Zworykin conceived a method whereby the light from the scanning beam, as it struck the photocells, created an electrical charge which was stored temporarily; by releasing this charge later, it was possible to increase the sensitivity of the electronic camera very considerably. But, although Zworykin had conceived this idea in general terms in 1919, it was far from being an operative conception. He discussed with a Russian friend, Mouromtseff, the possibility of their working together and developing television apparatus; but Mouromtseff was convinced that without capital it could not be done.

Zworykin joined the Westinghouse staff in 1920. At that time the focus of attention in radio research was on sound broadcasting, which was just coming into its own; and no research was being undertaken on television by any of the important laboratories. Zworykin’s expressed desire to work on television fell on deaf ears, and he was assigned to other work. He resigned from the laboratories in 1921 but returned a year and a half later. Once again he asked for an opportunity to work on television. This time the response was more favorable, and he was encouraged to prepare some demonstrations.11

These proved disappointing. The manager of the research department con-

cluded that it would be a long time before any practical success could be obtained. He suggested that the inventor work first on photoelectric cells, which had many different applications other than their important use in television. During the next few years Zworykin developed a caesium-magnesium photocell which was an advance on any previous photocell. He also worked on sound movies. Finally, in 1928, he succeeded in producing a practical photoelectric tube for television transmittal, which he called the “iconoscope.” This was to prove a revolutionary invention.

The importance of the iconoscope was recognized almost immediately. Mr. Sarnoff, vice-president and general manager of R.C.A., got in touch with Dr. Zworykin personally and asked him about his progress and the prospects for commercializing electronic television. Sarnoff, who had keen imaginative insight, was greatly impressed; and shortly thereafter Zworykin was told that he could have four or five assistants. He was thus able to push ahead more rapidly with his experimental work. Dr. Zworykin dates the end of his struggle for recognition from this discussion with Mr. Sarnoff.12

Until 1928 Zworykin had worked primarily to perfect an electronic phototube which was sufficiently sensitive to transmit a satisfactory image. But a great deal of work also remained to be done on circuits and methods of synchronization. Zworykin and his research assistants, therefore, turned their attention to these other elements.

In the meantime, another inventor, Philo Farnsworth, working independently, had developed a camera tube which he called the “image dissector.” The successful development of the icono-
scope and the image dissector quickly convinced almost all television engineers that electronic methods were more promising. In 1930, when R.C.A. took over from G.E. and Westinghouse the research that was being done in radio, Dr. Zworykin was transferred to R.C.A. Zworykin’s work now expanded very rapidly; by 1932 R.C.A. had about sixty people working in television. This proved to be the high tide of research for some years to come.

From 1929 to 1932 it was generally expected that commercial television might be launched at any moment. Dr. Zworykin and some of his research associates would have liked to see electronic television introduced to the public in the early 1930’s. They believed that limited commercialization would help to push forward the technical developments more rapidly. But the R.C.A. management, in reviewing the performance of television in 1932 and 1933, concluded that practical commercial operations were still a number of years away.

Hence Zworykin was encouraged to continue with his research, but with less pressure for immediate results and with a smaller staff. During the succeeding years he had a group of about ten people associated with him, and steady progress was made. By May, 1935, Mr. Sarnoff could report at the annual meeting of stockholders that “... upon a laboratory basis we have produced a 343-line picture as against the crude 40-line television picture of several years ago. The picture frequency of the earlier system was about 12 per second. This has now been raised to the equivalent of 60 per second.”

Sarnoff also announced that R.C.A. would begin at once to build a new transmitting station on the Empire State Building. Later, extensive development work was initiated on a radio relay system to establish television networks.

Such a prolonged period of experimentation and engineering development proved very costly. From 1930 to 1939, when limited commercialization was first authorized, R.C.A.’s expenditures were over $9 million (see Table 2).

**TELEVISION RESEARCH BY FARNSWORTH**

While Zworykin was forging ahead in television with the backing of Westing-
house and R.C.A., a less-well-trained but equally imaginative young inventor was working primarily outside the large corporations. His accomplishments were more limited, but, considering the obstacles to be overcome, they were nonetheless remarkable.

Philo Farnsworth was a fifteen-year-old farm boy in Rigby, Idaho, when he first became interested in television. At high school he discussed television with his chemistry teacher and started reading about photoelectricity and the cathode-ray tube. At the age of nineteen, when he was a student at Brigham Young University, he met an influential businessman, George Everson, who listened with keen interest to Farnsworth’s enthusiastic predictions about what could be done with television. Everson asked an electronics specialist at the California Institute of Technology to review Farnsworth’s work, and, when the scientist reported favorably, Everson persuaded a group of California bankers to back the young inventor as a speculative investment.

Farnsworth, established in a laboratory of his own in San Francisco, now tried to reduce his ideas to practice. Here he began to experience major difficulties. He worked well enough with his engineering assistants, but he was continually thinking up new ideas to try and found it very difficult to press any of them forward to practical results. And, like many young inventors, he greatly underestimated the time required for successful development work. Farnsworth had originally expected that he could create a commercial television system in a comparatively short time and with only modest funds at his disposal. This proved an illusion. Developmental expenses from 1926 to March, 1929, amounted to nearly $140,000—considerably more than Farnsworth or the original backers had anticipated. On the other hand, Farnsworth achieved a system of electronic television which worked in the laboratory, even though crudely, and he did this essentially single-handed.

Farnsworth continued for some time to be given a free rein. In 1930, however, the directors strongly urged him to accept an offer from Philco to transfer his work to Philadelphia under Philco financing. This came about in the following manner: Philco was concerned over the vulnerability of its position if commercial television came as rapidly as predicted. The company was particularly anxious to break away from its subservient position to R.C.A. Zworykin was with R.C.A., and the only alternative system of electronic television was that of Farnsworth. Philco, therefore, offered to support Farnsworth in the Philco laboratories. His research expenditures were to be credited as prepaid royalties.

The arrangement lasted for two years. The Philco management was by that time convinced that, although Farnsworth was an ingenious inventor, it would take him years to develop an operating commercial system of television. Farnsworth’s research had cost nearly $200,000 between 1930 and 1932, and there was no evidence that the rate would decline.

Thereafter Farnsworth continued in Philadelphia with California support only. Although the stockholders were becoming increasingly impatient, they

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Taussig refers to this as "the irresistible urge to invent." In reviewing the work of Watt, Cartwright, Fulton, Ericson, Edison, etc., he writes: "... there seems to develop an erratic streak" (Inventors and Money Makers [New York: Macmillan Co., 1915], p. 24).

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McCargar, the California banker who had backed Farnsworth in 1926, was by far the largest stockholder.
felt that they had to continue to back the inventor and hope for the best. As with R.C.A., the television demonstrations that Farnsworth made in 1934 and 1935 were considerably superior to what had been possible before. But the undeniable fact remained that television was not yet good enough for successful commercial introduction. And a small research company under the direction of an inventorr who had no commercial instincts was at a great disadvantage in competition with the large patent resources of R.C.A. The stockholders finally decided to take action.

The Farnsworth patents were offered for sale to both R.C.A. and Paramount. Neither company was willing to pay a price commensurate with the expenses that had been incurred, which in 1938 had reached $1,000,000 (see Table 3).

Something had to be done to get ready for commercialization. So, in December, 1938, a new Farnsworth Television and Radio Corporation was launched as a manufacturing and patent-licensing concern. The original backers of Farnsworth had recognized the importance of patent counsel to protect their investment, and one of their first moves in 1926 was to retain a very able patent attorney in San Francisco. It is not, of course, possible to create important patents where there have been no significant inventions. But a patent attorney, working closely with an inventor like Farnsworth, who was full of ideas in an unexplored field, could greatly enhance the strength of his patent position. By 1938 research had resulted in seventy-three patents and sixty applications, for about three-fourths of which Farnsworth himself was responsible. The result was that R.C.A. and A.T. & T. both felt it desirable to take out Farnsworth licenses.

To consolidate this patent position, the Farnsworth companies have been involved in extensive interference proceedings. Perhaps the most important of these was over the George and Heim patents, which R.C.A. controlled. From 1929 to 1932 Professor George and an assistant, Dr. Heim, had worked on a complete electronic television system at Purdue University, with initial financial support from one of the large radio manufacturing companies of that period—the Grigsby-Grunow-Ilhinds Company. The scientists made a patent application on their work covering basic electronic television developments; and a broad patent was later issued to them. Their patent was subsequently purchased by R.C.A.

Had the patent remained in force, it would have been a very serious blow to Farnsworth. But the company instituted interference proceedings, and after a

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# Table 3

<table>
<thead>
<tr>
<th>Expenditures of Farnsworth Television 1926-38*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental and patent expenses (original company), 1926</td>
</tr>
<tr>
<td>Developmental expenses, March, 1929—December, 1938</td>
</tr>
<tr>
<td>Patent expenses and legal fees, March, 1929—December, 1938</td>
</tr>
<tr>
<td>Total expenses</td>
</tr>
<tr>
<td>Receipts from license fees</td>
</tr>
<tr>
<td>Net developmental cost</td>
</tr>
</tbody>
</table>

*Source: Registration Statement, SEC, No. 2-3939.
The long-drawn-out case Farnsworth finally won the majority of the claims in 1941. The decision meant that the patents on synchronization and other important features of modern television will not expire until 1958 (seventeen years from 1941, and about thirty years after the original work was done).

The Farnsworth company did well during the war, and both the inventor and his financial backers were at last in a position to obtain substantial financial rewards for the long-drawn-out period of research and experimentation. After the war, however, the company lost money heavily in the competitive struggle for peacetime markets, and it was purchased in 1949 by the International Telephone and Telegraph Company.

Farnsworth himself withdrew from active participation in his company in 1940, at the age of thirty-four, finding the struggle for business development hard to bear. He was primarily content when isolated in his laboratory with a few close associates. And in the laboratory he liked to work on new ideas, but quickly lost interest when it came to reducing them to a usable device. It soon became clear that he was out of place as vice-president in charge of research for a sizable manufacturing concern.

His decision may have been influenced by the fact that television has proved one of the most difficult technical fields in which to operate, and the scientific requirements have become increasingly exacting. Television today, like radar, is an area in which the lone inventor is at a disadvantage. The field primarily needs a team attack by individuals who are highly trained in the different branches of science related to television and whose skills complement one another. This is not to say that the individual, working alone, cannot make important further contributions. Television might be advanced tremendously, for example, through a deeper understanding of the entire process involved in reception of light by the eye. But scientists capable of making such advances are rare.

OTHER TELEVISION RESEARCH

From the standpoint of the basic technical innovations necessary to bring television to the stage of successful commercialization, R.C.A. has been by far the most important factor in the industry. Farnsworth’s contributions were very ingenious, and his patents have stood the test of court action. But R.C.A. succeeded in perfecting electronic television without assistance from Farnsworth, whereas there is very little evidence that Farnsworth and his backers were capable of doing much more than building up a patent structure in television. And, in terms of advancing the art, the contributions of other manufacturers have simply not been in the same class.

Philco, as we have seen, supported Farnsworth for two years and considerably later collaborated with the Hazeltine Corporation in trying to improve television synchronization. Columbia Broadcasting did some interesting work on color television; Sylvania Electric perfected an ion trap to prevent discoloration of the picture tube; and the Allen B. DuMont Laboratories made some contribution to synchronization methods. Yet none of this work was of basic importance in the sense that it provided an essential element for current television practice.

This requires explanation. Between 1920 and 1940 almost all the concerns which entered the radio industry (and which have now become the household names of radio) were primarily concerned with achieving volume production, low-
ering costs, and obtaining brand preference for their radios through advertising and promotion. They acted on the principle that, if some important new development arose from research in one of the large industrial laboratories, they would be able to follow this lead very rapidly. This attitude, of course, was partly the result of the license arrangements. Yet the fact remains that an entrepreneur with a research spirit and an absorbing interest in new technical developments did not arise in these companies.

CONCLUSIONS

Let me now suggest some generalizations on patents and technical progress that are of significance to economic development.

The principal dilemma raised by the present patent system is this: patents provide an important protection to research budgets in large corporations and make it possible for small companies of a scientific character to come into being. On the one hand, society appears to need this public grant of monopoly to achieve certain technological objectives; on the other, the grant is subject to serious abuses, especially in the hands of large corporations.

The only completely satisfactory way of handling the monopoly aspect of the problem is to abolish the patent grant. And there is a considerable group of informed individuals in this country, including a number of industrialists, who favor this. I should like, therefore, to consider briefly some of the alternatives that might be available for fostering new developments like television without relying on the stimulus of patents.

Industry-wide co-operative research is one possible solution. This has been attempted in the textile industry—so far, without marked success. It has the advantage of maintaining greater equality of opportunity between the various companies in an industry than usually develops under the patent system. However, my impression of the experience, both in this country and in England, is that the director of a co-operative research activity tends to become too far removed from the key decision-makers in his industry. And in the annual competitive struggle for increased budget allocations between the internal departments of a firm and the "outside" co-operative research department, the insiders usually win. It thus proves exceedingly difficult to get first-rate talent to work on a project financed in this way.

The alternative of relying on public bodies to carry the major load of important new technological developments also has some appeal. I do not personally feel that government research agencies in this country, as now organized, would perform this task so efficiently as industry would. But a product like television could be effectively developed in university laboratories in the same way that radar was perfected during the war. In fact, today a considerable number of universities are engaged in very expensive and time-consuming engineering development work of a comparable nature, under contract with the Armed Services. But I feel that in peacetime this represents an undesirable distortion of the purposes of a university and that in the long run such activities will be handled more efficiently by private industry.

It is therefore my personal conviction that we are justified in relying on patent incentives to call forth the type of technological progress described in this article, provided that the abuses in the system can be significantly reduced. And I think they can.
Television seems to be a clear case in which the provision of a strong incentive has acted as a stimulus and “protection” to research. We have seen how many years it took to develop the product to a stage where it was commercially feasible. During this entire period there was almost no advantage to being the “first in” on the product. Before regular broadcasting could be initiated, the Federal Communications Commission had to fix engineering standards for transmission which determined the type of receivers that could be sold. And television receivers can be imitated very readily. In fact, the second largest producer of television sets today—Admiral—did no pioneering research in television at all. Yet the company is rivaling R.C.A. because of merchandising and promotional skill. The major financial incentive to R.C.A. was the possibility, which it, in fact, realized, of building a patent position on which it could collect royalties from the entire industry.

Without some such incentive, it seems unlikely that Westinghouse and R.C.A. would have spent over $9 million on television development before they received any returns. A possible analogy is the case of the automobile industry and headlight glare. Any system devised to eliminate glare will have to be installed on all automobiles simultaneously, and presumably no individual company will profit by the development. In consequence, no automobile manufacturer has undertaken any significant research on this problem. And, although I really think R.C.A. would have done some work on television without the patent incentive, I believe progress would have been much slower.

In the case of Farnsworth, his backers were interested only in supporting him because they hoped to sell the patents at a profit or to obtain very substantial royalty returns. And when the initial hope of rapid gain proved illusory, they kept on backing him because they were told that he was acquiring a very strong patent position. The Farnsworth experience should give pause to the critics of the patent system who have been pressing for compulsory licensing at rates fixed by the courts. It is hard enough to get capital for new scientific enterprises of a speculative character today; and in marginal cases, such as Farnsworth’s, I believe compulsory licensing would have effectively discouraged the backers from spending nearly $1 million over a twelve-year period before they knew that they would obtain any return.

But, while these cases show that patents are a real incentive to certain types of development work, the history of radio and television also points up a number of serious patent problems that have to be solved.

IS PATENT LIFE TOO LONG?

Granting the importance of a patent incentive, is the patent grant too long and given too freely? In the television record, Farnsworth’s principal early patent applications were filed from 1926 to 1928, and many of Zworykin’s were filed about the same time (and some of them earlier). A patent granted in 1928 would, under the present seventeen-year law, have expired in 1945. Full-scale

19 This was a recommendation of the TNEC to Congress.
20 For an elaboration of this point, see my “Investing in Science for the Future,” Technology Review, May, 1946.
21 See also Frank J. Kottke, Electrical Technology and the Public Interest (Washington: American Council on Public Affairs, 1944), p. 136: “So far as the rank and file of the electric apparatus industries are concerned, the principal drawback to compulsory licensing is that . . . it would impair their ability to finance research and development.”
commercial television was authorized by the Federal Communications Commission as of July 1, 1941; and if it had not been for the war, this would have given the patent-holders four years in which to collect royalties. But actually, as we have seen, the Farnsworth applications of 1928 came into interference with George and Heim. The life of a patent commences on the date when the patent is finally granted, and if there is interference with another application, no patent is issued until the case is settled. These particular patents, therefore, obtained a thirteen-year extension of life—to 1958.

To prevent this type of prolongation, the suggestion has been repeatedly made by various investigators, including the United States National Patent Planning Commission, that over-all patent life be reduced to twenty years; but as yet no congressional action has been taken. Under the present law there is a strong incentive for the contending parties to protract interference cases. On the critically important regenerative circuit patent, which Westinghouse acquired from Edwin Armstrong in 1920, Armstrong had submitted his original application in 1913 and his rival, de Forest, in 1914; but the final decision on priority of invention was not awarded by the Supreme Court until 1934. By the time the de Forest patent was upheld, de Forest had long since sold his patent rights, had gone through several bankruptcies, and had finally left the radio field entirely. Armstrong had also sold his regenerative circuit patents (to Westinghouse) because, as he reported, “I was in danger of being litigated to death.” And in another famous case, the Arnold-Langmuir high-vacuum tube, litigation dragged on for eighteen years before the Supreme Court decided that there had been no invention by either party.

A contributing reason to such delays is that the courts are handicapped by lack of expert technical assistance in such complicated technical fields as radio and television. The high-vacuum case produced a volume of expert testimony by physicists and engineers on each side, which ran to thousands of pages, most of it highly technical. If the courts had funds available to employ their own experts to sift this material, the procedure would be more expeditious.

My own belief is that over-all patent life should be reduced to perhaps fifteen years. I incline to the view that this is long enough under our present high tempo of research. Television was a particularly difficult new product to launch, and it was partly delayed by the great depression. I do not think, therefore, that it is essential today to give as long a patent life as was required in the 1920's.

ARE STANDARDS TOO LOW?

Another alternative is to make a distinction between basic and “improvement” patents and to provide a much shorter life for the latter. There are, however, special objections to this. The patent attorneys of firms like Farnsworth, R.C.A., and Westinghouse agree that they almost never rely on a single patent for protection. Their whole objective is to build up a patent portfolio which will blanket a new art. Apparently, it is relatively easy for a would-be infringer to get around any single patent but very difficult to penetrate a blanket. This inevitably means that a large proportion of the patents that are relied on for protection are improvement patents. The abuse really comes at a later stage. When the original patents are about to run out, the patent monopoly can be prolonged for

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**Interview, July, 1944.**
another seventeen years by a whole series of minor changes. This is the reason, as far as I can ascertain, why every manufacturer of standard AM radio receivers today pays a royalty to R.C.A., whereas the significant inventions of the last twenty years incorporated in a modern radio set are hard to name.

To solve this problem is certainly difficult, and it will probably always remain a source of dissatisfaction. My own preference is to insist on a higher original standard in the patent office and to deny patents on minor improvements in an old art. Realistically, this is hard to do in an overworked and underpaid patent office. And as the courts have been invalidating a large number of improvement patents, we have the anomaly of a double standard. This means that many companies are given patent protection merely because the expense and time involved inhibit their competitors from seeking relief from the court. Hence it seems desirable for the patent office to adopt the same standard as the courts.

**CAN MONOPOLISTIC ABUSES BE CORRECTED?**

Monopolistic abuses of patents, some experts believe, can be adequately policed by the Department of Justice. But this is a cumbersome process, which only works after the damage has been done and then frequently imperfectly—as in the case of the R.C.A. consent decree of 1932, which left R.C.A.’s cross-licensing agreements undisturbed. Moreover, the Department of Justice has not evolved a clear and consistent position in regard to monopoly. It seems to strike out rather indiscriminately and to attack a delicate problem with sledgehammer blows. The courts themselves are also apparently trying indirectly to guard against monopoly power by applying a more rigorous standard on patents belonging to the large research company than to the small concern. I suspect that the Supreme Court decision in the high-vacuum tube case, declaring that “there had been no invention,” was partly motivated by the fact that the court did not wish to give G.E. an exclusive monopoly on the whole vacuum-tube art. And Judge Thurman Arnold has specifically urged that the patent grant be interpreted as applying only to inventions that represent “a flash of genius” rather than patents that arise from a systematic team attack in a large research laboratory. Yet two standards—one for the lone inventor and the other for a research team—are bound to be unsatisfactory, especially as the trend of research is in the direction of a team attack, even in small enterprises.

In this article I cannot analyze all phases of the thorny question of monopolistic abuses of patents. We have, however, been examining an industry built on cross-licensing. Does the record suggest that cross-licensing should be prohibited? There are cases in which the cross-licensing of existing patents is critical for the best engineering development of a product. I believe that this was so in 1920 when the R.C.A. group was formed: neither G.E. nor Westinghouse nor the telephone company could have manufactured the best radio set without cross-licensing agreements on their major patents.

The principal disadvantage of the cross-licensing of both present and future patents among the major concerns in an industry is that new firms find it extremely difficult to acquire a significant patent position of their own and to obtain there-

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by some protection for their research budgets. The position which R.C.A. took until World War II was that its responsibility was to do research for the entire industry and that there was no reason why the licensee companies should aspire to have research departments. And from 1920 to 1940 R.C.A. was largely successful in its intention.

I believe this was unhealthy. But how much can we blame on patents? Many of the R.C.A. licensees actually made sufficient profits to support first-rate research. Yet practically all the research of the R.C.A. licensees in the interwar period was directed toward specific practical objectives—toward the improvement of existing products rather than toward the creation of new ones. They did not attempt to take scientists into their laboratories and give them a free hand in the selection and execution of a long-range project of inquiry. And it is the cultivation of the latter type of research which is vital in the exploration of new frontiers. The presence of a group of men who ask fresh and penetrating questions and are not inhibited by existing practices can have an extraordinarily stimulating effect.

It is an axiom of research that, in the day-to-day pressure for immediate accomplishment, applied research drives out pure research. Freedom of inquiry within the broad limits of the company’s long-range objectives is essential. The best scientists will not stay in an industry unless they are convinced that the company knows what such research is, believes in it thoroughly, and assures a fair trial for a research program, without pressure for immediate accomplishment. The R.C.A. licensees, by and large, did not face this problem squarely. It was not the characteristic practice of Philco, Zenith, Sylvania, Galvin, or Emerson to encourage men to plan a research career and stay with it. The major rewards in these companies went to the administrators in manufacturing and engineering.

Philco’s behavior is perhaps typical. Frightened in 1930 by the possibility that television might suddenly appear on the market and undermine its radio position, it made a hasty and ill-considered deal with Farnsworth without adequately investigating the real status of television research or Farnsworth’s particular strengths and weaknesses. After two years of very meager practical results, it discontinued the arrangement abruptly and made no effective substitute for it. And I can only conclude that Zworykin would have been treated in very much the same way.

Similarly, Sylvania started a small radio research department in 1936, but at the beginning of the recession of 1937–38 the budget of the department was slashed, even though the company continued to make a profit throughout 1938 and paid preferred and common stock dividends.

Why did this happen? Was it really due to the overwhelming character of the R.C.A. patent position? Not entirely, because when the approach was sufficiently original, as in the case of Farnsworth, it proved possible to build an important patent structure in competition with the great laboratories. Similarly, in another industry Edwin Land has acquired patent control for his picture-in-a-minute camera under the nose of one of the leading industrial research laboratories in the world—the Eastman Kodak Company.

The real problem is more subtle. Scientist-inventors of the originality of Farnsworth and Land are rare; and special managerial skills are required to provide the type of environment that is es-
ential for their work. In a highly competitive industry like radio, it is exceedingly difficult for the top management of a small or medium-sized company to have the courage and conviction to build a first-rate research team in direct competition with G.E., Westinghouse, and R.C.A.

In recent years the government has played a much more active role in encouraging research. During the war a considerable number of radio-manufacturing companies acquired substantial research and development contracts on war weapons, and many of these arrangements have been continued in some form. This has meant that the government has been supporting industrial research in many new phases of radio and electronics. It has also meant a weakening of R.C.A.'s patent position.

Gradually, under contract from the government, a research spirit is developing in a number of these radio concerns. I believe the results will show that competition in research is as important to the consumer as it has proved to be in marketing and pricing. And I think the historical evidence in radio and television suggests that more competition among G.E., Westinghouse, and A. T. & T. would have resulted in greater technical progress from 1920 to 1940 than actually occurred. Although I cannot prove this point, there seems some evidence to support it.

After the formation of R.C.A. in 1920, G.E., Westinghouse, and A. T. & T. agreed that all their radio patents were to be available, royalty-free, to one another. At first, the field of radio broadcasting was sufficiently new and important so that all three companies made a major effort to exploit it. Each erected its own stations, and each spent large sums on research. Had this competition continued, I think the industry would have remained healthier. But the officers and most of the directors of R.C.A. were apparently afraid of competition; and in 1926 they bought A. T. & T.'s famous station, WEAF, and persuaded the telephone company to withdraw permanently from entertainment broadcasting. The cross-licensing agreements, however, continued. This situation led Dr. Jewett, president of the Bell Laboratories, to write in protest: "From the standpoint of the man who has a brilliant idea, an agreement in advance to hand over the results of all research work to another company without financial reward will tend to discourage the research workers of the laboratories from exploring that area."

Thus, as it became increasingly clear that television would be primarily useful for entertainment purposes rather than for telephonic communication, the excellent research on mechanical systems of television was not continued for electronic television. I believe that, if the Bell Laboratories had been provided with a more direct incentive, the power of their research organization and their very great skills would have resulted in more important contributions to television.

Considering, next, G.E. after its separation from R.C.A., the patent cross-licensing policy did not provide the maximum incentive to press forward with original radio research. This perhaps ex-

24 Donald Wallace reached a similar decision in his study of the aluminum industry, in which he concluded that several large companies competing aggressively against one another would have advanced aluminum technology more rapidly than did the Aluminum Company of America (see Market Control of the Aluminum Industry [Cambridge: Harvard University Press, 1937], pp. 337–52).

plains why G.E. made no significant contributions to television or to FM up to World War II.

And with Westinghouse, as G.E.'s original junior partner in radio, there was a greater incentive for its officers to concentrate their research outlay on areas in which they had a hundred per cent financial interest and which contributed the largest share of their profits, such as central-power stations and other heavy industrial equipment. Although the research directors of the Westinghouse laboratories took an early interest in television, Zworykin was given little support for a considerable period. It was Mr. Sarnoff of R.C.A. who saw clearly the commercial possibilities of television and made arrangements with the Westinghouse laboratories to have Zworykin's work pushed forward more rapidly.

I believe, therefore, not only that it is important for small and medium-sized firms to be encouraged to develop research but that competition among the large patent-holders in an industry should be fostered. Hence I doubt that cross-licensing of future patents should ever be permitted.

I should like to conclude, however, on a note of warning. In our "liberal" desire to prevent monopolistic abuses, we could easily go too far. One of the significant features of the television story is that some protection against the "perennial gale of competition" was essential to television research. The technical obstacles to be overcome were exceedingly difficult, and there were many who believed that it would be years before sets could be sold in large volume. Research expenditures have been enormous and could not have been forthcoming under conditions of perfect competition. For the development of such a product by industry some degree of monopoly is essential.
THEORIES OF WELFARE ECONOMICS

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From its inception, economics has been oriented toward questions of public policy; the economist's sermons have almost always been aimed at the behavior of governments rather than at that of individuals. For this reason economic tracts have, of necessity, been couched in terms of the "public good" and therefore contained welfare analysis. The need for a special "welfare economics," whose function it is to relate the findings of positive economics to problems of public policy, is of relatively recent date. Only within the last fifty or seventy-five years have economists made serious and consistent efforts to create a positive science divorced (at least conceptually) from the consideration of public policy. For a time it seemed fashionable to label the study of welfare problems as unscientific and, by implication, unworthy of serious attention. However, in the last decade and a half there has been a revival of interest in these problems, and much of the best work of leading contemporary theorists has been directed toward systematizing and extending "welfare economics." The volume under review is, in part, a recapitulation of this work and also a comparison of it with the welfare aspects of "classical economics."

Dr. Myint distinguishes three levels of welfare analysis: a "physical level," where "quantities of economic welfare are proportional to quantities of physical products"; a "subjective level," where "quantities of economic welfare are proportional to quantities of satisfaction of given and constant individuals' wants"; and an "ethical level," which is "not concerned with the quantitative measurement of success in achieving given ends, but with the appraisal of the ethical quality of the ends themselves" (cf. p. 229). The book is divided into three parts, with one part devoted to each level. A careful distinction is made between "production" and "distribution" welfare economics. The former is concerned with the conditions of attaining the proper size and composition of society's product, while the latter is concerned with the distribution of that product. The author carefully indicates that the book is confined to the production aspects of welfare theory.

The "physical level" of analysis is identified with the work of the classical economists (Smith, Ricardo, Mill, etc.). Their analysis is said to be on a "physical level" because (according to the author) they neglect the question of whether the composition of output is properly adjusted to the pattern of consumer demands and, instead, evaluate the performance of an economic system in terms of its success in maximizing aggregate output (pp. xii and 6–9). In line with this approach, the classical economists attached an intrinsic value (i.e., a value independent of the market-expressed desires of individuals) to the production of durable (i.e., capital) goods. Because of the above two characteristics of classical thought, the author concludes that the classical welfare views have been misunderstood; that they were not (primarily) anticipators of modern welfare theory, with its emphasis on the appropriate allocation of resources, but had an entirely different orientation (expanding total output, facilitating capital accumulation, and the like), which he has discovered (Introed. and chap. i). Myint claims that his interpretation enables one to understand classical doctrine as a coherent system, while the "usual view" (that their central

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problem was the allocation of resources) does not (p. 2).

In my opinion this claim is quite unacceptable. Little attention is paid to that very important aspect of classical thought that stems from Malthus' population theory. The implications of a concern with overpopulation obviously involve a welfare criterion in terms of real income per capita rather than in terms of either total (rather than per capita) output or capital stock. If the classical economists' only welfare criterion had involved maximizing either of the latter, they would not have been concerned with overpopulation; for, so long as the marginal product of labor exceeds its cost of maintenance and replacement, extra labor will increase aggregate output and/or investment. That they were, in fact, vitally and practically concerned with the problem of overpopulation indicates that the author does not have the sole key to the understanding of their welfare theory. Actually, Myint has seized upon one aspect of classical doctrine and has emphasized it to the exclusion of the remainder. This aspect, which stresses aggregate output and capital accumulation, was essentially a heritage from their mercantilist predecessors and is more characteristic of these earlier (mercantilistic) views than of classical ones.

The author recognizes that the doctrine of comparative advantage and the argument for free trade based upon it constitute exceptions to his view of classical doctrine, but he argues that this line of reasoning does not represent the main current of their thinking (pp. 65–69). The grounds for this contention, however, are by no means clear, and it would seem to me that there is an alternative view which is both more accurate and less likely to promote fruitless controversy over what the classical writers "really meant." Specifically, I submit that there is no single current of classical thought which can properly be considered predominant; the classical writers were, above all, concerned with contemporary issues of public policy, and they developed special theories to cope with particular problems. In view of this, it is not difficult to understand why the various aspects of their work were not mutually consistent and why no one of their ideas ought to be identified as the core of their thought.

Now let us turn to the discussion of "subjective" welfare economics, which occupies Section II. This consists of a recapitulation of modern welfare theory, of which two major strains are distinguished: the "general optimum theory," stemming from Pareto, Wicksell, Barone, et al., and the surplus analysis characteristic of the partial-equilibrium approach of Marshall and his followers. Although it is noted that contemporary welfare economics unifies these two strains, the discussion consists of allegation rather than demonstration. Throughout, the section suffers seriously from the author's misconception of the scope of modern welfare theory. He seems to believe that the "allocative view" of economic problems presupposes that all factor supplies (in particular the capital stock) are constant (pp. 88–93). This prevents him from considering the welfare implications of post-Jevonian interest theory (i.e., the interrelation between time preference and consumer choice). This belief is apparently responsible for his incomplete formulation of the marginal conditions of maximum welfare (p. 117), i.e., he omits the condition that the marginal rate of substitution between command over present dollars and command over them at any moment in the future must be equal for all individuals and firms (this condition expresses the familiar idea of time preference), which determines the optimum rate of saving at any given instant; he also omits the condition that the marginal rate of substi-

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tution between "work" and "leisure" must be equal for each individual to the rate of remuneration for work, which determines the optimal allocation of time between work and leisure.

The supposition that modern welfare theory assumes factor supplies to be constant seems responsible also for his erroneous conclusion that classical welfare analysis (because it concentrates attention on the problem of increasing the capital stock) is, in this respect, superior to modern analysis (pp. 229–32). But, as the previous argument indicates, there is nothing in modern welfare theory (correctly stated) which implies that the welfare gains or losses due to an inappropriate rate of capital accumulation are negligible. Nor (despite Myint's contrary opinion) are questions of increasing physical productivity (cf. pp. 229–32) beyond its purview; increasing efficiency by expanding the size of the firm is simply a re-allocation of factors of production which increases welfare; questions of stimulating technical progress are (when they in any way involve questions of economic activity) simply questions concerning the allocation of investment between research and other activities.

We may agree with the author (pp. 230–32) that some economists who operate with the apparatus of modern welfare economics overemphasize the importance of correctly allocating resources for the production of various consumer goods and neglect the problems of allocating resources between aggregate consumption and aggregate investment, etc. But this is the fault of the theorists' judgment, not the result of the theory. One may admire the wisdom of Smith and company (and deplore that of some contemporaries) without wishing to adopt their techniques of analysis.

Following the discussion of "The General Optimum" in chapter vii, the author discusses (in chap. viii) the welfare aspect of neoclassical economics with particular reference to Sidgwick and Marshall. His treatment of the often neglected Sidgwick is praiseworthy and informative, but his idolatry of Marshall is carried a bit too far. His generosity to Marshall contrasts sharply with the severe criticism of Pigou's *Economics of Welfare* offered in chapter x.

In chapter ix ("The Marshallian Surplus Analysis") the concepts of producers' and consumers' surplus are analyzed at some length. The description of Marshall's views is reasonably accurate, but the discussion of Hicks's "rehabilitation" of the surplus concept is sadly wanting, both in detail and in precision. The importance that the author attaches to the surplus concepts results from his belief that they are related to the "total" (as distinguished from the "marginal") conditions of maximum welfare. He is deeply—and properly—impressed with the importance of the aforementioned total conditions; but, in stressing their importance, he tends to underestimate the importance of the marginal conditions. For example, he argues (p. 234) that a concern with the marginal conditions involves a preoccupation with minutiae in contrast to the total conditions which are relevant to large and important deviations from the "general optimum." This is incorrect; it is the marginal conditions that indicate the optimal quantities of the relevant variables. The total conditions alone can tell us only whether the optimal quantity is other than zero; the marginal conditions tell us what this quantity is (if other than zero).

A concern with issues such as "approximately" how much wheat is to be produced (as well as whether there is to be any at all) is not, I submit, a concern with minutiae. It is

At times the author fails to appreciate the limitations of the "rehabilitated" surplus analysis: for example (p. 158), he asserts: "In the surplus analysis, by concentrating on the demand and cost curves of particular commodities, we know which groups of individuals will be affected by the proposed reorganization and by how much" (italics are the author's). This is, in general, quite impossible; in order to perform this feat for any one commodity, it is necessary for all other industries to be optimally organized and producing their optimal outputs corresponding to each quantity of that commodity. As variations in the output of one commodity will cause shifts in the demand and cost curves for other commodities (except in very special cases), it is impossible to compute the relevant surpluses from ordinary demand and cost curves.
interesting to note that perhaps the most important consequence of the distinction between marginal and total conditions—the proposition that prices should be made equal to marginal costs even though overheads are not covered—is not discussed at all.

Part III consists mainly of chapter xi, “Towards a Broader Concept of Welfare?” Here the author enters into the question of the ethical desirability of arranging the economy so that its output reflects consumers’ “dollar-backed” wants. He summarizes some of the arguments of Frank H. Knight and J. M. Clark on the nature of wants, values, etc., but makes little progress in clarifying their profound, but rather obscure, ideas.

In the concluding chapter (xii) the author summarizes his argument and enters a plea for more empirical work on the effects of population growth, capital accumulation, technical progress, unemployment, etc., on economic welfare. He suggests that this work be done at the “physical” rather than the “subjective” level and offers Colin Clark’s Conditions of Economic Progress as an example of what he has in mind. But it is difficult to see how welfare inferences can be drawn from a study of physical quantities without in some way valuing the different bundles of goods and services which are produced at different moments of time. To develop (successfully) a technique of valuation for this purpose which does not involve recourse to scales of consumer preferences (i.e., the subjective level of analysis) would be an intellectual feat of the first order.

Since the author’s objective was to survey and interpret past contributions, it would be unfair to criticize him for not providing us with new conclusions. However, fairness to the potential reader requires me to warn him of the not infrequent loose and/or erroneous statements which he will find. A full catalogue is unnecessary, but a few examples may serve to put him on guard: In the first sentence of this review the quoted definition of the welfare concept of “subjective” economists is not that accepted by any of the writers referred to and is inconsistent with the accepted definition given elsewhere in the book. On pages 57–62 the author strives to show that Smith believed the primary gain from free trade and competition to be the increased productive efficiency resulting from greater specialization and larger markets. From this he concludes (p. 62) that Smith’s arguments did not have reference to resource allocation, and hence differ from the arguments in behalf of competition advanced by modern economists. However, the increases in efficiency described result from either internal or external economies of scale and hence are simply examples of improved allocation of resources among firms and industries and therefore completely in keeping with the welfare gains in which modern economists are interested. The marginal conditions of maximum welfare set forth on page 117 are (in addition to the aforementioned incompleteness) not consistent with the (proper) distinction made elsewhere between the marginal and the total conditions; e.g., it is not necessary that marginal rates of substitution between any pair of products be equal in an optimum position—it is necessary only that this hold for every individual consuming both members of a pair. On page 104 it is alleged that “modern economists have now developed a method of ‘compensation’ by which it is possible to find out whether society as a whole is better off or worse off by a given change even if this change involves changes in the distribution of income”—this is simply the reverse of what is true. On pages 168–69 the existence of a positively sloping supply curve is incorrectly identified with the action of the “law of diminishing returns.” Such slips as these will be merely disconcerting to those familiar with the literature but may prove serious stumbling blocks to economists not well acquainted with this field.
THE MATHEMATICAL THEORY OF MONOPOLY IN 1839

CHARLES ELLET, JR.

C. D. CALSOYAS

ECA Mission to Italy

I

THE cult of Cournot and the lack of extensive research in the early mathematical writings on economic topics have kept important writers in virtual oblivion. Before Cournot wrote his Researches, several authors had applied the calculus to the solution of particular, and sometimes significant, economic problems. Immediately after the publication of Cournot's major work, an eminent American civil engineer independently published a book and a series of articles which constitute a mathematical treatise on the theory of simple and discriminating monopoly and on the theory underlying the determination of canal and railroad tariffs. Charles Ellet, Jr. (1810-62), who built the world's longest suspension bridge over the Ohio at Wheeling and many other major engineering works, did not write as a political economist but as an engineer concerned with the task of maximizing the profits of developmental companies. The purpose of An Essay on the Laws of Trade, in Reference to the Works of Internal Improvement in the United States (1839), a "work that was written in almost every tavern on the line between Richmond and the Ohio, and in a manuscript that is sent from his saddlebags to the press," was to direct the attention of the president of the James River and Kanawha Improvement Association to the principle by which the charges for the use of a new canal about to be opened "should be regulated so that it may be rendered most profitable to the stockholders, and most beneficial to the community." The tariff which is "to secure the greatest amount of revenue to the company" depends "on the construction of the work, the length of the line, the proportions of water and land transportation, the nature of the article, the ability and position of rivals, the value of the commodity in the mart at which you deliver it, and the mode and place where the trade reaches the improvement."

Limitations of space prevent a full consideration of the practical and historical parts of Ellet's extensive writings on many subjects. The controversies in which he was involved illuminate several aspects of the period of aggressive canal and railroad promotion when the America...
can economy was rapidly expanding into the wilderness beyond the Appalachians. One of the chief objectives of the builders of the lines of internal improvement constructed in the United States during Ellet's time was the tapping of the wilderness trade, which consisted mainly of heavy, bulky articles which would bear only a limited transport charge. Ellet recognized that, with a uniform tariff for all points along the route, the tonnage of such articles carried would increase as the terminus of the improvement was approached. Therefore, "this fact suggests immediately the propriety of so modifying the charge, as to levy at every point, the tax best proportioned to the ability of the trade to sustain. . . . Such a discrimination in the tariff of tolls is common on public works; and the tendency of the practice is to promote the interest of the improvement, and is not irreconcilable with principles of justice." He does not state those principles which justify discriminating monopoly and a freight charge inverse with the distance traveled.

Ellet's vigorous criticism of the pricing policies of the canal and railroad companies shows that they even failed to operate as benevolent monopolies. "The patrons and proprietors of any line of improvement . . . whose property is to be enhanced in value, or whose reputations, valued perhaps more highly than property, are to be elevated by its success," are unaware of the principles which govern the amount of total profits and are not maximizing their profits, owing to the incorrect tariffs which they levy. "The establishment of the tariff for an important improvement, is a momentous question for the company; and one which requires as careful an investigation of the facts, and the exercise of as much sound judgment, as any other which the engineer is likely to encounter in the course of his professional practice." Ellet demonstrated that a certain tariff would maximize profits and that a higher tariff would reduce the total return to the corporation and, by diminishing the flow of trade, injure society. His analysis indicates that the tariff should be reduced in the interests of society to the point where profits are maximized. He does not doubt that "restrictions are frequently necessary, to check the rapacity of corporate power." 

Ellet was well aware of the conflict between public interest and monopoly power in the range of values of the charge which would cover costs and provide a nominal profit without, however, maximizing profits. He consistently emphasized that the mutual interest of the public and the monopoly dictated a tariff no higher than that which maximized profits, and he saw the necessity for legislative restrictions on tariffs in cases where the owners of the improvement did not have adequate knowledge of the laws of trade. "In general, after the reduction of the toll has reached a certain limit the interests of the proprietors of the work, and of them who supply the trade will not be found to be identical." Although

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6 In the second of four articles which Ellet contributed to the American Railroad Journal in 1840, he writes (p. 296): "We may conclude from these facts, how very essential it is, where an uniform charge is adopted—a practice, however, which cannot be too highly deprecated—to make that charge on all commodities which escape the competition of rival works, exceedingly low." (Italics added.)

7 Laws of Trade, pp. 61-62.

8 Ibid., pp. 23-24.

9 The Laws of Trade Applied to the Determination of the Most Advantageous Fare for Passengers on Rail Roads (Philadelphia, 1840), p. 5.

10 Essay on the Laws of Trade, p. 68.

11 Ibid., p. 86. Cf., however, the Preface to Laws of Trade . . . Passengers on Rail Roads.
Ellet, throughout his work on the laws of trade, develops a theory of monopoly, at all times he recognizes the influence of potential competitors on the monopolistic position. He observed that "there is on great works which are prudently managed, but little danger of permanent extortion, however wide may be the latitude which is permitted. The fear of raising up a rival, the influence of an existing rival, or it may be, the interest which the proprietors of the work feel in the advancement of the trade, will rarely be wanting in power sufficient for the protection of any interest." The effective or anticipated influence of rivals extends far beyond price and output policies when a new factory or a new improvement is to be built. "In fact, it may be shown that the choice of a system [canal, railroad, or macadam], the cost of its construction, and, in many instances, the location of the line itself, are subject to their [the rivals'] influence." The location of new lines of improvement would under the most "normal" circumstances engage the close attention of canal promoters and engineers.

During the first half of the nineteenth century, when the main routes of railroads and canals were laid down, the location of the lines and their termini was highly important. Apart from the influence which canals exerted on the development of the lands through which they ran, the chief effect of the great canal-building boom was to divert traffic from the Mississippi River and New Orleans to the seaports on the Atlantic Coast. It was part of Ellet's task "to determine whether ... the freights of these improvements will not be limited to certain descriptions of merchandise of moderate extent; and if so, whether its division among so many candidates will not render the competition ruinous to all." Overlooking the nature of a regional monopoly, he says, "Nature, in the formation of the great divisions of the Union, and its watercourses, would seem to have been averse to monopoly, and have meted off to each its appropriate trade." Since Ellet was too good an apologist for the interests of his employers to allow his concern with the topography of nature to divert his attention from the total profits function, in a later paper he advocated a railroad pool.

Applying his laws of trade, Ellet demonstrated that the diversion of trade from the Mississippi Valley would be feasible and that freight would move along the Ohio and on the Great Lakes to the artificial lines of transportation. Within the scope of this great diversion of trade toward the east, where markets had a preference over New Orleans, a skilful promoter could not be indifferent to the terminus of his work; nor could a town or seaport situated at the terminus of the work be indifferent to the volume of freight carried by the improvement, and hence to its charges for toll. Three great improving systems were competing for the western trade, through New York, Pennsylvania, and Virginia. Ellet calculated that the vast improvements to be made on the Erie Canal would not suffice to throw the Pennsylvania system or the James River and Kanawha system out of competition. However, if the Pennsylvania system were not substantially improved, the products moving along the James River system, the terminus of which was Richmond, would compete even for the market at Philadelphia. Most of Ellet's calculations and

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14 Essay on the Laws of Trade, p. 68.
15 Ibid., p. 73.
16 Laws of Trade ... Passengers on Rail Roads, p. 16.
forecasts on the probable distribution of trade between the Mississippi River and the eastward canal improvements were nullified when the railway age made the canal virtually obsolete. Even an observer as astute as Ellet was a singularly bad prophet of a movement which was well launched and was gathering impetus during the time he was writing his Essay on the Laws of Trade.

II

In nearly all his writings Ellet draws a distinction between the technical problem which concerned him as an engineer and the economic problem which concerned him as a promoter of public works. The first may be defined as the attempt to minimize inputs and maximize outputs when certain technical data are given. The second may be defined as the attempt to minimize costs and maximize profits by choosing among diverse methods of production the one best suited to the economic circumstances. Moreover, he succeeds in establishing certain relationships between these two problems, for example, in the "optimum" length of a railroad line, in the "optimum" amount of capital to be sunk in an improvement, etc. Since freight rates are a decisive factor in determining the volume of trade, they are at the same time decisive in the location of a line of improvement and its cost of construction. More resources should be sunk in "fixed capital" when, with certain freight rates, the trade is 100,000 tons per annum than when, with higher rates, it is 10,000 tons. At an interest rate of 6 per cent, a capital investment of $16,000 per mile that would lower costs by 1 cent per mile on 100,000 tons would be economic; with a trade of 10,000, only $1,600 would be economic. It is clear that Ellet considered those charges which are traditionally treated as "fixed costs" on railroads to be in fact variable costs above an absolute minimum. As a practicing engineer, he recognized that "the expenses which are independent of the amount of business on the line would be very small, in comparison with the aggregate charge for freight." 20

In an ingenious article Ellet investigated the value in time of certain commodities, measuring the value by "the interest on the capital invested in the commodity, at the rate at which the proprietor estimates his profits for the time, added to the rate at which his goods depreciate in value in consequence of detention on the route." 21 He uses his general analysis once again to buttress his position that heavy freights should be moved at a slow rate of speed because the wear and tear on the rails and equipment far outweigh the loss in time-value. In the case of passenger service, fast speeds are imperative.

Ellet charges that engineers have perfected the art of construction and neglected a precise discussion of the factors which impinge upon the volume of dividends, because of the "irregularity of the distribution [geographical] of trade,

18 Laws of Trade . . . Passengers on Rail Roads, pp. 5-6.
19 Cf. "Cost of Transportation on Railroads," Journal of the Franklin Institute (September, 1842), p. 145. Ellet's view that unprofitable railroads were characterized by too elaborate an equipment in proportion to the trade was expounded in a pamphlet, Exposition of the Causes Which Have Conduced to the Failure of Many Railroads in the United States, which was unfavorably (and unintelligently) reviewed in January, 1842, in the American Railroad and Mechanics' Magazine, pp. 3-8. Cf. also Essay on the Laws of Trade, p. 105.
20 Essay on the Laws of Trade, p. 166.
which might seem, at first glance, to put at defiance any attempt to reduce it to the order necessary for the application of the principles of an exact science. . . .

Compared with the most approved theory of the Equilibrium of Arches . . . or even with some of the safest principles of hydraulics, it is believed the candid reader will acknowledge, that the announcements of many of the Laws of Trade here offered, are the most rigorous. On the hypothesis that trade was equally distributed over an area, and that each section of the improvement received the same amount of freight, he established the relation between "the toll [profit] which is levied, the cost of carriage, and the trade which depends on them." Although this hypothesis does not correspond to every mile of an improvement, it does tend to apply for every twenty, thirty, or fifty miles; and it is sufficiently exact to allow the deduction of meaningful laws.

In Part I of the Essay on the Laws of Trade Ellet gives an exposition of the pure theory of the general laws of trade. His first law of trade shows that, the lower the cost of freight on an improvement for commodities brought by lateral connecting road branches, the greater will be the distance that the commodity is carried on the improvement. Thus a motive exists for reducing the charge for transportation. Certain commodities of small value such as stone, plaster, and lumber will not be transported if the freight charge is above a definite low limit. Since a great part of the freight handled on the improvements stretching into the western wilderness consisted of heavy, cheap materials, Ellet devoted attention to the method of maximizing profits obtained from their transportation.

Let \( \pi \) be the transport charge the commodity will bear; \( C \) the transport charge per ton-mile on the improvement, including freight and profit; \( c \) the charge per ton-mile for profit or toll; \( \delta \) the charge per ton-mile for freight; \( \beta \) the charge on the feeder road; and \( h \) the distance the article is carried on the improvement. Then \( \frac{\pi - hC}{\beta} \) is the distance along the feeder road which the article may be carried. If the article is to be carried only up to the improvement, the distance will be \( \frac{\pi}{\beta} \) on the feeder road. If there is no carriage along the feeder road, then the distance traveled on the improvement will be \( h = \frac{\pi}{C} \); and a toll higher than \( c = \frac{(\pi - h\delta)}{h} \) will exclude those articles transported \( h \).

The complication of competition between two lines of improvement is then introduced. When two rivals compete for the transportation of an article, the choice of the improvement to be used depends not only on the cost of transport but also on the relative advantage of the markets at which the two improvements terminate (Fig. 1). Let \( h \) be the distance along the improvement terminating at \( A \) from the junctions of the lateral roads \( RR; \) \( X \) the length \( RR \) of the lateral road; \( h' \) the distance \( BR \) along the rival, from the junction of the lateral road to the terminus \( B; \) \( x \) the distance \( Ra \) from the improvement \( A \) to the point where the trade is divided; \( C \) the charge per ton per mile for conveyance on the improvement; \( \beta \) the charge on the connecting
road; $C'$ the charge on the rival; $M$ the value of the superiority of the market at the terminus $A$.\textsuperscript{25} The division of the trade between the two rivals will then be given by the following equation:

$$hC + x\beta = (X - x) \beta + h'C' + M$$

$$x = \frac{X\beta + h'C' - hC + M}{2\beta}.$$  

The profit per mile obtained by the company whose improvement terminates at $A$ is

$$\frac{X\beta + h'C' - hC + M}{2\beta}.$$

"and it is an object of the present inquiry to render their profit the greatest possible." Thus, differentiating with respect to $c$, the variable which is under the control of the company, and equating to zero, with $C = \delta + c$,

$$Q = c = \frac{X\beta + h'C' - h\delta + M}{2h}$$

is the charge for toll (profit) rendering profits maximum.\textsuperscript{26} This equation shows that when the attractiveness of two rival markets is equalized by the addition of a term $M$, "the toll corresponding with the maximum revenue [profit] is equal to the cost of sending the commodity from the point where it comes on the work to the rival port, less the cost of freight on the improvement, divided by twice the distance it is transported on the improvement." When profits are greatest, the whole charge on the article is

$$\delta + Q = \frac{X\beta + h'C' + h\delta + M}{2h}.$$  

Comparison of the last two equations leads to the conclusion that "any increase of the cost of freight will at the same time diminish the toll or profit on the article; and while the company suffers a loss of revenue, the public is taxed an additional amount for the transportation of its property."\textsuperscript{27} If in

$$x = \frac{X\beta + h'C' - hC + M}{2\beta},$$

$x = 0$, then

$$C = \frac{X\beta + h'C' + M}{h}$$

is "the whole charge on the improvement which will exclude the article entirely from the line, and force that portion of the commodity that is found in the district lying between the two works, to seek the rival market." Since $C = \delta + c$,

$$c = \frac{X\beta + h'C' - h\delta + M}{h}$$

is "the whole charge on the improvement which would entirely shut out this branch of the trade."

A comparison of equation (1) with (2) shows that maximum revenue is obtained when profit per ton-mile is just half the profit per ton-mile which would exclude the trade from the line. Also, "when the toll is most advantageous, the distance from the improvement to the point where the trade begins to flow in the opposite direction, is half what would be the distance to the same point if no toll were charged."\textsuperscript{28}

III

In order to maximize the profit on articles of small value (not subject to competition), it is necessary to charge a different toll on every point of the line of improvement where the lateral road connects with the improvement. Ellet thus develops the theory of monopoly in fixing of transport charges and explicitly derives the equations which show that total profit is a function of the toll levied (that part of the tariff which constitutes profit). In accordance with the symbols

\textsuperscript{25} Ibid., p. 50.  \textsuperscript{26} Ibid., p. 74.  \textsuperscript{27} Ibid., p. 75.  \textsuperscript{28} Ibid., p. 77.
of the previous section, the greatest dis-
tance the article will be carried along the
lateral road is \((x - hC)/\beta\), and, assuming
tonnage to be proportional to the dis-
tance, the total tonnage carried will be
\(t(x - hC)/\beta\), where \(t\) is the number of tons
per mile of the lateral road. Multiplying
the first expression by \(c\), and with
\(C = \delta + c\),
\[
r = \frac{\pi - h \delta - hC}{\beta} c
\]  
(3)
is “the revenue per mile due to this
trade.”

Since the height of the toll is under the
control of the improving corporation, it
should set that toll which would maxi-
mize total profits. If we differentiate (3)
with respect to \(c\) and maximize the func-
tion, we obtain
\[
Q = c = \frac{\pi - h \delta}{2h}.
\]  
(4)
Thus, “the proper charge per ton per
mile for toll, on articles which do not ex-
cite the competition of other lines, is
equal to the difference between the whole
charge which the article will bear, and
the actual cost of transporting it on the
improvement, divided by twice the dis-
tance it is carried on the improvement.”

Several corollaries of this theorem may
be noted. First, because articles of high
value can bear a heavier charge than ar-
ticles of low value, a more elaborate and
expensive line of improvement may be
constructed for their transport. Second,
it is not always true that “the most prof-
itable part of the trade is that which is
transported the greatest distance on the
lines.” Third, for articles of small value,
“not only the toll per ton per mile, but
the aggregate toll for the whole distance
the ton is carried, ought to be less when
that distance is great, than when it is
small.” Fourth, “the higher the charge
for freight on the line, the lower will be
the toll; the more expensive the system
of transportation, the smaller will be the
profit and the dividend.” If the charge
for freight is added to the toll in equa-
tion (4), the charge per ton-mile will be
\[
C = \frac{\pi}{2h} + \frac{\delta}{2}.
\]

This equation shows that an increase in
freight charge increases the total tax,
and, since the total revenue is diminished
by increases in the freight charge, the in-
terests of both the community and the
monopoly are served by using that form
of transportation on which the freight
charge is lowest.

The case of monopolistic price dis-
crimination in the fixing of transport
tariffs treated by Ellet is not exactly that
of the long- and short-haul discrimina-
tion. The latter form of discrimination
applies at isolated points where no com-
petition between the carriers exists and
does not apply to points at which there
is competition. Ellet considers the case
of discrimination all along a line of im-
provement, the extent of the discrimina-
tion varying inversely with the distance
of the haul.

Comparison of \(c = (\pi - h\delta)/h\), the
toll at which articles are excluded from
the improvement, with \(Q = (\pi - h\delta)/2h\)
shows that profits are at a maximum
when profit per ton-mile is one-half of the
excluding toll. Also, “the distance from
which the commodity will be transpor-
ted, or the tonnage of the improvement,
will be just half as great as if the charge
was only equal to the cost of carriage and
the revenue was consequently nothing.”
Further, “when the dividend is the great-
est possible, the profit derived from the
commodity, on the improvement, is just

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\(^{39}\) Essay on the Laws of Trade, p. 63. Ellet drops
the proportionality factor \(t\) in this equation.

\(^{39}\) Ibid., pp. 63-65.
MATHEMATICAL THEORY OF MONOPOLY

equal to the extreme cost of transporting it to the line." Even if trade is not distributed along the line according to the law of equal distribution, but is concentrated at single points (e.g., coal mines), the above principles still apply.

Ellet had a peculiar theory of monopolistic duopoly in which a single line of improvement is divided between two monopolists. Unless the lines are of equal length and the transport charge is regulated to the mutual monopolistic interest of the two carriers, the rate will be higher than the optimum rate and the total volume of trade will be lower than that flowing under the rate which maximizes profits for a single monopolist. Instead of fixing the rate at one-half of what the traffic will bear, the independent duopolists would establish a rate two-thirds of the greatest possible rate. The following example demonstrates this case: Let $P$ be the greatest toll that could be exacted without entirely excluding the trade; $h$ the length of the longer of the two lines; $h'$ the length of the shorter line; $c$ the toll per ton per mile on the longer; $c'$ that on the shorter. The total toll on the longer for the whole length is $hc$; on the shorter $h'c' = (P - hc)/2$. Also $hc = (P - h'c')/2$.

If we eliminate $h'c'$ from these equations, we obtain $hc = P/3$; also $h'c' = P/3$; or the entire toll for both lengths: $hc + h'c' = 2P/3$.

Moreover, if organizations providing necessary transport services are not under the control of the owners of the improvement (e.g., transshippers, loaders, etc.) and intervene between the improvement and the ultimate receiver of the freight, the tolls of the improvement will be reduced. For even though the toll be reduced, trade will not be increased, if the service organizations raise their charges, the increase of which can now be borne by the shipper. The case considered here will be recognized as the paradox demonstrated by Edgeworth, that it is better to be at the mercy of a single monopolist than of two monopolists on a transportation line. It is also similar to the Cournot case of the production of zinc and copper and their joint use in the production of brass.

Having elucidated the theory of monopoly pricing, Ellet gives a method for testing whether the tolls which are actually being levied are at the level which yields maximum profits and the trade "has . . . acquired, so to speak, its equilibrium." At the maximum position a small error in the toll will cause only a negligible loss of profits. But, as the error becomes greater, the loss of profits increases as the square of the error. Ellet calculates that a deviation from the maximizing toll greater than 25 per cent will lead to heavy losses.

IV

Ellet's formulation of the theory of passenger-fare rates contains an explicit discussion of the demand function. He divides his exposition into two parts:

1) rates on lines connecting important places and
2) the determination of "what should be the fares common to

Ellet, Essay on the Laws of Trade, pp. 77-78.
several connected railroads, [in order] that their aggregate *net revenue may be the greatest possible." Each individual, on the basis of whatever rational or irrational criteria he chooses, determines the highest fare he is willing to pay for a given trip. Prospective travelers may then be divided into groups which are willing to pay various rates, and those rates may be charged which are determined by the formula which maximizes profits in the case of freights. "But, in the present case, we cannot proceed in this way, since we are compelled, by the constitution of society, to charge all—or at least all who receive the same accommodation—alike; and consequently, before the formula could be employed, it would be incumbent on the company to find, among all these infinite grades, that one which, if made the basis of the tariff, would yield the highest revenue. The company do not, however, know whether the value which represents this particular grade is a constant quantity, or whether, as appears probable, it may not be a function of the distance, or otherwise complicated." Ellet makes the number of passengers who will travel a decreasing function of the cost of travel and by methods of elementary calculus derives the equation which gives the maximum revenue. He explicitly formulates the idea of the demand function, and subsequently he implicitly discusses its elasticity. He questions the validity of his method, since it is based upon an assumption which is highly questionable: that the number of passengers who will travel will be reduced proportionally for any increase of fare. He dismisses this objection by saying that the relevant range of the independent variable is small, and thus that for practical purposes the assumption is applicable.

Although Ellet did not affect the course of economic inquiry, the sketch of his writings on the technical-economic subject of tariff-fixing and monopoly pricing, which constitute only a small part of his extensive literary work on diverse subjects, reveals him as one of those rare men of affairs who scan their activities from a general position and are capable of marshalling a seemingly incoherent mass of physical and economic data into a series of significant relations. That the mathematical formulation of his ideas would follow almost automatically was inevitable, since they involved functional relationships which could be treated by the methods of the calculus—an analytical device of the physicist and engineer, which oftentimes becomes a mere weapon of the economist in sterile controversy.

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39 *Laws of Trade... Passengers on Rail Roads*, p. 7. Cf. p. 18: "It need scarcely be said, that in fixing the charges for a long route made up of several distinct interests, an agreement between the companies composing it, to prevent injustice from being done to either, is an assumed condition. The method proposed aims for the maximum *aggregate* net income; the equitable distribution of the proceeds among the companies, will involve no difficulty, for the profits of any one line, derived from individuals who pay fare over that line only, will, of course, belong exclusively to that company; but the profits obtained from tickets over two or more lines, will be divided among the several companies in proportion to the number of miles of travel of them respectively."

BOOK REVIEWS


Thomas More was a merchant, lawyer, humanist, scholar, and a deeply religious man. His Utopia (1515) was written in the age of the Renaissance, humanism, the enclosure, and the dissolution of feudalism and the birth of capitalism, and only two years before Luther struck. Which of these influences lie back of the masterpiece as its source of inspiration and its organizing principle is a question which has stirred many scholars. Various factors were stressed. Karl Kautsky, to whom, without visible justification although not without critical remarks, Ames gives pride of place among writers on More, treats More as a rebellious bourgeois; to R. W. Chambers, the most authentic biographer of More, he is a reformer inspired by what is best in medieval thought and practice; F. Seebohm regards him principally as a humanist; and H. Oncken christens him the "father of British imperialism."

The present study sees More as "citizen" (bourgeois) More, as pre-eminently a person of the middle class—defined broadly to embrace all who are not laborers or idle aristocrats—critical of the old and the new about him and hoping "to reform society along bourgeois-republican lines in the immediate future" (p. 18). The first half of the book, after an interesting introduction, opens with a chapter on declining feudalism as the social map of England in 1515 and then sketches More's life until that date, stressing his occupations and formative connections. The second half examines briefly those aspects of social England and Europe which are singled out in Utopia for discussion, condemnation, and reform, e.g., the city, the guild, the church, the merchants. Ames's thesis is that Utopia, far from tracing the fancy of a genius, reflects More's times and his class position; that his proposals in it originate in a background of practices and agitations during his day or not long before. The aim is to present primarily a social interpretation, correcting, elaborating on, and documenting Kautsky's study of More, promising—but not quite delivering—recognition of the humanist element and frankly omitting the religious and literary influences on More, which at once makes the study incomplete and narrow.

Nonetheless, the product is a very readable scholarly work, with many good judgments, some useful caveats (often honored in the breach), competent historical summaries, well balanced in places and well documented throughout, although references to college textbooks are somewhat conspicuous. Placing Utopia in an illuminating social frame, it sheds much light on More, his times, and his celebrated work.

The study suffers from the implied belief in propinquity as causation and from the acceptance of the primacy of the economic factor. Ames succeeds very well in demonstrating that the criticisms and reforms in Utopia have their counterparts in events contemporary with More or recent for him. This, however, does not establish the causative sources of his particular orientation. For example, John Ball advocated a sort of communism, and a Bohemian town practiced communism; but these events do not nullify the suggestion that More may have obtained the idea of communism from Plato or from the early Christians, two major influences in More's development neglected in this essay.

The Utopia, says Ames, carries "many implications of embryo capitalism to their logical democratic conclusions" (p. 35). It requires the gift of a prophet for More to extrapolate from such a nebulous economic fact as capitalism in 1515 to such a remote conclusion as democracy—remote because democracy actually materialized nearly two centuries later in England and later still in France and elsewhere. In chapter i Ames describes conditions in 1515 and titles it, not even "embryonic capitalism," but "Late Feudalism." Perhaps More got his ideas of democracy from Aristotle and from the history of Greece and Rome. It may be added that the Marxian conception of democracy as the "logical" fruit of capitalism is subject to challenge; but the editor did not allot space for the argument. Ames lays much store by More's middle-class status and points to it a score of times throughout the book. One wonders how much
light is gained from this repeated characterization. He defines this class so broadly that it includes cardinals, a banker like Fugger, and the “noble engaged in capitalist farming” (p. 75). Such a definition would put in the middle class a contemporary of More like Machiavelli, whose Prince, only two years older than Utopia, is the antithesis of it. It is an optical illusion to see More mirroring the middle class when Utopia champions the cause of the poor; exalts the lowly laborer as of a superior order; stresses handicraft as against the infant factory of the day, and learning as against wealth; and advocates communism, a six-hour working day, social security, and social medicine.

There are also blemishes of minor key, and a few will be cited. The enclosure movement, referred to several times, is presented simply as a crime of greed, without mention of the better side of this economic event. In enumerating the causes of the decline of the Hanse, Ames omits its long and fatal war with the merchant-adventurers. He makes the unsupported assertions that the “slave-owner Plato” gives first place to the soldier and only second place to the philosopher as the ideal citizen in the Republic and that the “Republic is founded on slave labor” (pp. 114, 170); and he ventures the strange suggestion that the Prince may well be a satire penned by a freedom-loving Machiavelli.

A broad-gauged evaluation of More’s Utopia is yet to be written. It will hardly be written by one who has bitten of the apple of Karl Marx or Karl Kautsky.

M. M. Bober

Lawrence College


This essay is concerned with more than “equality.” It is an examination of the historical development and contemporary significance of the ideal of equality as one element in the totality of the democratic ideal. In that totality the “affiliations between the ideals of liberty and equality” are stressed; and the need “to re-unite and to reconcile” these “twin sisters” is posed as the means to a “revitalised concept of democracy.” The conflict arises because “the even distribution of material benefits can be most readily achieved by highhanded and authoritarian means,” so that “equality can thrive at the expense of liberty, even within the framework of a democratic society” (p. 24).

After a brief introductory chapter discussing the concept of equality and some misconceptions, three chapters deal with the development of the ideas and with the realities of “legal,” “political,” and “economic” equality, always with an eye to their contemporary significance. In these chapters the material is prepared for the discussion of the contemporary problem, in the final chapter, on “liberty, equality and fraternity.” But, first, there comes a less satisfactory chapter on “equality between nations,” in which too little attention seems to be devoted to equality between people irrespective of nationality, too much to equality of the “nations” as units. The final chapter is an interesting and valuable contribution to that reformulation of the “faith and philosophy of democracy . . . in more apt and comprehensive terms sensitively appropriate to the needs and desires of men in modern society” (p. 155) which the author believes to be urgently needed. Essentially, his argument is this:

There is an “outer” equality of condition and circumstance which can be enforced, and there is an “inner” equality of human personality for which respect is unforced; and the second is a higher form of equality than the first. But without some regard to the first, the second is unlikely to grow and flourish. . . . The kind of equality which satisfies the democratic ideal is to be found, ultimately, in that quality of human relationships where spontaneous reverence for the personality of a fellow human being is taken for granted and is inseparably part of every day life (p. 151).

This is “fraternity.” It is of the essence of democracy and is “embedded in the very foundations of European civilization, in the amalgam of Greek, Roman and Christian ideas and institutions that are the rock on which our culture is based” (p. 13). The discussion of our heritage and our ideals is of particular importance in an age of rapid institutional change, and this essay is a useful contribution to that discussion.

V. W. Bladen

University of Toronto


I think it is fair to say that, as a diagnosis of social change, this book is nothing more than a
new edition, with different title and author, of the standard Communist declaration of faith on the evils of capitalism and the inevitability of communism. It would be a wearying experience to force one's self to read it, were it not for the fact that it constitutes another historical document demonstrating the intellectual sterility of the Communist movement in the United States. As such, it has a certain fascination; one wonders if slogans adapted to the nineteenth century will continue to be used for the whole of the twentieth.

The prose style of the work is in the old tradition. “Obsolete capitalism is rotting in every fiber and the stench from it sickens the whole world. The workers and their allies are snatching the banners of leadership from the treason-soaked capitalists” (p. 14).

Nevertheless, much of what the Communists have to say about American society needs frequent repetition. And, even if this book is pathetic as a literary, scientific, or propaganda work, it is important simply as a statement of announced doctrine of a political group not without power and influence—important despite the fact that it is the same old doctrine all over again.

CHARLES E. LINDBLOM
Yale University


“The purpose of this compilation of tables and charts is to provide a wide range of factual information to accompany discussion of the principal topics usually covered in elementary economics courses” (p. i). The authors intend to keep the book up to date. The first edition appeared in June, 1948, the second in May, 1949. The book should appeal to the average student, for the charts are on letter-size paper, the print is reasonably bold, and a plastic spiral-type binding is used so that the book easily lies flat when open. The authors have prepared a table showing what tables and charts are best suited to what chapters in sixteen widely used texts. There are about two hundred tables and charts, each chart being accompanied by the table of figures from which it was constructed. These tables and charts are arranged under nine chapter headings, namely, (i) “National Income”; (ii) “Population and Working Force”; (iii) “Natural Resources”; (iv) “Money and Banking”; (v) “International Trade and Finance”; (vi) “Government Finance and Private Debt”; (vii) “Price Levels and Business Fluctuations”; (viii) “Manufacturing”; and (ix) “Agriculture.” The material has been well selected and should satisfy teachers with a variety of viewpoints. After each section there are questions to guide the student in consulting the tables and charts.

In an era in which teachers emphasize statistics, seek visual aids, and endeavor to sketch the outline of the economy in broad strokes, a book of this character was inevitable. It should receive an enthusiastic welcome. There have been only a few like it. About twelve years ago Louis Hacker and two associates prepared a booklet entitled The United States: A Graphic History for use with history or economic history texts, but it is out of print. Early in 1949 the Twentieth Century Fund published a booklet entitled U.S.A.—the Measure of a Nation, which is “a graphic presentation of America’s needs and resources” and a condensation of Dewhurst’s monumental study. It might be used with an economics text. But neither of these is so carefully fitted to texts as is the book under review. That raises the question, however, as to the best way for the student to get his statistical data. Since the student should be taught not only to use statistical data but how to locate them, might it not be better for him to have to dig material out of publications like the Statistical Abstract, Historical Statistics: 1789-1945, Economic Almanac, and the Survey of Current Business? Most of the tables used come from accessible sources like these.

The authors made numerous improvements in preparing the new edition. I presume to offer a few more. Most of the tables begin after 1920, and only fifteen contain data before 1900. There are several good reasons for this. Yet the result is that the student depends almost entirely on recent years for statistical illustrations of economic principles and ideas. The danger is obvious. More effort should be made to include earlier data whenever they are available, reliable, and pertinent. The growth of capital, depicted in an excellent chart in the Twentieth Century Fund booklet mentioned above (p. 3), should be stressed more. There may be immense reserves of bituminous coal, but there are not of coking coal (p. 84). Some of the income and debt statistics might better be reduced to a per capita basis and be put in terms of dollars of a common
Finally, the accomplishments of the economy at different periods in terms of, say, per capita real income, capital per worker, and life-expectancy deserve mention. But, on the whole, the authors deserve words of high praise for the care with which they have prepared this book and for some of the tables and charts, in particular those in the national income section and those on the Marshall Plan.

DONALD L. KEMMERER
University of Illinois


Volume I of the United Kingdom's official history of the second great war, sponsored by the government and prepared under the direction of W. K. Hancock, Fellow of All Souls College, Oxford, with the assistance of M. M. Gowing, augurs well for the entire series. The title "civil histories" was given to the series in 1942 to distinguish it from military histories and other official records, such as diplomatic, which might be planned. The following subjects were chosen for investigation: war production, civil industry, and commerce; financial policy; agriculture; fuel and power; building; wartime social services (including education); civil defense; economic warfare; and colonial policy.

It is possible that the published civil histories may reach thirty volumes, with the responsibility for research and writing assumed by professional historians, who, from 1942 forward, were given access to government documents. In many instances, however, documentary evidence was almost nonexistent, the historians resorting to conversations with men who retained in their memories the knowledge of unrecorded events. American writers might well read the Preface to this study, which offers valuable clues to the overcoming of deficiencies and pitfalls which confront individuals seeking to analyze war programs and personalities.

Launched from the perspective of traditional war finance, the present book reviews the economic and military planning during the ill-starred Anglo-French alliance, in the years between the two world wars, and in the periods from Dunkirk to Pearl Harbor, Pearl Harbor to Normandy, and Normandy to 1948. Accepting the British convention of an impersonal civil service, the authors have left to future historians the consideration of those large moral and political issues which place the greatest strain upon contemporary judgment. They have concerned themselves, instead, with the adequacy of means to an end—the winning of a war. Detailed attention in the process is paid to documentation, with the decision reached to confine footnotes to material that is readily accessible to the student. Complete documentation has been given in confidential print where it will become immediately available to critical readers within the government and, in all probability, in due time will be made available to the public. In the words of W. K. Hancock, "the official historians of this generation have consistently submitted their work to the professional verdict of the future."

The volume under review, providing a résumé of the over-all expansion of British economic effort, the division of resources between war and civilian zones, and the effects of the war drive upon the economy as a whole, has been written from the viewpoint of the war cabinet. Technical problems have been discussed in non-technical language, without reference to details which accrue to the expert. Inevitably, one feels the oppressive weight of war—in personal and financial resources—especially in the case of the United Kingdom. Victorious, yet deprived of the rights of victor, the postwar course of Great Britain has become increasingly hazardous. Hancock and Gowing close their study with paragraphs evaluating the costs of war, prophesying that the nation's struggle to overcome the consequences of war will be long and hard. That Britain's war economy was skilfully fashioned is amply demonstrated by their volume; the question of whether her postwar program was as ably designed will be answered by future historians, who will carry the Hancock-Gowing story to its logical conclusion. These future historians are challenged to meet the excellence of conception and execution of the British civil history bearing the title of British War Economy.

MARY E. MURPHY
Hunter College of the City of New York


Up to now French publications on the theory of employment have been limited to the long re-
in Etienne Mantoux before the war, Lar- gentay's translation of the General Theory during the occupation, and a succession of articles after 1944. Gruson's volume, the first book-length interpretation of Keynes published in France, is consequently a substantial addition.

In a way his book serves as an inclusive and orderly exposition in French of Keynesian economics, since it contains the usual analytical devices and reaches the well-known conclusions. As such it is not controversial. There are no quarrels with Keynes or his followers, and almost none with his critics. Since there are no page references to the General Theory and only one mention of any of the writings to which it gave occasion, Gruson's interest in the revision and amendment of Keynes since 1936 can only be implied—for example, it is apparent from the tone in which he rejects control over the rate of interest as an instrument of policy.

Yet the book is not a literal digest of the General Theory; nor did the author intend that it should be. The expressed intention of the author was to add rigor by replacing the intuitions of Keynes with more precise analyses. Evidently the intuitions of Keynes are correct but ought to be dissected. Part of the result of the dissection is a series of hypothetical cases of increasing complexity, set forth with numbered theorems and lemmas. These are based on refinements of Keynesian definitions. Investment, for example, is split into direct and indirect. When direct investment occurs, the investment good never enters the market for sale. Both direct and indirect investment are divided further according to the method in which they are financed. The drag on the reader of these refinements in definition and the resulting subcases to which they lead is considerable.

Another characteristic of this book is its predominant concern with money as an asset. It is not, as one might expect, a concern with an elaboration of the connection of money to interest and then of interest to employment. Nor is it stressed because the author sets great store by monetary policy as a means to gain full employment; he does not. Money assets dominate because they are the standpoint from which the whole process of attaining equilibrium is viewed.

This standpoint is evident both in the pattern to which the general organization of the book is cut and in the details of the conduct of almost every part of the analysis. The expression into which Gruson expands the average propensity to consume exemplifies how far the preoccupation with money assets is carried. His expression swells the basic fraction of income spent for consumption goods into a fraction with five terms in the numerator and three in the denominator. It is not only the complexity of the expanded expression but the fact that four of these terms involve either cash balances or the methods by which investment is financed that characterizes this study in Keynesian economics.

It is certain that an analysis of employment equilibrium can be written in various ways, of which Gruson's is an allowable one. There is doubt, however, that the advantage of his statement is plain. One can wish that the labor spent had resulted in new conclusions or had shown more convincingly the benefit of added work on the connection of money assets to employment.

University of Kansas

R. S. Howey


America is searching for an industrial way of life that will produce fruitful and harmonious co-operation between management and labor. Profit sharing is one of the many experiments designed to aid in bringing about this happy result. Thompson's book is a highly valuable description, analysis, and evaluation of profit sharing in America.

Many diverse arrangements for compensating workers have been loosely called "profit sharing." Thompson, however, defines the term restrictively as the sharing of a company's profits with its employees according to a definite plan which is formulated and announced in advance. Using this definition, he discusses the history, the philosophy, and the theory of profit sharing; he presents and explains the attitudes of labor and management toward profit sharing; he evaluates profit sharing as a device for developing labor-management co-operation; and he describes in detail practical procedures for instituting a sound profit-sharing plan in a business enterprise. The book is interestingly written and is altogether a competent treatment of the subject. It will doubtless become the standard work on the subject.

One of the most suggestive sections of the book is the discussion of profit sharing in relation to the recent concept of "ability to pay" as
a factor in wage negotiations (pp. 38-41). Thompson points out that application of the ability-to-pay principle is, in fact, closely akin to profit sharing. This he refers to as "an interesting, if explosive, subject for speculation." In his concluding section he remarks in somewhat the same vein (p. 249) that "the sharing of profits is actually the subject of every wage negotiation. To formalize this relationship through the establishment of a Profit-Sharing program is to recognize that labor's interest in profits can be made beneficial to both indispensable parties in production."

In this conclusion and elsewhere, Thompson expresses the view that profit sharing is a wholesome and hopeful development in modern industrial relations. This judgment, however, is tempered. He frankly recognizes possible limitations, weaknesses, or abuses. He emphasizes the need for good basic human relations before profit sharing can be expected to work. He warns that profit sharing is not a panacea or a substitute for other forward-looking personnel policies.

Despite Thompson's cautious commendation of profit sharing, he does not, in my opinion, give due recognition to its limitations from the broad economic and social points of view. Theoretically, in the long run, a company can share its profits with workers only (a) if it is earning monopoly returns, (b) if it is not paying full differential rents to various factors employed (c) if its owners are willing to accept less than the going rate of return to capital, or (d) if it is paying less than the going rate of straight wages. If at least one of these four conditions is not present, the sharing of profits will reduce the return, and the firm will be unable to maintain its capital. Surely, profit sharing cannot be practicable in the long run for a competitive firm that is paying its full rents and the going rate of wages and whose owners expect the going return on their investment. A solution to the problem of labor relations that depends for its practicability on the presence of one or more of the above four conditions could not in any sense be looked upon as a solution of wide applicability in a free-enterprise system.

On the other hand, it can be argued that profit sharing, through its favorable effect on incentives and on industrial harmony, may so increase productivity as to reduce labor cost and thereby make possible the sharing of profits without reducing the return to capital below the necessary minimum. The evidence presented in this book does not prove that profit sharing, if adopted widely, would have such a pronounced effect on productivity. I, for one, would tend to remain skeptical of its potentiality as a device of wide applicability. Profit sharing would seem to me to be a technique that could successfully be adopted by certain companies (especially monopolists) in certain circumstances to their individual advantage—and perhaps to the advantage of their workers—but not a technique that would offer much hope of providing a widespread solution to the "labor problem."

With these conclusions the author does not explicitly disagree in principle. My only complaint is that he does not sufficiently stress the limitations of profit sharing. Nevertheless, having stated my difference of opinion regarding the generality of the author's conclusions, I would reiterate my hearty commendation of the book.

University of Illinois

Howard R. Bowen


Readings on Agricultural Policy is similar in concept to the four volumes of readings prepared under direction of the American Economic Association, which began with Readings in the Social Control of Industry, published in 1942. This, however, is sponsored by the American Farm Economic Association.

After decision had been reached to experiment with a book of readings in agricultural economics and when a choice of subjects was being made, I expressed skepticism about the suitability of agricultural policy as the subject matter for a volume of this kind. A number of my colleagues shared that view. Perusal of the volume under review has not altered that opinion. In fairness to the editor and to the publishers it should be pointed out, however, that the subject chosen was the one recommended by a majority of those questioned in regard to topics. This indicated the current widespread interest in the subject rather than a considered judgment as to how such a book could be assembled and organized.

Agricultural policy is not a field of specialization in itself, in the sense that business-cycle theory or international trade constitutes such a realm of interest. It is a whole group of fields of study. The problems of international trade in
farm products are about as complex as those relating to international trade generally. Price policy, as related to agriculture, is another major field, and land policy constitutes another. Thus, when one attempts to embrace all these and more in a single volume of less than five hundred pages, the product is too thin. In fact, some question can well be raised as to whether the body of writing in this realm is yet sufficiently developed and profound to make possible a satisfying volume built up out of articles. Very evidently, opinions will differ on this point. Certainly, there has been a considerable amount of writing on the subject in recent years, some of it very good. On the whole, however, the better treatments are too lengthy for inclusion in a book of this kind.

The space limitations within which the editors made their selections become evident when one considers the makeup of the book. The first fifty-four pages are assigned to the general setting, under the heading “Background.” Thereafter comes a section entitled “Price and Production Adjustment,” which covers one hundred and ten pages. This is followed by Part III, on “International Trade and Relations,” which consists of eighty-three pages. The fourth and last section, entitled “Land and Rural People,” occupies ninety-nine pages.

The adequacy of such brief treatments of these large subjects must, of course, be considered in relation to the uses for which they are intended. Presumably, the audience for which the book was prepared consists in the main of college students and professional economists. But the level at which some of the selections are pitched would seem to make them unsuitable for this type of reader. This is not intended as depreciation of the writers concerned. They were, in some cases, writing for popular audiences, not for students or professional economists. For example, such articles as those by Wilcox on “What Makes Farm Prosperity,” by Kline on “What the Farmers Want,” and by Schultz on “Needed! A Production and Marketing Price Policy” are clearly designed for popular audiences and can hardly be expected to be suitable for serious study in college courses.

It must be clear to anyone that no two people or committees would select the same articles for inclusion in a volume of this kind. One is surprised, however, to find absent such thought-provoking articles as J. S. Davis’ “American Agriculture: Schultz’ Analysis and Policy Proposals,” in the Review of Economic Statistics for May, 1947, and Schultz’s own article, “Postwar Agricultural Policy: A Review of the Land-Grant Colleges Report,” in the Journal of Land and Public Utility Economics for May, 1945. This reviewer misses, too, such landmark articles as E. G. Nourse’s “The Outlook for Agriculture,” in the Journal of Farm Economics for January, 1927, and, if nutrition is to be dealt with, M. L. Wilson’s “Nutritional Science and Agricultural Policy” in the same Journal for February, 1942. Several others might be mentioned.

It would obviously be unwarranted to imply that, because a particular reviewer thinks a number of articles were omitted that are better than some of those included, a case is made for that conclusion. It does seem clear, however, that, before the association proceeds further with a series of this kind, the purposes to be served should be brought more sharply into focus and that the subject of each volume should be reduced to a scope which will permit more adequate discussion. This probably would mean, too, the selection of a smaller number of longer articles. Topics of this importance cannot be dealt with adequately in articles prepared for such popular mediums as the Farm Policy Forum or in such short articles as are customarily published in the Annals of the American Academy of Political and Social Science.

Murray R. Benedict
University of California
Berkeley, California


This book represents one of the most complete attempts thus far to orient a general public finance text in terms of economic effects of expenditure and revenue policies, with particular emphasis on the consequences for the level of national income. Descriptive material is held to a minimum. The analysis of expenditures stresses the multiplier and acceleration-principle reactions. The taxation section is primarily a study of incidence and economic effects of income and sales taxes. The incidence analysis deliberately ignores the effects of expenditures of the tax revenues and therefore presents conclusions which must be interpreted with care. The last portion of the book is a well-balanced study of fiscal policy. Great emphasis is placed upon
the fact that the effects of fiscal policy depend not upon the size of the budget deficit or surplus but rather upon the extent to which the budget releases (or absorbs) consumption funds. Professor Somers emphasizes the possibility of insuring full employment with a balanced budget, provided that the program is adopted before a depression becomes severe.

The book is best suited for an advanced course in public finance. For an introductory course, the book does not provide an adequate explanation of the functioning of the government financial system and requires a knowledge of economic analysis which the typical college Junior lacks. The author attempted to make the book usable in introductory courses by including some descriptive material. I feel that he not only failed to accomplish this purpose satisfactorily but made the study less suited as an advanced text than it would have been, had it been designed solely for the latter purpose.

As a whole the analysis is highly competent, and, except for the first two chapters, well written. For text purposes the expenditure section gives rise to serious problems; chapters iv and v, dealing with the consumption and investment effects of expenditures, present a level of analysis much higher than that of the rest of the book. Yet if these chapters are omitted, the reader is left with only a very brief summary of the effects of expenditures. This section would have been more usable had these chapters been simplified and the large number of conflicting points of view which they contain relegated to footnotes.

Major problems of the present tax system, such as the taxation of corporate dividends and the averaging of income, are not subjected to detailed analysis. There is a tendency throughout the taxation section to evaluate measures almost solely in terms of income-effects, with serious underemphasis on other considerations. The treatment of levies other than income and sales taxes is extremely brief. In the incidence analysis the incidence of income taxes is based upon a high degree of abstraction, which ignores the influence of labor unions and oligopoly.

In view of the very brief treatment given to many major issues, excessive space is allocated to an analysis of Tinbergen's statistical testing of the acceleration principle and to the presentation and criticism of Adams' views on the relationship of governmental and private borrowing. A few statements will bother many readers; for example, "The economic surplus mentioned above [economic rent] comes from nature's contribution to the produce" (p. 156). The view that "for the most part, tax shifting theory which actually deals with the same problems as price theory is at least twenty-five years behind the latter" (p. 160) is scarcely acceptable today. It is most unfortunate that 1945 data were used for state and local governments; the tremendous changes in magnitudes and the trends since that time are completely ignored.

University of Illinois

John F. Due


This is the first major attempt in the English language to develop comprehensively the field of location theory by systematic and rigorous analysis. There is an extensive literature in technical German in this field, but previous work in English has been limited to specific segments of the field. In the United States there have been guides for businessmen on where to locate a store or factory, descriptions of patterns of distribution, analyses of the factors in the location of specific industries, studies in land utilization, and work on the relation of industrial location and national resources. In the British Isles there have been substantial contributions on industrial location and public policy, especially with respect to the depressed areas. Hoover's book transcends these previous works by the breadth of its scope, by the balance of its treatment, and by the clarity of its presentation. Nevertheless, it is modest in size and nontechnical in language in conformity with the plans of the "Economics Handbook Series," of which it is the first volume to appear. Though basically economic in content and method, the book draws materials from other fields also, particularly geography, sociology, political science, and planning, and in turn develops concepts of value to each of these fields.

The book treats three major divisions of the field: patterns, changes, and public policy. Under "Locational Preferences and Patterns" transfer costs and processing costs are analyzed. Under "Locational Change and Adjustment" attention is turned to the processes involved, the role of technological changes, and the plight
of problem areas. In the sphere of "Locational Objectives and Public Policy" may be grouped the locational significance of boundaries, the sphere and tools of public policy, and alternative policies for (1) locational flexibility, (2) locational stability and balance, and (3) national security and power. In each of these, the underlying assumptions and resulting impacts are considered. Although well reasoned throughout, the book is most stimulating in the section dealing with public policy.

Chauncy D. Harris
University of Chicago


This doctoral dissertation is an analysis of failures of banks doing a commercial banking business. By "failure" the author means a bank in receivership, i.e., an insolvent bank. She does not include banks voluntarily liquidated or, always, suspended banks. The study is thorough, well organized, and competently executed. It should particularly interest students of bank management.

The book is in two parts: one is a historical survey, and one is based on ratio analyses. The historical survey deals first with bank failures in general from 1863 to 1948 and then more specifically with those in the District of Columbia. Altogether, eighteen thousand banks have failed in the nation since 1863. Why? The chief reason, the author concludes, has been mismanagement. It follows that many failures might have been foreseen and prevented. How? Obviously, eighteen thousand failures cannot be examined in detail. The author has undertaken to study those in one significant segment of the economy, the nation's capital. First, she examines the case histories of six banks failing before 1900: the value of this portion of the study is slight. Then she describes the failures of four national banks since 1900, one by one, and then those of eighteen nonnational banks. Most of them failed after 1931, and none of the nonnational banks were members of the Federal Reserve System. Virtually all were small to medium small, their capital ranging from $50,000 to $2,000,000.

In the ratio analysis the author first discusses thirteen types of bank ratios, their virtues, and their shortcomings. These thirteen are: (1) capital to deposits; (2) capital to total assets; (3) cash to total assets; (4) loans and discounts to total assets; (5) loans, discounts, and investments to total assets; (6) U.S. governments to total assets; (7) real estate assets to total assets; (8) cash to total deposits; (9) cash and U.S. governments to total deposits; (10) loans and discounts to total deposits; (11) time deposits to total deposits; (12) loans, other stocks and bonds, and real estate (minus capital funds) to total deposits; and (13) real estate assets to capital. She then takes the five last year-end statements of the twenty-two banks failing since 1900 and applies the thirteen ratios to them, asking whether an astute observer would have foreseen disaster if he had done this. Because she has the advantage of "hindsight," she can always read warnings of trouble in some of the ratios of every bank. One wonders how their ratios would compare with those of twenty-two nonfailing banks picked at random and whether an astute observer could separate the twenty-two bad from the twenty-two good by examining only the ratios.

The exercise she has performed has, nevertheless, considerable value, for it indicates which ratios were most valid and which ones least in a limited area and in a limited period. She should, however, have summarized her findings more fully and more clearly. The six-page final chapter hardly does justice to her previous painstaking efforts, but certain conclusions do emerge. The once respected capital to deposits ratio of 1 to 10 for banks is almost worthless, but that was being discarded by the middle 1930's. The loans and discounts ratio to total deposits proved a good measure—high ratios repeatedly showed up banks with a heavy burden of poor loans. Real estate assets to capital is a helpful ratio, too. One of the best is loans, other bonds and stocks, and real estate (minus capital funds) to deposits, because it shows the "relationship between assets of uncertain liquidity and total deposits." Banks appear to have failed largely because of poor loans (of course!) and because of heavy real estate investments. It must not be forgotten that the usefulness of a ratio depends on the nature of the mismanagement, and that varies from place to place and from depression to depression.

Donald L. Kemmerer
University of Illinois
Economic system, with alternative forms of eco-

free enterprise, as he calls the present American

calls a synthesis, relies heavily on previous pub-

lished studies and of those of the Institution over the

last twenty years. The book, which the author

calls "Looking Backward" and the other "Looking,

Forward." Part I begins with an examination of

the pessimism of the classical school and finds

this pessimism to have been derived from an un-

critical faith in the operation of the law of di-

minishing returns and from a failure to antici-

pate the increasing rate of technical progress.

The innovations, including such institutional in-

novations as corporate organization and the

evolution of bank credit, are described as the

sources of the economic development, which

confounded the expectations of the classicists.

Progress, however, was not uninterrupted, and

recurring business depressions marred the ad-

vance in welfare and imposed heavy human

costs on certain sections of the community. Dr.

Moulton examines various theories of the busi-

ness cycle to show that no single cause can ex-

plain all depressions. The final chapter of Part I,

which is devoted to other than cyclical factors

which retard economic progress, the present re-

viewer found the most interesting in the book.

In this chapter the author reviews, with ad-

mirable clarity, the Brookings studies on Ameri-

capacity to produce, America's capacity to

consume, the formation of capital, and in-

come and economic progress. He shows that ex-

cess capacity to the extent of about 20 per cent

was normal in the American economy over the

entire period from 1900 to 1929, that there was

a growing concentration of the national income

over this period, and that the increased concen-

tration of the income structure was the cause of

increased money savings. The increase in money

savings was not always accompanied by an in-

crease in real investment, and this exerted infla-

tionary pressure on the securities market. The

relative restriction in consumption affected ad-

versely the rate of new capital formation.

In Part II the author formulates the goals of

a continuing progressive economy; compares

free enterprise, as he calls the present American

economic system, with alternative forms of eco-
nomic organization to the great disadvantage of

the alternatives; and, after a most optimistic

survey of basic resources and present scientific

advances, concludes that there is no reason why

America cannot experience the same rate of

progress over the next century as she has

achieved in the past. The final chapters on poli-

cy will please the business community, to whom

the book seems primarily to be addressed. Pro-
ductivity must be increased, and trades-union

obstruction to more scientific methods over-

come. Large-scale enterprise is desirable and

should be free of vexatious fiscal restrictions and

of taxes which discourage initiative. Monetary

and fiscal stability are likewise regarded as con-

ditions of progress, and the budget must be bal-

anced and the national debt reduced to "man-
geable proportions." The national income

should be redistributed, but the best method of
doing this is by reducing prices. Redistributive
taxation and union action to raise money wages
are both condemned. As one would expect from
the historical chapter on the business cycle,
Moulton does not think that the cycle can be
controlled or eliminated. Government policies,
in the past, he argues, have had little effect on
the course of the cycle. He does believe, how-
ever, that sound monetary, fiscal, and business
policies can mitigate the severity of depression,
stimulate recovery, and prevent undue suffering
during the period of unemployment.

I find it a little difficult to set out briefly and
appropriately my criticisms of this book. I dis-
agree with the political views and policy conclu-
sions of the author, but this disagreement is in
large measure political. Obviously a short re-
view is neither an appropriate nor an adequate
place for the expression of such disagreement.

The policy conclusions, however, express Moul-
ton's preferences rather than necessary conclu-
sions from the economic argument. With much
of this I have no quarrel. In a popular book of
this sort, it is natural that the writings of other
economists should be given but cursory treat-
ment, and the summaries of other schools of
thought leave much to be desired. The "pessi-
mism" of the classicists, for example, was a
qualified pessimism. Indeed, it is improper to
lump Smith, Malthus, Ricardo, and Mill to-
gether in this way. Smith had a profound belief
in the possibilities of innovations, and Malthus,
as Professor Spengler has shown, had a certain
optimism about the possibilities of human pro-
gress. Similarly, Moulton's treatment of Lord
Keynes and Professor Hansen will not satisfy
their followers. Whereas, in my opinion, Moulton's criticisms of Keynes's handling of the propensity to consume and of his confidence in interest rates as a determinant of the decision to invest are soundly based, some of Keynes's followers have modified his system in both respects. Moulton's criticisms would not hold against them, yet the policy conclusions which they come to are directly contrary to his. This is not to say they are right, but rather to say that they are as likely to be right as Moulton is, for in both cases the policy conclusions represent a political preference, not a necessary corollary of the argument.

A more serious criticism is that Moulton's optimism seems to me as shallow as the Hansenian pessimism which he attacks. His chapter on resources and potentialities ignores many difficulties and much contrary evidence. For example, he found in wood products, plastics, and cellulose fibers suitable substitutes for scarce metals, and he foresaw no limits to the production of wood products. "A recently developed chemical process, whereby paper is made from quick-growing southern pine, has made it possible to increase the supply of this product almost indefinitely" (p. 223). I do not know what Moulton means by "recently developed." Presumably he is referring to the kraft process, which has nothing to do with the supply of newsprint, as his footnote on page 225 would indicate; and, in any case, the present rate of cutting of southern pine is already excessive in the accessible stands. These forests are unlikely to be capable of yielding the thirty-fold increase in production, about which Moulton is talking in this context. Similarly, his calm confidence that Canadian forest and mineral resources are capable of almost indefinite expansion and that their entire output will be available to American industry would not be shared by many Canadian economists. Moulton's optimism also stems from his treatment of institutional problems. There is here a neglect of many of the difficulties his brother-economists have been trying to grapple with. The growing inflexibilities and indivisibilities of commodity markets, of the capital market, of the labor market, are all discussed. The hierarchical structure of both corporate enterprise and trades-unions, the concentration of power, the use of this power for various types of protectionism—all these receive scant attention. Moulton believes that the Sherman Act can take care of these problems and is content to leave it at that.

Moulton writes with clarity and simplicity and with a welcome freedom from jargon. Some of his clarity is obtained, as I have indicated, by avoiding difficulties. Sometimes, too, his efforts to achieve clarity for the lay reader result in a certain slowness in the development of his argument which is tedious to a professional economist who would like to move along rather faster. This book, however, is probably not primarily directed to the professional but to the business community. For such readers it is admirably calculated to please.

B. C. KEIRSTEAD
McGill University


In this brief but useful report, Professors Hoover and Ratchford have compiled a wide range of factual and analytical materials on the southern economy. In Part I (pp. 1-20) they present a statistical review of the recent trends and present status of the South's basic economic resources. While two-thirds of the southern people still lived in rural areas in 1940, the proportion of the region's gainfully employed who were engaged in agriculture fell from one-half to less than one-third during 1929-46. With nearly one-half of the nation's farms, southern agriculture has been becoming less dependent upon cotton and tobacco, whose combined contribution to total cash receipts from farm marketings fell from 54 to 35 per cent (the contribution of livestock and livestock products increasing from 28 to 37 per cent) during 1929-46. The South's high birth rates and only slightly higher death rates, relative to the non-South, enabled it to "export" 3,000,000 citizens during 1940-47, while continuing to show some population growth. As a consequence, its proportion of non-productive population to workers of productive age is about one-fourth greater than that of the non-South.

In natural resources, the South presents a mixed picture. Offsetting its poor endowment of soils and of minerals—apart from petroleum, sulphur, and coal—are its relatively favorable climate, water resources, and (potentially at
least) forests. While the South's share of the nation's industry has substantially increased during the last half-century, in 1940—with 37 per cent of the nation's gainfully employed—it still accounted for only 17 per cent of the nation's wage-earners in manufacturing and 14 per cent of the value of the manufactured products. Since 1940 the South has about held its relative position industrially, but its dependence upon textiles has been somewhat reduced. Although the thirteen southern states still rank at the bottom in absolute terms, their per capita income payments as a percentage of the non-South's rose from 47 to 63 per cent during 1929-47.

In Part II (pp. 21-37) the authors consider the validity of various alleged barriers to the economic development of the South. They do not believe that lower labor efficiency is a fundamental factor in North-South wage differentials and attribute low productivity per worker to the fact that southern industries are generally those with a low ratio of capital equipment to labor while, in southern agriculture, workers have less land, poorer land, and less machinery to work with. They conclude that—given equal training, equipment, and managerial ability—southern labor is about as efficient as nonsouthern labor. Admittedly, since health and education affect productivity, the South in these regards labors under a handicap, but they do not consider it a major one. While the South lacks sufficient indigenous capital funds to finance large-scale industrial plants, the authors are hopeful that its economic advantages will continue to attract outside funds for such enterprises. Although absentee ownership of southern industry has some frequently exaggerated disadvantages, the South should encourage more investment from all available sources. It is in the area of financing small and medium-sized companies that the authors see the greatest problem, since these companies must be financed locally. The South has only rudimentary facilities for assembling and investing savings, and there is a serious shortage of auxiliary industrial services and facilities for research and managerial training. Notwithstanding widespread claims to the contrary, Hoover and Ratchford conclude that "high freight rates are not now, and never were, a major barrier to the economic development of the South"; while northern industry's high protective tariffs have gradually become much less disadvantageous to the South. In sum, of the many causes often advanced to explain the South's economic lag, the authors find that most are actually of minor importance or are symptomatic rather than causal.

In Part III (pp. 37-52) Hoover and Ratchford turn to the basic elements of a program by which the southern economy may be adequately developed. First and foremost they place national full employment and dynamic demand conditions, which will favor the mobility of labor out of agriculture and out of the South, the establishment of new industries in the region, and the improvement of its terms of trade. Second, southern agriculture must be reorganized into a smaller number of larger, mechanized farms with increased productivity per worker and greater diversification of products, necessitating the movement of surplus farm labor into nonagricultural employment. Third, the South needs more industries in which the use of modern machinery and the nature of the product make a high rate of output per worker possible. Fourth, the South's natural and human resources require continued attention through power development, wise forest management, soil conservation, and improved educational opportunities.

Part IV (pp. 52-90), dealing with specific federal policies and programs for the southern economy, comprises nearly one-half of the report under review. The authors' proposals for federal agricultural policies (illustrated by detailed application to cotton and tobacco) follow closely those of T. W. Schultz and others, including the reviewer. The federal government would guarantee the prices of farm products at, say, 85 per cent of their "normal market prices," and, if actual market prices fell below these guaranteed levels, farmers would be paid the difference in the form of "compensatory payments." Thus, like most economists, Hoover and Ratchford would depend primarily upon prices to guide agricultural production and clear the market rather than upon the direct production and marketing controls and storage programs of present federal legislation. They would have the federal government take a continued active role in developing and conserving the South's natural resources—by investigating thoroughly the possibilities of adapting the successful methods and techniques of the TVA to other areas with water-power potential; by substantially increasing financial support of the Forest Service and advancing long-term, low-cost credit for forest development; and by promoting an adequate system of heavy severance taxes on oil and gas to provide a special trust
fund to be used for economic development as these valuable resources approach exhaustion.

The authors recognize that southern industrial expansion (apart from government-sponsored "defense industries"), and the capital funds by which it is financed, must depend primarily upon large-scale private enterprise from outside the region. They do propose, however, that the federal government extend deposit insurance to cover 100 per cent of all deposits in order to protect large business deposits in southern banks; and that, in times of financial tension, the Treasury be prepared to move Treasury deposits into any region from which there is a pronounced tendency for private funds to be withdrawn. Believing that wage differentials have been only a minor inducement for new plants to locate in the South, the authors view past federal labor legislation with favor and conclude that a minimum wage of 60-75 cents an hour (preferably tied to an index of the general price level) would be desirable.

In the field of federal fiscal policy, Hoover and Ratchford point out the difficulties of financing the necessary industrial development of the South in the face of present high tax rates on corporate and large private incomes. Without attempting to offer a solution for this national problem of providing equity capital, they emphasize that the South has a special stake in finding a solution. The South would also gain more than proportionately from an increase in personal income-tax exemptions. Most of all, the South needs federal aid to public education. With one-third of the nation's children—forming the reservoir from which the rest of the country will draw much of its future labor supply—the South has only 18-20 per cent of the nation's income. The authors urge, however, that every precaution should be taken to prevent political use of the system as an instrument of social reform.

In details, if not in broad design, this report is subject to some question. For example, some may feel that, possibly by overemphasizing the dangers of exhausting our petroleum and gas reserves, the authors lend undue comfort to fuel monopolies acting in the guise of conservation. Again, while properly preferring outright subsidies to direct interference with the pricing system in the realm of agricultural policy, they are inconsistent in supporting a minimum wage in the labor field. They might profitably have applied more generally the principle of direct subsidies as a technique of assuring to all a minimum standard of living (including public services), especially in view of the fact that most recent "welfare" legislation—by working through the pricing system—helps the least those who need economic benefits the most. Or, again, they omit consideration of the possible detrimental effects of basing-point pricing and other industrial price policies which, by protecting investments in the non-South, may slow southern industrial development.

Nonetheless, this report is honestly and courageously written; and it at least touches upon most of the important aspects of the South's economic problem. True, by its very comprehensiveness, it frequently suffers from superficiality. But it is to be hoped that this shortcoming will be overcome as Hoover and Ratchford expand their present report into a book commensurate in length with the importance of the problem under attack.

WILLIAM H. NICHOLLS
Vanderbilt University


This survey of federal statistical agencies was undertaken by the National Bureau of Economic Research at the request of the Commission on Organization of the Executive Branch of the Government. Professor Mills, who directed the investigation, has had long experience with statistical practice and organization as well as an earlier opportunity to appraise federal statistics. The experience and knowledge of government statisticians and of other experts were drawn on through written reports on present organization and activities and a series of hearings in Washington.

The heart of the report is the appraisal of operating problems and deficiencies of federal statistical agencies and the recommendations for remedying defects. Present decentralized collection of statistics that call for highly specialized knowledge should be improved by elimination of overlaps and areas of doubtful jurisdiction. Greater centralization of statistical activities is suggested only for operations of repetitive collection and tabulation not requiring highly specialized knowledge. The report emphasizes the emerging role of the central co-or-
The coordinating agency and the additional functions and powers needed if a more unified and positive statistical program is to develop.

The twenty-eight recommendations "outline in some detail the basic features of a system of statistical intelligence adapted to present national needs, and suggest certain modifications of organization and practice that should conducd to economy and efficiency." This approach is of major value both to government statisticians who may view their work in the light of broad goals and to the public generally.

Some indication, however, of the more important or more feasible suggestions for the immediate future—taking account of the fact that many changes require congressional action—would have been useful. For example, the extensive increase in authority of the co-ordinating agency, the Office of Statistical Standards and Services, will come slowly if the experience of the last forty years is any guide.

Information on personnel and expenditures is important in considering the means whereby statistics can be economically and effectively provided. This is illustrated in the recommendation of an annual consolidated statement of actual and contemplated expenditures on statistical services, to be used with recommendations for achieving better balance and over-all adequacy in the federal system of statistical intelligence. The appendices indicate the difficulties of deriving satisfactory expenditure data for statistical activities, especially for the numerous agencies that provide statistics in conjunction with administrative or regulatory activities. Undoubtedly, in the time available it was impossible to explore the problem in a more systematic manner. However, the statement that 10,385 individuals are engaged in federal statistical activities at an estimated over-all cost of about forty-two million dollars needs more qualification than appears in the report.

Development of federal statistics can be effectively promoted by the numerous users in private activities. Requests for data and suggested changes constitute the "grass-roots" demand for more and better statistics to which Congress eventually lends an ear. With this report the public will be well equipped to understand the present system and the changes needed. The elements and operating characteristics of the system of federal statistical intelligence are set forth effectively, and the mass of detailed information for numerous agencies is well summarized in tables, charts, and appendices, which present such aspects as the uses made of federal statistical reports, statistical returns to agencies, and characteristic flows of data through agencies. Irrespective of any action taken by Congress on the Hoover Commission's recommendations on statistical activities, the report of the National Bureau provides an important basis for achieving a more forward-looking program.

Susan S. Burr

Washington, D.C.
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