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C O N T E N T S

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Outline of the Argument. The present inquiry is concerned with relations between the productive process and the monetary circulation. It will be shown 1) that the acceleration of the process postulates modifications in the circulation, 2) that there exist "systematic", as opposed to windfall, profits, 3) that systematic profits increase in the earlier stages of long-term accelerations but revert to zero in later stages, -- a phenomenon underlying the variations in the marginal efficiency of capital of Keynesian General Theory, 4) that the increase and decrease of systematic profits necessitate corresponding changes in subordinate rates of spending, -- a correlation underlying the significance of the Keynesian propensity to consume, 5) that either or both a favourable balance of trade and domestic deficit spending create another type of systematic profits, 6) that while they last they mitigate the necessity of complete adjustment of the propensity to consume to the accelerations of the process, 7) that they cannot last indefinitely, 8) that the longer they last, the greater becomes the intractibility of ultimate problems. From the premises and conclusions of this analysis it then will be argued 9) that prices cannot be regarded as ultimate norms guiding strategic economic decisions, 10) that the function of prices is merely to provide a mechanism for overcoming the divergence of strategically indifferent decisions or preferences, and 11) that, since not all decisions and preferences possess this indifference, the exchange economy is confronted with the dilemma either of eliminating itself by suppressing the freedom of exchange or of certain classes of exchanges or else of effectively augmenting the enlightenment of the enlightened self-interest that guides exchanges.

4. The Productive Process. The term, "productive process", is to be used broadly. It denotes not merely "making things" but the extraction or cultivation of raw materials, their transportation and assembly, the planning and designing of products, processing and distribution. It includes not only activities upon material objects but also services of all kinds, not only labour but also management, and not only production management but also sales management. In brief, it is the totality of activities bridging the gap between the potentialities of nature, whether physical, chemical, vegetable, animal, or human nature, and, on the other hand, the actuality of a standard of living. Such activities vary with the conditions of physical geography and with the cultural, political, and technical development of the population. They range from the simple and fixed routines of primitive hunters and fishers to the highly complex and mobile routines of modern Western civilization. Yet in every case there is one effect: the potentialities of nature become a standard of living. And in every case this effect is attained in the same way: it is attained not once and for all but only by a continuous succession of activities, by a rhythmic repetition of constant or mobile routines, by a process.

The productive process is, then, the aggregate of activities proceeding from the potentialities of nature and terminating in a standard of living. Always it is the current process, and so it is distinguished both from the natural resources, which it presupposes, and from the durable effects of past production. To draw sharp lines of demarcation is not possible immediately, but it will be possible later. Meanwhile it will be sufficient to advert to the fact that the current process is always a rate of activity, that this rate of activity differs from the potentialities of nature from which it proceeds, and that it differs from its finished products

which, ex hypothesi, are no longer in process but already produced. No doubt the three are closely related, but relation presupposes distinction, and before relations can be grasped adequately, the distinctions must be grasped. Goods that have been completed are not goods in process; services that have been rendered are not services being rendered. Again, goods in process are not the natural resources from which they are derived; and services being rendered are not the natural potentialities from which they are derived. There can be resources and potentialities without goods or services being derived from them; and while they are in process of being derived, the goods are not yet produced and the services not yet rendered.

Thus, the productive process is a purely dynamic entity. We began by saying how broadly the term was to be taken. But it is also necessary to insist how narrowly. It is not wealth, but wealth in process. It is none of the potentialities of nature, whether physical, chemical, vegetable, animal, or human. It is none of its own effects if, by effects, are understood what has been completed. It is neither the existence nor the use of durable consumer goods, of clothing, houses, furnishings, domestic utensils, personal belongings, or indeed any item of private or public property that can be listed as a consumer good and has passed beyond the process to become an element of the community's standard of living. On the other hand, with regard to producer goods a distinction has to be drawn: they are in the process as means of production; they are in the process in the sense that labour is in the process or that management is in the process, namely, their use forms part of the process; but once they are completed they no longer are under process, any more than labour or management is under process and being produced. A ship under construction is part of the process; but once the ship is completed and begins to transport ocean freight, it is

not the ship but only the use of the ship that is part of the process. The same distinction is to be made with regard to every other item of producer goods: factories and machinery, railways and power units, warehouses and offices, are in the productive process only while being produced; once they are produced, they themselves have passed beyond the process to enter the category of static wealth, even though their use remains as a factor of production.

Thus the productive process, which proceeds from the potentialities of nature, terminates in a standard of living in two distinct ways. It terminates in a standard of living inasmuch as the goods and services it renders become elements in a standard of living. But it may also terminate indirectly in a standard of living inasmuch as the goods and services it renders complement the potentialities of nature to make the process capable of effecting a higher standard of living. Consumer goods and services enter directly into a standard of living. Producer goods and services enter indirectly into a standard of living: directly they are improvements upon nature that facilitate the productive process and increase its power and efficacy; and only indirectly, through this increased power and efficacy, do they affect the standard of living by improving and increasing the supply of consumer goods and services.

5. Division of the Productive Process. The foregoing section isolated the productive process as a purely dynamic entity, and drew a distinction between consumer goods that enter the standard of living and producer goods that raise the standard of living. That distinction must now be examined more fully. It is to be shown that the correspondence between elements in the productive process and elements in the standard of living may be a point-to-point, or a point-to-line, or a point-to-surface, or even some higher correspondence.

There exists, then, a point-to-point correspondence between bushels of wheat and loaves of bread, between head of cattle and pounds of meat, between bales of cotton and cotton dresses, between tons of steel and motor-cars. In each case the elements in the standard of living are algebraic functions of the first degree with respect to elements in the productive process. These functions are not immutable. There can be more or less wheat in a loaf of bread, more or fewer pounds of meat from a head of cattle, more or fewer cotton dresses from a bale of cotton, more or fewer motor-cars from a ton of steel. One can, for instance, spin the cotton more loosely, weave it more broadly, cut it more skilfully, shorten skirts, eliminate sleeves, and perhaps find other devices to make more dresses out of fewer bales of cotton. But such efforts only serve to emphasize the existence of an inexorable law of limitation. No matter how one makes the dresses, one cannot get more cotton in the dresses than one had in the bales. No matter how one arranges the points, the point-to-point correspondence remains. For in the totality of such instances there is an identity of elements: the very material elements that were in the productive process enter into the standard of living; and the affirmation of a point-to-point correspondence is no more than the affirmation of the per-

manence of this material identity.

However, not all material objects in the productive process are limited to a point-to-point correspondence with elements in the standard of living. When a primitive hunter makes a spear, he makes it to kill not one wild animal, nor ten, nor fifty, but just as many as he possibly can get. Similarly, the primitive fisher makes his net not for one but for an indeterminate series of catches of fish. The ship-builder constructs ships not for one but for an indeterminate number of voyages. And in our industrial age machines are built and factories rise not for each batch of manufactured products but for an indeterminate series of batches. There is a new piece of leather, but not a new shoe factory, for every new pair of shoes. There is a new lot of metals, but not a new plant, for every new motor-car. In each of these instances the point-to-point correspondence is escaped because it is not the product but some ulterior effect of the product that enters into the standard of living. Spears, nets, ships, factories, machines end up as means of production. They enter the standard of living, not in themselves, but in their effects of pounds of meat and fish, ocean voyages, shoes, and motor-cars. Such a correspondence may be named point-to-line: elements in the productive process correspond not to single elements in the standard of living but to indeterminate series of the latter.

Higher correspondences are possible. The machines that make shoes are made by machine tools. Since the former are in a point-to-line correspondence with elements in the standard of living, the latter by that very fact are in a point-to-surface correspondence. Again, the machines used in ship-building are made by machine-tools: the ships are in a point-to-line correspondence with elements in the standard of living; the machines

making ships are in a point-to-surface correspondence; the machine tools making the machines used in making ships are in a point-to-volume correspondence.

Now there exist the same types of correspondence between elements of activity or services in the productive process and elements in the standard of living. The matter is clear when the services are, as it were, incorporated in a material product. All the services involved in growing wheat, storing it, transporting it, milling it, making bread, distributing bread, are proportionate to the supply of bread. They are repeated as often as wheat is grown and bread supplied. No doubt, they are variable functions of the wheat-to-bread process: more or less activity, a greater or less efficiency, may be involved. But the correspondence remains point-to-point, for there is no possibility of these services being done once and then the wheat-to-bread process being repeated an indeterminate number of times. Even if robots were employed, the robots would have to go through the motions every time wheat grew and was processed into bread. In like manner the activities and services involved in making ships are repeated as often as ships are made but not as often as ships are used. Their correspondence remains point-to-line. And the same holds for the activities and services incorporated in the making of machine tools. Their correspondence is point-to-surface, or point-to-volume, or at times even higher; they are repeated when the making of machine-tools is repeated; they are not repeated when the use of machine-tools is repeated; and much less are they repeated when the use of the products of the machine-tools is repeated.

However, not all activities and services are coincident with the process of material objects to take their correspondence from that of the objects. It remains that the same general types of correspondence may be discerned. There is a point-to-point correspondence between movements of trains and passenger-miles, not indeed in the sense that there is some fixed ratio between train-miles and passenger-miles, but in the sense that the train has to move as often and as far as passengers move. From instance to instance, a train may have more or fewer passengers, to vary the ratio between train-miles and passenger-miles; but the ratio is always some definite ratio; it is something determinate in the present of each instance. In fact, it is but another form of the flexibility of the point-to-point correspondence: as there may be more or less cotton in a cotton dress, as there may be greater or less efficiency in the operations coincident with growing wheat and making bread, so there may be greater or less efficiency in the transportation of passengers. The flexibility does not eliminate but rather emphasizes the point-to-point correspondence.

Train journeys illustrate one type of service that is not incorporated in material objects. Another ambiguous type is the maintenance of capital equipment. Strictly one may regard maintenance, like replacements, as a prolongation of the process of production of the capital equipment. On the other hand, one might prefer to consider it as a condition of the use of the equipment, and so to classify it along with the power that drives the equipment, the labour that operates it, the management that directs the operations. In fact, maintenance is an accountant's unity and it comprises quite different realities. There are types of maintenance that are part and parcel of use; there are others that arise whether or not the equipment

is in use; and it should seem best to distinguish, at least in a theoretical discussion, according to concrete circumstance, and sometimes count maintenance in the lower correspondence in which the equipment is used, sometimes in the higher correspondence in which the equipment is made.

So much, then, for the division of the productive process. In the previous section it was defined as a purely dynamic entity, a movement taking place between the potentialities of nature and products. In the present section, there has been attempted a dynamic division of that dynamic entity. Elements in the process are in point-to-point, or point-to-line, or point-to-surface, or even some higher correspondence with elements in the standard of living. Some general reflections are now in order.

The division is not based upon proprietary differences. It is not a difference of firms, for the same firm may be engaged at once in different correspondences with the standard of living. Again, it is not a division based upon the properties of things: the same raw materials may be made into consumer goods or capital goods; and the capital goods may be point-to-line or point-to-surface or a higher correspondence; they may have one correspondence at one time and another at another. Similarly, general services such as light, heat, power, transportation may be employed in any correspondence, and in different proportions in the several correspondences at different times. The division is, then, neither proprietary nor technical. It is a functional division of the structure of the productive process: it reveals the possibilities of the process as a dynamic system, though, to bring out the full implications of such a system will

require not only the next section on stages of the process but also a later section on cycles.

There remains, however, a more immediate question. The point-to-line and higher correspondences are based upon the indeterminacy of the relation between certain products and the ultimate products that enter into the standard of living. Now such indeterminacy does not seem to be a fact. Granted that there is not a new shoe-factory for every new pair of shoes, still every factory has a calculable life, and the same holds for every piece of machinery; in advance one can estimate and in historical retrospection one could know exactly how many pairs of shoes are to be produced or were to be produced by the given equipment. Hence the whole division breaks down. There is no real difference between point-to-point, point-to-line, and the higher correspondences.

The objection is shot from a double-barrelled gun. The indeterminacy is not a fact, first, because at some date, in a more or less remote future, determinate information is possible and, second, because here and now a very accurate estimate is possible. It should seem that the indeterminacy is very much a present fact. One has to await the future to have exact information. And while estimates in the present may be esteemed accurate, the future has no intention of being ruled by them: owners do not junk equipment simply because it has outlasted the most reliable estimates; nor are bankrupts kept in business because their expectations, though mistaken, are proved to have been perfectly reasonable. The analysis that insists on the indeterminacy is the analysis that insists on the present fact: estimates and expectations are proofs of the present indeterminacy and attempts to get round it; and, to come to the main point, an analysis based on such estimates and expectations can never arrive at a criticism of them;

it would move in a vicious circle. It is to avoid that circle that we have divided the process in terms of indeterminate point-to-line and point-to-surface and higher correspondence.

6. The Basic and Surplus Stages of the Productive Process. In the fourth section the productive process was isolated as a dynamism proceeding from the potentialities of nature and terminating in a standard of living. In the fifth section the dynamism itself was subjected to analysis: different types of correspondence were found to exist between elements in the process and elements in the standard of living. The purpose of the present, sixth, section is in the main to collect results.

Let us assume as known what is meant by the term, standard of living. Let the term, emergent standard of living, be defined as the aggregate of rates at which goods and services pass from the productive process into the standard of living. Then each of these rates will be a "so much every so often"; for instance, so much bread a year; so much meat a year; so much clothing a year; so many motor-cars a year; so many passenger-miles a year; and so forth throughout the whole catalogue of elements entering into the standard of living. It follows that the emergent standard of living, the aggregate of such rates, is a variable with respect to intervals of time: for instance, in a comparison of successive years, one may find two types of difference; the catalogue of elements may change, some items being dropped and other new items added; further, the rates with respect to the same items may change, becoming greater or less than in the previous year. Thus, the emergent standard of living is an aggregate of rates that are both qualitatively and quantitatively variable with respect to successive intervals of time.

Next, let the basic stage of the productive process be defined as the aggregate of rates of production of goods and services in process and in a point-to-point correspondence with elements in the emergent standard of living. As explained in section four, goods and services are in pro-

cess when they are neither the mere potentialities of nature nor on the other hand finished products. As explained in section five, goods and services are in a point-to-point correspondence with elements in the standard of living when they are some determinate, though not immutable or unvarying, algebraic function of the first degree with respect to elements in the standard of living. Finally, just as the aggregate of rates constituting the emergent standard of living is an aggregate of instances of "so much every so often", so also is the aggregate of rates of production in the basic stage of the process; and, again, as the emergent standard of living, so also the basic stage of the process is an aggregate of rates that are qualitatively and quantitatively variable with respect to successive intervals of time.

It is to be noted that the emergent standard of living and the basic stage of the process are not identical aggregates of rates. The basic stage of the process is, in its pure form, an aggregate of rates of labour, of managerial activity, of the use of capital equipment, for the sake of the goods and services that enter the standard of living. Let us say that some ultimate product, whether service or material object, is Q_i; that "j" enterprises contributed each a respective Q_{ij} to the emergence of Q_i; that in each of these enterprises "k" factors of production, such as labour, management, capital equipment in use, contributed each a respective Q_{ijk} to the emergence of Q_i; then the ultimate product, Q_i, is a double summation of the contributions of the factors of production, Q_{ijk}. For the ultimate product is the summation of the contributions of the several enterprises to the ultimate product; and the contribution of each enterprise is a summation of the contributions of each of its factors of production; so that there is some sense in which

$$Q_i = \sum_j \sum_k Q_{ijk} \qquad (1)$$

the summations being taken, first, with respect to all instances of "k" and, secondly, with respect to all instances of "j". But if the ultimate product, Q_i, is related by a double summation to the contributions of factors of production, Q_{ijk}, then the rate of emergence of Q_i, say, dQ_i, is also related by a double summation to the rates of the contributions of the factors of production, dQ_{ijk}, where both dQ_i and dQ_{ijk} are instances of the form, so much or so many every so often.

Since the form of the relation between them is a double summation, the emergent standard of living and the basic stage of the process are not identical aggregates of rates. On the other hand, precisely because the relation is a double summation, they are equivalent aggregates of rates. However, this statement requires three qualifications. First, mistakes are made in the productive process: there are activities that are useless in the sence that they do not contribute to any of the goods and services that enter the standard of living; materials are wasted; production is begun but not completed; operations are performed wrongly and have to be begun over again. Second, there is an extremely complex and somewhat variable pattern of lags between the time of the contribution made by the factor of production and the time of the emergence of the ultimate product; to select the time limits of the elements, Q_{ijk}, relevant to a given Q_i, would be a Herculean task that would have to be repeated on every occasion on which there was a variation in the pattern of the lags; however, though a Herculean task, it would not be an impossible task, in the sense that such time limits are not objectively determinate in the present and past, for every contribution to Q_i, which now exists, did take place during a determinate period of time. The

third qualification is with regard to the meaning of the equivalence: the symbolic expression (1) is not a mathematical equation and it cannot be until a common measure is found for ultimate products and contributions to ultimate products; such a common measure is not had until the measure of exchange value is introduced; for the present, then, the equivalence in question is not a mathematical equality but a form of correlation, a double summation, that can become a mathematical equality.

Hence, both the emergent standard of living and the basic stage of the productive process are aggregates of rates that are quantitatively and qualitatively variable with respect to successive intervals of time; and, further, when allowance is made for lags and for mistakes in production, the relation between these two aggregates of rates is a double summation.

The basic stage is only part of the current productive process. Besides it, there is a series of surplus stages. Each of these surplus stages is an aggregate of rates of production of goods and services in process and in a point-to-line, or point-to-surface, or higher correspondence with elements in the standard of living. As before, each of these rates is a "so much or so many every so often"; again, each is qualitatively and quantitatively variable with respect to successive intervals of time; and, finally, the relation between an ultimate product, Q_i, of any surplus stage and the contributions of factors of production in that stage with respect to that product, Q_{ijk}, is again a double summation in which allowance must be made for lags and for mistakes in production.

However, there is this difference between the basic stage and the surplus stages. The ultimate products of the basic stage, whether goods or services, enter into the standard of living. The ultimate products

of the surplus stages, whether goods or services, do not enter into the standard of living. From being under process themselves they pass into use in a lower stage of the process: they become means of production or the replacement or the maintenance of means of production, where production is understood in the broad sense already defined. Thus, as the emergent standard of living is consumer to the basic stage of the process, so the basic stage in turn is consumer to the lowest of the surplus stages, and each lower surplus stage is consumer to the next higher surplus stage. In other words, producer goods and services are goods and services consumed by producers. Not passengers but railway companies consume rolling-stock and rails. Passengers consume transportation. And similarly in similar cases.

But if the ultimate products of the surplus stages do not enter into the standard of living, none the less they are related to it. To determine that relation a distinction has to be drawn between short-term and long-term accelerations of the productive process. A short-term acceleration is an increase in rates of production due to a fuller use of existing capital equipment, to a greater efficiency of labour and management, to a decrease in stocks of goods. A long-term acceleration is an increase in rates of production due to the introduction of more capital equipment and/or more efficient capital equipment. The latter is termed a long-term acceleration because it changes the basis on which the short-term acceleration works: the short-term acceleration makes the best of existing equipment; the long-term improves and increases the equipment which a corresponding short-term acceleration will use in the fullest and most efficient manner.

Now, as is apparent from the definitions, the several stages of the

process may have, independently, short-term accelerations. But long-term accelerations take place in virtue of the dependence of each lower stage on the next higher stage. More, and more efficient, capital equipment is had in the basic stage by procuring more, and more efficient, equipment from the lowest of the surplus stages. If the demand in the basic stage is strong enough, the lowest of the surplus stages will have to go into a long-term acceleration to obtain for itself more, and more efficient, capital equipment. Similarly, the next stage may need a long-term acceleration to meet its demand, and so on until the highest of the surplus stages is reached, and there only a short-term acceleration is possible. Thus, the structure of the productive process is a series of stages, where each stage is an aggregate of rates of production, and each lower stage receives from the next higher stage the means of long-term acceleration of its rates.

The phenomena of a generalized long-term acceleration of the whole productive process are well-known. They may occur in a backward economy that is copying the achievements of an advanced economy, and then one gets a series of five-year plans. They may occur in an economy that is pioneering advance for the rest of the world, and then one gets an industrial revolution. In either case there is a transformation of the capital equipment of the economy. There are continuous migrations of labour as it is displaced by more efficient equipment and turns to operating more equipment. There is first a period in which the consumption of materials and the quantity of labour mount with no corresponding increase in the standard of living; and after this period of transformation, of equiping industry and commerce anew, there follows a period of exploitation in which the fruits of the long-term acceleration finally reach the basic

stage of the process and the standard of living rises to a new level. Thus a cycle is inherent in the very nature of long-term accelerations of the productive process.

To cycles the argument returns later. The one point to be observed at present is that long-term accelerations are limited. With respect to a given field of natural resources and population, and on the supposition of a given level of cultural, political, and technical development, there is a maximum rate of production for the process. The ground of the limitation is that both the greater complexity of more efficient equipment and the greater quantity of more equipment postulate proportionate rates of replacement and maintenance. The process accelerates against an increasing resistance, so that every element of acceleration reduces the room for further accelerations. In the limit the whole effort of the surplus stages is devoted to replacement and maintenance of capital equipment, and then the only possibility of further acceleration is to depart from the assumption of a given level of cultural, political, and technical development. For with better men, a better organization of men, and better practical ideas, it becomes possible through the short-term accelerations to introduce more efficient equipment, displace labour, devote the displaced labour to a greater quantity of equipment, and so recommence the cycle of long-term advance.

7. Cycles of the Productive Process. The cycle that is inherent in the very nature of a long-term acceleration of the productive process is not to be confused with the familiar trade cycle. The latter is a succession of booms and of slumps, of positive and then negative accelerations of the process. But the cycle with which we are here concerned is a pure cycle. It includes no slump, no negative acceleration. It is entirely a forward movement which, however, involves a cycle inasmuch as in successive periods of time the surplus stage of the process is accelerating more rapidly and, again later, less rapidly than the basic stage. When suitable classes and rates of payment have been defined, it will be possible to shew that under certain conditions of human inadaptation this pure cycle results in a trade cycle. However, that implication is not absolute but conditioned, not something inevitable in any case but only something that follows when human adaptation is lacking.

These further consequences are not to the present point. For the present issue is whether the pure cycle is itself inevitable on the supposition of long-term acceleration. Would it not be possible to have a long-term acceleration and yet "smooth out" the pure cycle? Or must one say that, in view of the dynamic structure of the productive process, pure cycles become inevitable if long-term accelerations are attempted? A discussion of this issue turns upon two main points. What is involved in a long-term acceleration of the productive process? What is involved in a pure cycle? These will be discussed in turn.

There are three reasons for expecting a long-term acceleration to be a massive affair. In the first place, it is a matter of long-term planning: the utility of capital formation emerges only over long periods; hence long-term planning is involved in capital formation and, since one

is settling one's fate for years to come, it is generally worth-while to do so in the best manner possible. In the second place, the introduction of more or more efficient units of production is not to be expected to take place in random fashion: the supply of a single product depends upon the activities of many units, so that it is worth-while for many units to develop when it is worth-while for anyone of a series to develop; on the other hand, increased demand does not concentrate upon some one product but divides over several products, so that if there is an increased demand for one, there will be an increased demand for many; and as the increased demand for one justifies development in a series of productive units, so the increased demand for many justifies development in a series of series of units. There is a third consideration of a more abstract character. The emergence both of new ideas and of the concrete conditions necessary for their practical implementation form matrices of inter-dependence: any objective change gives rise to series of new possibilities and the realization of any of these possibilities has similar consequences; but not all changes are equally pregnant so that economic history is a succession of times periods in which alternatively the conditions for great change are being slowly accumulated and, later, the great changes themselves are being brought to birth.

7 bis. Cycles in the Productive Process. It will be well to state systematically the foregoing conclusion that cycles are inherent in the very nature of a long-term acceleration of the productive process. Consider the following four series of continuous functions of time, namely,

$$f_1'(t),\ f_2'(t),\ f_3'(t),\ldots$$

$$f_1''(t),\ f_2''(t),\ f_3''(t),\ldots$$

$$A_1,\ A_2,\ A_3,\ldots$$

$$B_2,\ B_3,\ldots$$

The suffixes, 1, 2, 3,... refer respectively to the basic stage of the productive process, the lowest of the surplus stages, the next to lowest of the surplus stages, and so forth. Expressions of the type, $f_n'(t)$, measure the rate of production on the nth level, while the derived functions, $f_n''(t)$, measure the acceleration of the rate of production. Again, the functions, A_n, measure the short-term acceleration of the rate of production on the nth level, so that the long-term acceleration is $f_n''(t) - A_n$. Finally, the functions, B_n, measure the rate of production that is effecting merely replacements and maintenance on the next lower stage, so that the rate of production effecting long-term acceleration on the next lowest stage is given by $f_n'(t) - B_n$.

Now let a, b - a, c - b,... be time lags, and let $k_2, k_3,\ldots$ be multipliers that connect the rate of production effecting long-term acceleration and the rate of acceleration so effected. Then since this effect emerges with a time lag, one has:

$$k_2[f_2'(t-a) - B_2] = f_1''(t) - A_1$$

$$k_3[f_3'(t-b) - B_3] = f_2''(t-a) - A_2$$

$$k_4[f_4'(t-c) - B_4] = f_3''(t-b) - A_3$$

The equations are simply symbolical expressions of the analysis to the effect that any stage may accelerate in either of two ways: by a short-term acceleration in the stage itself when A_n becomes greater than zero and so $f_n''(t)$ increases equally; or by in virtue of the fact that on the next higher stage the rate of production is greater than a rate of mere replacement and maintenance and so is bringing about, with a time lag, a long-term acceleration of the next lower stage.

The advantage of such symbolical expression is that its brevity makes its implications more obvious. Thus it is evident that any level of the process can accelerate on its own in short-term fashion, but if such acceleration occurs on any level but the lowest then, since a small increase in $f_n''(t)$ is identical with a great increase in $f_n'(t)$, there will have to be great increases in replacements and maintenance, in B_n, if there is not to be, with a time lag, a great long-term acceleration of the next lowest stage. If such an acceleration occurs, the same argument re-occurs to give a still greater long-term acceleration on the next lower stage. Hence, if on any level of the process except the lowest there occurs a short-term acceleration, then unless this rate of production is totally absorbed by increasing rates of replacement and maintenance, there is released a series of expansive movements in which each successive movement measures the acceleration of the next. It is as though an aeroplane were so difficult to accelerate that its accelerator were not a simple lever but a wheel turned over by a motor; and this motor in turn had its accelerator run by another motor; and so on.

This dynamic structure has now to be connected with the idea of cycles. Let us distinguish two totally different types. There is the familiar trade cycle which is characterised by a succession of positive and negative

accelerations of the productive process; there are booms and then there are slumps. Quite different from this trade cycle one may conceive a pure cycle that has no necessary implications of negative acceleration. A pure cycle of the productive process is a matter, simply, of the surplus stage accelerating more rapidly than the basic, then of the basic stage accelerating more rapidly than the surplus.

7 ter. Classes of Payments. In any economy, with a degree of development beyond that of primitive fruit-gathering, it is possible to verify the existence of a productive process with one or more surplus stages, a basic stage, and an emergent standard of living. Equally may one verify the facts that as the emergent standard of living is consumer to the basic stage, so the basic stage is consumer to the lowest surplus stage, and similarly up the hierarchy of stages. Again, in each case this rate of consumption stands, with due allowances, as a double summation of the activities constituting the product to be consumed. Finally, while each higher stage is for the long-term acceleration of the next lower stage, the basic stage is for the standard of living, and the standard of living for its own sake.

These differences and correlations have now to be projected into their monetary correlatives to set up classes of payments. Thus a restrictive supposition is introduced into the argument. The productive process is now to be envisaged as occurring in an exchange economy. It will be supposed to be an economy of notable size, complexity, and development, with property, exchange, prices, supply and demand, money. However, to obviate considerations irrelevant for the moment, it will be convenient to suppose that foreign trade and foreign payments do not exist; and this supposition is to be maintained until notice to the contrary is given.

The supposition of an exchange economy is a supposition of a relation to sales. Thus along with the productive process of the exchange economy in a given geographic area, there may exist other productive processes. Any individual may set up his own Robinson Crusoe economy in which he is both monopolist seller and monopsonist buyer in transactions which occur only in his own mind. One may go to a barber or shave oneself. One may live in maximum dependence upon the goods and services of the exchange

process, or one may pursue an ideal of autarky on a farm. There results from such decisions a difference in the size of the exchange economy, and this difference in size is constituted by setting up another complete or partial economy distinct from the main exchange process or, on the other hand, by eliminating such withdrawals.

It follows that the productive process of the exchange economy is a process of production for sale. Already it was remarked that the productive process included sales management as well as production management. The remark has now to be completed. The productive process includes not only sales management but the sales themselves. What is produced and not sold either does not appertain to the exchange economy at all or else it is an unfinished product. Inversely, in any section or stage of the productive process, goods and services are completed only if they are sold and only when they are sold. For in the exchange economy production is not a matter of art, of doing or making things for the excellence of the doing or the making; it is a matter of economics, of doing and making things that other people want and want badly enough to pay for.

This gives a fundamental division of exchanges into operative and redistributive. Some exchanges are operative: they are part and parcel of the productive process; they mark the completion of an element at some section or stage of the process; they not merely mark that completion but constitute it; for without the exchange the element remains an unfinished product. Because they are intrinsic to the process and partial constituents of the process, operative exchanges form a net-work that is congruent with the proprietary net-work flung over the process itself. Thus, they recur with the recurrence of its routines. In general, they are proportionate to the volume of these routines to set up the immanent manifestation of their success and the only immediate common measure of

their magnitude. Finally, there is a correlation of operative exchanges based upon the technical correlations involved in the physical productive process.

While this description of operative exchange is derived from a deduction of the idea of production for sale, the meaning of the description may be made clearer by an example. Consider in broad outline the production of shoes. It involves in an exchange economy payments by consumers to shop-keepers, payments by shop-keepers to wholesalers, payments by wholesalers to manufacturers, payments by manufacturers to tanners, to spinners, to makers of nails, payments by each of these to their sources of supply. It also involves a host of other categories of payments but our purpose is not a study of the shoe-industry but an illustration of the idea of operative payments. Now the payments listed above are part and parcel of the production of shoes in an exchange economy. They occur at proprietary frontiers. They are repeated at regular intervals as long as the process is maintained. They increase and decrease with the volume of the shoe-trade. They are the index of its prosperity as also of its misery. They provide the one common measure of all its elements, a measure that is intrinsic to the element as completed. Finally, they are correlated with one another along lines of inter-connection that are congruent with the correlations involved by a process from leather, cotton, and iron into shoes.

Redistributive exchanges form a remainder class. They are all non-operative exchanges. Like operative exchanges they transfer ownership; but unlike them, they are not constitutive elements of the current productive process. They are with respect to the natural resources that are presupposed by current production. They are with respect to the durable products of past production, provided these have not re-entered the current

process as happens in some cases of the second-hand trade. Finally, they may be with respect to money, that is, they include exchanges in which money is not only what is paid but also what is paid for. No doubt, redistributive exchanges may be related intimately to operative exchanges; no doubt, this relationship is at times highly significant; but, without metaphysical digressions, it perhaps may be taken for granted that it is one thing to be related to another type of exchange, and that it is something quite different to be an instance of that other type. Again, border-line cases exist in which one has to attend closely to the definitions if one is to apply them correctly; but that is a misfortune that is common to every effort to place data into in the categories of a classification; and it will be more convenient to postpone a study of a few such problems until operative exchanges have been identified more fully by their division into basic and surplus, and by the division of both basic and surplus into initial, transitional, and final payments.

Operative exchanges are intrinsic to the current productive process; but that process divides into basic and surplus stages; hence operative exchanges also divide into basic and surplus. For every element under process becomes a completed product only when it is sold. Again, every element under process stands in a point-to-point, or a point-to-line, or some higher correspondence with the emergent standard of living. There are, then, operative payments completing basic elements, and these may be termed basic operative payments. There are, also, operative payments completing surplus elements, and these may be termed surplus operative payments. The division of operative payments into basic and surplus is but a corollary of the division of the productive process into basic and surplus stages.

Further, it has been argued that the products, whether goods or services, of any stage of the process stand as a double summation of the activities of that stage. There is a first summation with respect to factors of production within a given entrepreneurial unit. There is a second summation with respect to the contributions of several entrepreneurial units towards the same product. This formal structure of any stage of the process gives the division of payments of that stage into initial, transitional, and final. Initial operative payments are to the factors of production within a given entrepreneurial unit; they reward each contribution to the process and are with respect to that contribution; they are wages and salaries, rents and royalties, interest and dividends, allotments to depreciation, to sinking funds, to undistributed profits. Initial payments are the payments of the first summation. Now the second summation may emerge, not all at once, but gradually: sources of raw materials are paid by dealers, dealers are paid by manufacturers, manufacturers are paid by wholesalers, wholesalers by retailers; again, any one of these may pay the contributions of transportation companies, of public utilities, and so forth. But in any such case, the second summation is only in process. Payments that regard the second summation in process are termed transitional. They are from one entrepreneurial unit to another as operating in the same stage of the process. In any particular case, the entrepreneurial unit might be fully self-sufficient and on its stage of the process reach from raw materials to final buyer; then transitional payments are a zero class; for then the second summation takes place not gradually but all at once. Lastly, whether the second summation takes place gradually or all at once, it must be completed; else we are outside the supposition of an exchange economy; production becomes like art, for

itself and not for sale. The payments with respect to the completed second summation are termed final payments. They are final in the sense that they are the last payments that are operative with respect to that product. They are final in the sense that any subsequent re-sale involves not an operative but a redistributive payment. They are final in the sense that they define the limit of the current process; for once these payments are made, the product is no longer under process but a product of past production.

So much then for the classes of payments. With respect to any exchange one has to ask: Is it a constitutive element of current production, recurrent with the recurrence of productive routines, in correlation with other similar payments along lines defined by the physical and technical dependence of products upon their sources? If the answer is negative, the payment is redistributive. If the answer is affirmative, the payment is operative, and further questions arise. Is the element, economically completed by this payment, in a point-to-point correspondence with elements in the emergent standard of living? If the answer is affirmative, the payment is a basic operative payment. If the answer is negative, the payment is a surplus operative payment. In either case, further questions arise. The lines defined by the physical and technical dependence of products on their sources have the structural form of a double summation. If the given basic or surplus operative payment is an item that is added in the first summation, a cost in the broadest sense but in its primary form, then the payment is initial. Next, if the payment occurs as the second summation gradually adds together the results of the first summation, then the payment is transitional. Lastly, if the payment occurs in the completed second summation, the payment is final.

The divisions of the process into basic and surplus stages, and the formal structure of the stages as double summations of activities, have been discussed previously. The troublesome border-line cases arise from the fundamental distinction between operative and redistributive payments, and as is to be expected they occur at the frontier of final operative payments. Four types of instances are discussed: the re-sale of durable basic products, the re-sale of durable surplus products, such re-sales when there is an organized second-hand trade, and financial operations.

First, the re-sale of durable basic products where no second-hand trade is involved gives a redistributive payment. Mr. Jones has a private home constructed for his personal use. He pays the construction company for it. His payment is the final operative payment on that product. If he did not pay, the company would have the home on its hands, an unfinished product in the sense of an unsold product. When he does pay, his payment is submitted to the analysis of a double summation: the construction company is given the means of carrying on its own internal, and so initial, payments and, further, by transitional payments it gives other companies the means of carrying on their internal and so initial payments. Next, Jones sells the home to Brown. This may occur after forty years or it may occur immediately. In either case Brown's payment is redistributive. It changes titles to ownership. However relevant to current production -- for otherwise Brown might have had a house of his own built -- Brown's payment is not a constitutent part of current production.

Second, the case is exactly the same if Jones had a factory built instead of a home. The final operative payment on the factory is the payment made by Jones. Any subsequent re-sale involves not an operative but a redistributive payment. Objection, however, may be made to calling

Jones' payment final. Does he not intend to get his money back? Does not the consumer pay? But the question is not whether the consumer pays for the factory in some virtual sense. The only question is whether the consumer comes to own the factory. Evidently, the consumer does not. There is no question of the consumer owning the factory because there is no question of the consumer buying the factory. What the consumer buys are products made in the factory. Again, the question is not whether Jones intends or hopes to get his money back. No doubt, he has such intentions and hopes; but they are not intentions and hopes of anything so elementary as getting the money back by re-selling the factory; they are the more sophisticated intentions and hopes of getting the money back, and more, and still remaining owner of the factory. The final operative payment made upon the factory was made by Jones when he bought it from the construction company. That payment completed an element in current production. But the production Jones will carry on in the factory, though current, will not be production of the factory but of something else. The profits Jones garners or fails to garner in will be operative payments, not in the process that built the factory, but in the process in which the factory is used. Finally, should Jones happen to sell the factory to Brown, that event occurs neither in the process that built the factory nor in the process in which the factory is used; it involves a redistributive payment outside the process.

In the third place it will be best to consider financial operations, that is, any exchange in which a sum of money is paid for a sum of money to be received. Now either the two sums of money are equal, or else one is greater than the other. If the two are equal, the transaction is purely redistributive. If one is greater than the other, then, generally speaking,

the difference is the payment for a service of some specific type; rendering such services is as much a part of current production as rendering any other service; while the payment will be divided up, perhaps among different entrepreneurial units, and commonly in initial payments of wages, salaries, rents, dividends, reserve funds, and so forth. In other words, financial operations are partly redistributive payments and partly payments for services rendered; thus, in banking payments of principal are redistributive but payments of interest are operative with interest paid to the banks as a final operative payment and interest paid by the banks to depositors an initial operative payment; again, in insurance the payment of policies is redistributive but the payment of premiums on policies is partly redistributive and partly operative; it is redistributive to the extent it balances the payment of policies; and it is operative to the extent it pays insurance companies for their services.

There remains the second-hand trade. As a trade with recurrent routines of varying volume, it is part of current production of services; but what is traded belongs to past production or, as is the case with the indestructible properties of the soil, never was a human product. Thus, with regard to the second-hand trade, one again must distinguish between payments for the object traded and payments for the services of the trader; the former are redistributive; the latter are operative. The analysis applies of course not only to old watches and jewelry, books and motor-cars, but equally well to real estate, and, except in the first instance of investment, to the re-sale of stocks and shares. Investment itself is a complex payment but its analysis may be left until later. However, there is a special instance of the second-hand trade, in which an old product is brought back into the process as a raw material or semi-finished product; in such a case the payment causing re-entry into the process is redistri-

butive but subsequent payments are operative.

8. Rates of Payment and Transfer. A baker's dozen of classes of payments have been defined by the relation of the payments to the productive process. The argument now moves from classes of payments to rates of payment, and from rates of payment to the circulatory inter-dependence of the rates. Just as there is a dynamic structure of the productive process, so also there is a dynamic structure of the circulation. The classes of payments provide the link between the two: the classes are based upon the dynamic structure of the process; the rates, constructed from the classes, aim at an analysis of the circulation.

Eight rates of payment form the main points of reference in the circulatory process. They will be denoted by the symbols DE', DR', DE", DR", DO', DO", DI', DI". The initial upper-case "D" is used in each case to emphasize the fact that we deal not with a static quantity but with a rate, a "so much every so often". The dashes (') and (") indicate basic and surplus rates respectively. Upper-case "E" stands for expenditure, "R" for receipts, "O" for outlay, "I" for income. All rates refer to some standard interval of time: a day, week, month, quarter, half-year, year, as the subject-matter of the issue may permit or demand. The rates of successive intervals may be distinguished by suffixes: thus, DE'_1, DE'_2, DE'_3, ... denote the rate DE' in three successive intervals.

The rates, DE' and DR', are the two aspects of final basic operative payments. DE' is the expenditure of consumers purchasing the emergent standard of living of the given interval; DR' is the receipt of this expenditure by the final agents of basic supply.

The rates, DE" and DR", are the two aspects of final surplus operative payments. DE" is the expenditure of producers purchasing surplus products: it includes the payments of basic producers to the final agents of the

lowest stage of surplus supply; the payments of producers in the lowest stage of surplus supply to the final agents of next to lowest stage of surplus supply; and so on up the dynamic ladder of the productive process. On the other hand, DR" is the receipt of such expenditure by the final agents of surplus supply, no matter what level of surplus supply they may represent.

Next, both DR' and DR" stand as double summations to activities in basic and surplus industry respectively. The analysis leaps across the double summations to the initial elements. DO' is the aggregate of initial basic payments during the given interval; DO" is the aggregate of initial surplus payments during the same interval. These rates may be named basic outlay and surplus outlay respectively; they are payments of wages and salaries, rents and royalties, interest and dividends, and allocations to depreciation, sinking funds, undistributed profits; they are the rewards of the ultimate factors of production in the basic stage and in the surplus stage respectively of the productive process.

Now while DR' is identical with DE', and DR" is identical with DE", not only is DO' not identical with DR' nor DO" with DR" but it usually happens that it is greater or less. One is not to think of DO' as the distribution of DR' among the factors of production. DO' is simultaneous with DR', and aggregate calculated with respect to the same time interval as DR'. A present DO' is an aggregate of initial payments that at a series of future dates will reach their place in a double summation to become elements in some DR'; similarly, a present DR' is a double summation with respect to initial payments occurring at a series of past dates. The same is true of DR" and DO".

Six of the eight rates of payment have been defined. Before defining basic income, DI', and surplus income, DI", it will be necessary to introduce the idea of monetary functions. Thus, the argument takes a further step towards defining a circulation of money. For a circulation of money is not a rotational movement of money. Rather it is a circular series of relationships of dependence of one rate of payment upon another. Money moves only at the instant of a payment or transfer. Most of the time it is quiescent. It may be totally quiescent, as when it is held in reserve for no purpose whatever. But also it may be dynamically quiescent, held in reserve for some definite purpose.

Money held in reserve for a defined purpose will be said to be in a monetary function. Five such functions are distinguished: basic demand, basic supply, surplus demand, surplus supply, and a fifth, remainder, redistributive function. Money held in reserve for basic expenditure and so on its way to entering DE' will be said to be in the basic demand function. Money held in reserve for surplus expenditure and so on its way in entering DE" will be said to be in the surplus demand function. Again, money on its way from DR' to DO', from final basic operative payments to initial basic operative payments, will be said to be in the basic supply function. Similarly, money on its way from DR" to DO" will be said to be in the surplus supply function. Finally, money held in reserve for redistributive payments, or for no specific purpose whatever, will be said to be in the redistributive function.

Now initial payments are income. They may be supposed to be, at least for an instant, in the basic or surplus demand functions. Hence one may write, without affecting the generality of the analysis,

$$DO' + DO'' = DI' + DI'' \qquad (2)$$

where DI' are the initial payments entering basic demand and DI" are the initial payments entering surplus demand during the given interval of time. Let us now introduce two cross-over ratios: G' is the fraction of DO' that moves to surplus demand, and G" is the fraction of DO" that moves to basic demand. Hence one may replace equation (2) by two equations, namely,

$$DI' = (1 - G')DO' + G"DO" \tag{3}$$

$$DI" = (1 - G")DO" + G'DO' \tag{4}$$

These equations may be given a simpler form in two ways. One may introduce a rate of cross-over difference, DG, where

$$DG = G"DO" - G'DO' \tag{5}$$

so that equations (3) and (4) may be written

$$DI' = DO' + DG \tag{6}$$

$$DI" = DO" - DG \tag{7}$$

Again, one may introduce the supposition that

$$G" = 1 - G' \tag{8}$$

namely, the movement of money to basic demand disregards its source, so that generally the same proportion of both basic outlay and surplus outlay move to basic demand. Hence one has

$$DI' = (1 - G')(DO' + DO") \tag{9}$$

$$DI" = G'(DO' + DO") \tag{10}$$

and the definition of cross-over difference becomes

$$DG = (1 - G')DO" - G'DO' \tag{11}$$

It is to be remembered that equations (2) to (7) are perfectly general, while equations (8) to (11) involve a restrictive supposition.

Movements between four of the monetary functions have now been named and defined. They form two circuits connected by a cross-over. There is a basic circuit of basic expenditure, DE', becoming basic receipts, DR', which move towards basic outlay, DO', which, with allowance made for the cross-over difference, DG, becomes basic income, DI'. There is a similar surplus circuit of surplus expenditure, DE", becoming surplus receipts, DR", which move towards surplus outlay, DO", which, with allowance made for the cross-over difference, DG, becomes surplus income, DI".

Now the redistributive function is to be studied only in its relations to these two circuits. These relations are basically to be derived from changes of the quantity of money in the circuits. Let DM' be the quantity of money added to the basic circuit during the interval, and DM" be the quantity of money added to the surplus circuit during the interval. Further let us write,

$$DM' = DS' + DD' + DG \qquad (12)$$

$$DM'' = DS'' + DD'' - DG \qquad (13)$$

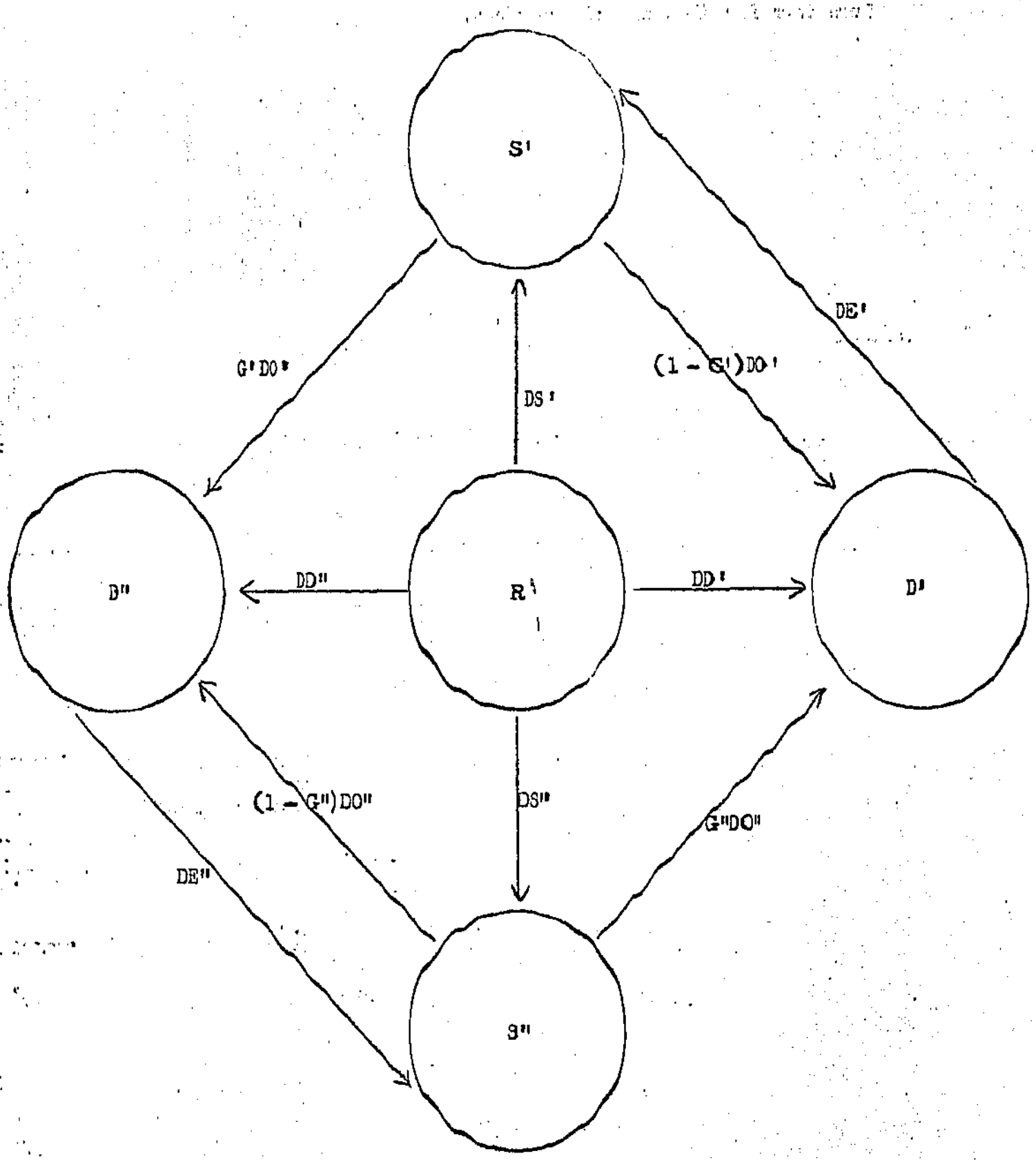
where any of the rates involved may be positive, zero, or negative. DG has been defined already. DS', DS", DD', DD" are quantities of money per interval transferred from the redistributive function to basic supply, surplus supply, basic demand, surplus demand respectively. These quantities per interval are net quantities, that is, the net result of all transferences in either direction. DS' and DS" are the quantities added to, or if negative subtracted from, the quantity of money moving from basic receipts to basic outlay (DR' to DO') and from surplus receipts to surplus outlay (DR" to DO") respectively during the interval. DD' and DD" are the quantities added to, or if negative subtracted from, the quantity of money moving from basic income to basic expenditure (DI' to DE') and from surplus income to surplus

expenditure (DI" to DE") respectively during the interval. Hence equation (12) states that the total quantity of money added to the basic circuit during the interval, DM', is equal to the quantity added from the redistributive function to basic supply, DS', plus the quantity added from the redistributive function to basic demand, DD', plus the quantity added from the other circuit by the cross-over difference, DG. Similarly, equation (13) states that the total quantity of money added to the surplus circuit during the interval, DM", is equal to the quantity added from the redistributive function to surplus supply, DS", plus that added from the redistributive function to surplus demand, DD", minus the quantity contributed to the other circuit by the cross-over difference, DG. Any of these seven quantities per interval may be negative; and when they are negative, "added" is to be replaced by "subtracted" in the above statement.

It is to be observed that there is no simple correlation between rates of payment per interval, DE', DR', DO', DI', G', DE", DR", DO", DI", G" and, on the other hand, changes in the quantity of money per interval, DM', DS', DD', DM", DS", DD". Rates of payment are products of quantity and velocity of money. Hence without suppositions regarding the velocity of money, changes in quantity yield no conclusions about rates of payment. Inversely, with velocities undetermined, changes in rates of payment yield no conclusions about changes in quantities.

This section may be resumed by explaining the diagramme of transfers on the following page. There are five monetary functions: a redistributive function, R, basic supply, S', basic demand, D', surplus supply, S", and surplus demand, D". In a given interval, the action of the redistributive function changes the quantity of money available in the other four functions by DS', DD', DS", DD", respectively; these changes may be posi-

Diagramme of Transfers between Monetary Functions.



Turn over for diagramme of transfers.

tive, zero, or negative. In the same interval, basic supply makes basic initial payments of $(1 - G')DO'$ to basic demand and of $G'DO'$ to surplus demand; similarly surplus supply makes surplus initial payments of $(1 - G'')DO''$ to surplus demand and of $G''DO''$ to basic demand. In the same interval basic demand makes final basic payments, DE', to basic supply; and surplus demand makes final surplus payments, DE'', to surplus supply. The other rates of the analysis are defined in terms of the foregoing, as follows:

$$
\begin{aligned}
DR' &= DE' \\
DR'' &= DE'' \\
DI' &= (1 - G')DO' + G''DO'' = DO' + DG \\
DI'' &= (1 - G'')DO'' + G'DO' = DO'' - DG \\
DG &= G''DO'' - G'DO' \\
DM' &= DS' + DD' + DG \\
DM'' &= DS'' + DD'' - DG
\end{aligned}
\tag{14}
$$

9. Circuit Acceleration. The foregoing section defined two circuits of expenditure, receipts, outlay, and income, a pair of cross-overs, and two pairs of transfers from the redistributive function to the demand and the supply functions. The present section is concerned to watch the circuits in motion and, more particularly, to inquire into the conditions of their acceleration. The inquiry is conducted in three steps: first one asks what is the possibility of circuit acceleration when DS', DS", DD', DD", and DG are each zero; secondly one asks what is the possibility of acceleration when DS' and DS" are positive or negative but DD', DD" and DG remain zero; thirdly one asks what are the effects of DD', DD", DG not being zero.

On the first and largest assumption the quantity of money in each circuit remains constant interval by interval over an indefinite series of intervals. The possibility of acceleration, accordingly, arises from the possibility of changes in the velocity of money. However, not any change in velocity is relevant: a change in the rapidity with which money changes hands is in itself impotent to effect a circuit acceleration; what is needed is a change in the circuit velocity of money, in the rapidity with which money performs a circuit of work, moving say from expenditure through receipts, outlay, income back to expenditure. This difference is important. For, while the rapidity with which money changes hands is a highly indeterminate concept, the rapidity with which money performs a circuit of work may be correlated exactly with the turnover frequencies of industry and commerce.

To clarify the notion of turnover frequency, let us define the unit of enterprise as any integrated and determinate contribution to the basic stage or to the surplus stage of the productive process. A contribution is considered "integrated" when it is not the effect of labour alone, or

capital alone, or management alone, but of all three taken together. A contribution is considered "determinate" when it answers the specification to be found, say, in a catalogue, an order, a contract, and, further, the functional distinction is drawn between basic and surplus. Thus a contribution is any good or service sold at any transitional or any final market by any entrepreneur; it is exclusively the contribution of that entrepreneur, even though what is sold includes the contributions of earlier entrepreneurs in the production series; finally, though exclusively the contribution of the entrepreneur in question, it is not specified by the personality of the entrepreneur, who may conduct simultaneously several units of enterprise, but by the description found in a catalogue, order, or contract, along with the added determination of basic or surplus.

Now every unit of enterprise involves a turnover magnitude and a turnover frequency. The statement would be merely a truism if it meant no more than that the rates of payments received and made by the unit of enterprise involved quantities and velocities of money; for obviously all rates of payment are products of quantity and velocity. But the statement is not a truism, for it involves a correlation between the quantities and velocities of rates of payment with the quantities and velocities of goods and services.

The existence of this correlation may be seen readily enough. To double, say, rates of payment, one may double either the sums of money in each payment in the rate or one may double the frequency with which each payment is made. Similarly, to double a rate of production one may double the number of items handled at once by a unit of enterprise or one may double the frequency with which this number is produced and sold. There are, then, alternatives between quantity and velocity in both rates

of payment and rates of production. But the quantity alternative in the rates of payment is conjoined with the quantity alternative in the rate of production, and the frequency alternative in the rate of payment is conjoined with the frequency alternative in the rate of production. The two cases of quantity-velocity are not only parallel but also correlated.

The point may be illustrated by simple examples. Suppose a ship-builder to have four ships under construction at once, and to finish a ship every two hundred days. Let demand be doubled. Then the builder may put eight ships under construction at once or he may study Henry Kaiser's methods and learn to complete a ship in one hundred days. In either case his rate of production is doubled and, we may suppose, his rates of payments received and made are doubled, that is, the selling price of each ship remains the same and payments made include profits. But the doubling of the rates of payments takes place in different ways. If he has eight ships instead of four under construction at once, then the magnitude of payments in the rates is doubled: every two hundred days his payments received amount to the value of eight ships and his payments made amount to the value of eight ships, where before the payments received and made with the same frequency amounted to the value of only four ships. If on the other hand he has only four ships under construction but completes a ship in one hundred days, the magnitude of his payments received and made amount to the value of four ships, but their frequency is doubled since these payments take place every hundred days instead of every two hundred days.

Now it might be thought that this distinction between turnover magnitude and turnover frequency was valid in such discontinuous production as ship-building but broke down as production approximated to continuity.

It happens however that while production may approximate to continuity, sales do not, and that the relevant period to turnover frequency is not simply the production period but the period of production and sales. The perfect example of productive continuity is the supply of electric power in which the generation, the distribution, and the consumption of the product are practically simultaneous; indeed, on Einstein's definition, they are exactly simultaneous. However, a power company cannot collect payments due as rapidly as it can supply electrical impulses. While conditions of production do not limit the frequency of its turnovers, conditions of collection provide a very palpable limit. A power company might decide to receive smaller payments more frequently, but then it would have to hire more men to read meters and a larger office staff to send out bills; further, this greater cost of collection would not yield a higher turnover frequency unless people responded and paid their bills at shorter intervals.

Similarly, in every unit of enterprise there is some determinate turnover magnitude and turnover frequency. The magnitude of the turnover depends upon the number of items handled at once and the selling price of each item. The frequency of the turnover depends upon the period of production plus any time lag involved in sales or collection. In general, each unit of enterprise first estimates demand which determines both rate of payments received and rate of supply; in the second place it estimates turnover frequency from its conditions of production and of sale and, caeteris paribus, selects a more rapid rather than a less rapid frequency; in the third place it finds its turnover magnitude determined by the other two factors. The estimate of demand comes first, because there is no use producing without selling. The estimate of frequency comes

second because a more rapid frequency is, in the main, an advantage but one never can have as rapid a frequency as one pleases. Finally, turnover magnitude is left to be determined by the other two factors, because turnover magnitude is the easiest to control of the three.

Now, if in each unit of enterprise the magnitude and frequency of payments depends upon the magnitude and frequency of turnovers, it follows that with respect to the aggregate of basic units and again with respect to the aggregate of surplus units we have quantities and circuit velocities of money determined by turnover magnitudes and frequencies. Hence to say that the circuits accelerate in virtue of greater, or less, circuit velocities of money, is to postulate an aggregate change in turnover frequencies. Either production periods are shortening, or lengthening, or the lag of sales or collection is shortening, or lengthening. The question before us, then, is the possibility of changes in turnover frequency when there are no changes in the aggregate quantities of money available in the circuits.

First, one may expect a general increase in turnover frequencies in the brisk selling of a boom, and similarly one may expect a general decrease in turnover frequency in the lagging sales ushering in a slump. But whether one may expect either a boom or a slump without changes in the aggregate quantity of money available in the circuits, that is another question; and to it we shall give an answer that is negative. In the second place, there is the increment in turnover frequency due to reduced, or increased, production periods. Now there are variations in production periods to meet variations in demand for, at times, it is simpler to vary the production period than the used capacity; but one may expect such variations to cancel; they may be as much one way as another; they provide more a means of adaptation than a general principle of acceleration. In the main, variations

in production periods result from the application of new ideas; these may introduce more efficient machinery, more efficient organization, more efficient labour, more efficient selling. The effect of such changes may be very great. But they are all long-term changes. In the short run they occur in random units of enterprise. Further, under the limitation we are considering, namely, unchanged quantities of money in the circuits, the acceleration possible from these increased frequencies is limited by the irregularity of their incidence. All units of enterprise contributing in a series to one final product have to keep in step. Unless all the units in the series simultaneously increase frequency from reduced turnover periods, there cannot be a general acceleration due exclusively to increased frequency; the units with increased frequency have to reduce their turnover magnitudes to allow other units in the series without increased frequency to accelerate by increased turnover magnitudes.

This brings us to the conclusion of the first step in the inquiry. On the assumption that

$$0 = DS' = DS'' = DD' = DD'' = DG$$

there is a possibility of circuit acceleration but that possibility is quite limited. It is a matter of acceleration with quantities of money in the circuits unchanged in the aggregate but with circuit velocities increasing or decreasing. This change in circuit velocities involves a change in turnover frequencies which, of course, are determined not merely by the supply functions but, since they depend on sales and are lengthened by a lag of sales, no less upon the demand functions. Now turnover frequencies are the least controllable of the factors in the rates of production and sales. Each unit of enterprise tends to be already at its greatest turnover frequency and to depend upon the emergence of more

efficient methods for increments of frequency. Further, units in a series have to keep their rates of production adjusted, and since increments in frequency occur at random, the supposition of constant aggregate quantities of money cuts down the acceleration effect of increased frequencies by making necessary simultaneous reductions of turnover magnitude in the units with greater frequency. Finally, while booms and slumps effect a general increase or decrease of frequencies by shortening or lengthening the lag of sales, still one must have the booms or slumps before one can have the frequency changes that result from them.

If now one turns to the second step in the inquiry, the question is, What is the possibility of circuit acceleration when

$$0 = DD' = DD'' = D\cdot G$$

so that DS' and DS'' may be positive or negative? Now there is a sense in which this supposition is contrary to the common assumption of investment equalling savings, but a discussion of that issue had best be reserved until we have given a definition of savings and of investment. As to the fact of aggregate increments in the quantity of money in the circuits, there should seem to be no doubt. The whole history of the development of money points to that conclusion. Mercantilism is among the earliest of the products of economic thinking; it arose when inquiries into the prosperity of some and poverty of other principalities and republics of the early Italian renaissance led to the conclusion that prosperity depended upon an abundance of gold; for centuries nations endeavoured to buy abroad less than they sold that they might have a favourable balance of gold payments. Further, by the time mercantilism became discredited, other means had been found to provide the circuits

with greater quantities of money. Idle money had been decried. Laws against interest and usury had been attacked successfully. Bills of exchange and discounting houses flourished. Banking developed. There followed the fundamental increase in means of payment by the introduction of a gold standard and fiduciary issue. And in our own day we have witnessed the elimination of gold, even as a constitutional monarch, and the substitution of a managed money, that is, a money managed according to the requirements of industry and commerce and not according to rules of thumb and a gold reserve. Now unless the operative circuits have an appetite for ever greater means of payment, this whole development appears meaningless. On the other hand, the supposition that circuit acceleration to some extent postulates increments in the quantities of money in the circuits accounts both for mercantilism and for the substitution of more elegant techniques in place of mercantilism. Further, it points to excess transfers to supply, to DS' and DS", as the mode in which increments in quantities of money enter the circuits.

The effect of excess transfers from the redistributive function to the supply functions, of DS' and DS", is twofold. Primarily it is a matter of aggregate increments in monetary circulating capital; secondarily it is a matter of absorbing windfall losses and profits. As to the primary effect, the function of monetary circulating capital is to bridge the gap between payments made and payments received; as goods and services are in process, the unit of enterprise makes payments to earlier units in the production series and to its own factors; only when goods and services are sold, are payments received. Now this gap increases with increments in turnover magnitude: the greater the number of items the unit of enterprise handles at once and the greater the price per item handled, the greater the need of monetary circulating capital. Thus, at a first approx-

imation, DS' and DS" are positive when turnover magnitudes in the aggregate are increasing, and they are negative when turnover magnitudes in the aggregate are decreasing. There is, however, a second approximation to be made. Payments received are subject to windfall losses and profits, and these may not be passed on to decreased or increased initial payments made. For the entrepreneur may prefer to allow windfall losses and profits to average out to zero over a series of intervals; then fluctuations in payments received are smoothed out by transfers from or to a reserve fund in the redistributive function so that payments made vary only with changes in the scale of operations or in prices; in this fashion windfall losses are covered by positive elements in DS' and DS" while windfall profits yield negative elements in DS' and DS". Evidently enough, this secondary effect of transfers to supply, in so far as it exists, should be small in the aggregate of basic units and in the aggregate of surplus units unless, as perhaps in a boom or slump, windfall effects tend to be generalized either as profits or as losses.

Now on the supposition of increasing quantities of money in the circuits due to positive values of DS' and DS", there follows an acceleration of turnover magnitudes proportionate to the magnitude of DS' and DS" and to this may be added any acceleration of turnover frequency that occurs. Interval by interval the rates of basic outlay, basic income, basic expenditure and basic receipts are stepping up; similarly, interval by interval the rates of surplus outlay, surplus income, surplus expenditure and surplus receipts move upwards. Inversely, when DS' and DS" are negative there is a similar deceleration of the circuits; turnover magnitudes are decreasing proportionately to the magnitude of the negative values of DS' and DS"; and these decreasing magnitudes will tend to effect decreasing frequencies both because of lagging sales and because

units of enterprise cannot be run at their optimum capacity.

So much for the first two steps of the inquiry. With all five rates of transfer, DS', DS", DD', DD", DG each at zero, circuit accelerations are possible in virtue of changing turnover frequency but limited because aggregate turnover magnitudes remain constant. With only DD', DD", DG each at zero, there are accelerations in aggregate turnover magnitudes and these may easily be accompanied and reinforced by similar accelerations in turnover frequency. There remains the question, What happens when DD', DD", DG are not zero?

The immediate answer aims at no more than postponing the issue by defining different cases. First, there is the case of the superimposed circuit, when in addition to the basic and surplus circuits there is a third circuit involving the redistributive function; this phenomenon arises when, say DD' and DD", are opposite in sign; it will be discussed when we treat the circulatory effects of a favourable balance of foreign trade or deficit government spending.

Second, with DG at zero, positive or negative values of DD' or DD" belong to the theory of booms and slumps. For such positive or negative values are changes in aggregate basic or aggregate surplus demand. Entrepreneurs are receiving back more, or less, than their outlays (which include profits of all kinds). The immediate effect is upon the price levels at the final markets, and to these changes in price enterprise as a whole responds to release an upward or downward movement of the whole economy. Obviously one may not simply suppose DD' or DD" not to be zero, for that would be postulating rather than accounting for booms and slumps.

Third, when DG is not zero, then one circuit is being drained to augment the quantity of money in the other circuit. Further, this incre-

ment in quantity of money appears at the final markets, so that its immediate effect is upon prices, except in so far as it is offset by equal and opposite action by DD' and DD". Again one has to deal with cyclic phenomena and not the general case of circuit acceleration.

Thus, the general theory of circuit acceleration is that it takes place, in a constrained and limited way when quantities of money in the circuits are constant, but without let or hindrance when quantities of money are variable. Further, the normal entry and exit of quantities of money to the circuits or from them is by the transfers from the redistributive to the supply functions. Finally, provided DD', DD", DG vary only slightly from zero, so that their action is absorbed by stocks of goods at the final markets, they exercise a stimulating effect in favour of a positive or a negative circuit acceleration; otherwise their action pertains either to the superimposed circuits of favourable balances of foreign trade and deficit government spending, or else to the cyclic phenomena of booms and slumps.

Appendix to Section 9. On the assumption that all units of enterprise begin turnover 1 simultaneously and end turnover n simultaneously, it is possible to construct a simple mathematical model of circuit acceleration. One may write

$$DR' = \sum_{i'} \sum_{1}^{n} f_{ij}$$

$$DO' = \sum_{i'} \sum_{1}^{n} o_{ij}$$

$$DS' = \sum_{i'} \sum_{1}^{n} s_{ij}$$

where the unit of enterprise, i, in turnover, j, increases its monetary circulating capital by s_{ij}, makes initial payments, o_{ij}, and receives final payments, f_{ij}, and each double summation is taken in each unit of enterprise from turnover 1 to turnover n and then with respect to all basic units of enterprise, i'.

Now f_{ij} is zero in all units of enterprise that do not deal immediately with final buyers. Let T_{ij} be transitional payments received and t_{ij} be transitional payments made by the unit of enterprise, i, in turnover j. Further, let j' denote the turnover immediately preceding turnover, j. Then, since the increment in monetary circulating capital may be equated to the excess of payments made in turnover, j, over payments received in turnover, j', one has

$$f_{ij'} + T_{ij'} = o_{ij} + t_{ij} - s_{ij}$$

Submitting this equation to a double summation, one has

$$\sum_{i'} \sum_{0}^{n-1} (f_{ij} + T_{ij}) = \sum_{i'} \sum_{1}^{n} (o_{ij} + t_{ij} - s_{ij})$$

where the difference between turnovers j' and j is covered by the difference of the limits. However the limit on the left-hand side may be assimilated to that on the right-hand side by introducing dR' and dT' defined by the equations,

$$dR' = \sum_{i'} (f_{in} - f_{iO}) \qquad \left[\text{so that } \sum \sum_{1}^{n} f_{ij} - \sum \sum_{0}^{n-1} f_{ij} = dR'\right]$$

$$dT' = \sum_{i'} (T_{in} - T_{iO})$$

where, since turnover 0 is the last turnover of the previous interval, dR' is the difference in the turnover magnitude of basic final payments at the beginning and at the end of the interval; and dT' is the similar difference in the turnover magnitude of basic transitional payments. Further, since in the aggregate transitional payments made are identical with transitional payments received, one has

$$0 = \sum_{i'} \sum_{1}^{n} (T_{ij} - t_{ij})$$

so that all summations may be eliminated and one may write

$$DS' = dT' + (DO' - DR') + dR' \qquad (15)$$

and by changing (') to (") one has a parallel equation for the surplus circuit.

With DG at zero and DD' at zero, (DO' - DR') can be no more than a lag and, as will appear later, this lag unfortunately tends to be zero. Again, dT' and dR' will be of the same sign: final payments are not increasing when transitional payments are decreasing nor vice versa. Thus, excess transfers to or from supply, DS', tend to equal the sum of the increments of aggregate turnover magnitudes in final payments and in transitional payments. Of these two, the increment in transitional payments will be the larger, since for each sale at the final market there commonly

is a sale at a number of transitional markets.

In the summations, turnover magnitudes appear directly but turnover frequencies only indirectly, inasmuch as the number of turnovers, n, per interval increases in the case of any given unit of enterprise. An increase of the number of turnovers per interval would have a great effect on DR' and DO', since it increases the number of instances of f_{ij} and o_{ij} to be summated. But it need have no effect on DS', since s_{ij} may be positive or negative and so cancel in the aggregate of instances. Finally, increasing turnover frequency, of itself, has no effect on dR' or dT', since these terms represent the difference between two turnover magnitudes, and increasing frequency only puts further apart the two magnitudes compared.

Thus, in pure theory DO' and DR' might accelerate to any extent while DS', dR', dT' each remained at zero. It would be a pure frequency acceleration. The contention of the preceding pages was that such pure frequency acceleration has conditions that are difficult to realize, and that the history of the development of money points to a preponderant role of increasing turnover magnitude in circuit accelerations.

10. The Theoretical Possibility of Measurement of the Productive Process. In the three preceding sections classes and rates of payment were defined to make possible a statement of conditions of acceleration of the monetary circuits. Evidently it is desirable to complete this list of conditions by bringing in a consideration of the underlying acceleration of the productive process itself. But before this can be done, at least a method of defining the measurement of such acceleration must be provided. It is not necessary that any actual measurement be undertaken, or even that a method which statisticians would find practicable be assigned. But it is necessary that we have a clear and definite idea of what we are discussing when we speak of an acceleration of the productive process.

The problem of the present section may be put as follows. Consider two successive and equal intervals of time, long enough to be representative, yet not so long that much averaging is required. Suppose that in the first of the two intervals, objects of a class, i, were sold in the quantity, q_i, and at an average price, $p_i + dq_i$, and at the average price, $p_i + dp_i$. Suppose, further, that there are n such classes, that the aggregate payment for them in the first interval was DZ and in the second interval was $DZ + D^2Z$, so that

$$DZ = \sum p_i q_i \tag{16}$$

$$DZ + D^2Z = \sum (p_i q_i + p_i dq_i + q_i dp_i + dp_i dq_i) \tag{17}$$

where all summations are taken with respect to all instances of i from 1 to n. The question is, How much does the increment in the rate of payment, D^2Z, result from price increments, dp_i, and how much does it result from quantity increments, dq_i? In other words, can one define two numbers, say

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", and in the second interval objects in the same class were sold in the quantity, q_i

P and Q, such that P varies with a set of numbers, p_1, p_2, p_3,.... and Q varies with another set of numbers, q_1, q_2, q_3,....

An universally valid answer to this question may be had when P and Q are not mere numbers but vectors in an n-dimensional manifold. Let P and Q be the vectors from the origin to the points $(p_1, p_2, p_3,...)$ and $(q_1, q_2, q_3,...)$ respectively. Then any variation in the price pattern, that is, in any ratio of the type, p_i/p_j, will appear as a variation in the angle between the projection of P on the plane "ij" and the axis "j". Similarly, any variation in the quantity pattern will appear as a parallel variation in an angle made by a projection of Q. But besides such variation in price pattern or in quantity pattern there may be general increases or decreases in prices or in quantities. The latter appear as positive or negative increments in the absolute magnitudes of the vectors, for

$$P^2 = \sum p_i^2 \tag{18}$$

$$Q^2 = \sum q_i^2 \tag{19}$$

that is, the length of the vector, P, is the square root of the sum of all prices squared, and the length of the vector, Q, is the square root of the sum of all quantities squared. Thus, one may suppose two n-dimensional spheres of radii P and Q respectively. The vector from the origin to any point in the first "quadrant" of the surface of such spheres represents a determinate price pattern or quantity pattern. On the other hand, variation in P and Q is variation in the size of the spheres.

Now there is a well-known theorem, called the "dot product", which enables us to equate DZ with P and Q, whence

$$DZ = \sum p_i q_i = PQ \cos A \tag{20}$$

where A is the angle between the vectors, P and Q. Thus, variation in DZ depends not only on the magnitude of P and Q but also on the price and quantity patterns as represented by the angle A between the vectors. This is evident enough, since it makes a notable difference in DZ whether large or small instances of p_i combine with large or small instances of q_i, and such combination is ruled by the relative price and quantity patterns, to appear ultimately in the angle A.

Next, consider the second interval in which the vector, P, increases to (P + dP), the vector Q to (Q + dQ), and the angle A to (A + dA). Then

$$(P + dP)^2 = \sum (p_i + dp_i)^2 \qquad (21)$$

$$(Q + dQ)^2 = \sum (q_i + dq_i)^2 \qquad (22)$$

$$DZ + D^2Z = (P + dP)(Q + dQ)\cos(A + dA) \qquad (23)$$

From equations (20) and (23) one obtains for D^2Z the expression

$$D^2Z = PQ[(dP/P + dQ/Q + dPdQ/PQ)\cos(A + dA) - (\sin A \sin dA/2)/(dA/2)] \qquad (24)$$

Thus, D^2Z depends not only on the initial quantities, P, Q, A, and the increments in absolute magnitude, dP and dQ, but also upon changes in the relative price and quantity patterns as represented by the angle, dA.

From equations (18) to (20) it can be shewn that if all prices and all quantities change in the same proportion, then there is no change in cosA, so that the angle, dA, is zero. Further, dA is again zero whenever there is compensation for deviation of change from the same proportion, inasmuch as some prices or quantities change more and others less than a strictly proportionate change would require. But whenever dA is zero or very small one may write,

$$D^2Z = PQ[(dP/P + dQ/Q + dPdQ/PQ)\cos A - \sin A] \qquad (25)$$

so that the increment, D^2Z, then depends solely on the increments dP and dQ and the initial quantities, P, Q, A.

Now the significance of the foregoing is purely theoretical. The question has been about the possibility of price and quantity indices. The only relevant common measure of tons or iron ore, ton-miles of transportation, kilowatt hours, and so on, lies in their prices; but prices themselves are subject to change; hence if it is possible to measure the acceleration of the productive process, it has to be possible to differentiate between price variation, price pattern and quantity pattern variation, and the pure quantity variation of the productive process. The foregoing discussion has aimed at showing that, without ever lapsing into meaninglessness, it is always possible to make such distinctions.

However, the definitions that have been given are rather elaborate. When change is gradual, it will be sufficient to use the following approximate definitions of P, Q, dP, and dQ, namely,

$$PQ = \sum p_i q_i \qquad (26)$$

$$PdQ = \sum p_i dq_i \qquad (27)$$

$$QdP = \sum q_i dp_i \qquad (28)$$

$$dPdQ = \sum dp_i dq_i \qquad (29)$$

so that

$$D^2Z = PQ[dP/P + dQ/Q + dPdQ/PQ] \qquad (30)$$

as results by referring back to equations (16) and (17) which pertain to the statement of the problem. On this definition one obtains different values for P and Q and they may be termed "weighted averages" as opposed to the previous "vectorial averages". The difference is most apparent in

the respective equations for D^2Z: equations (24) and (25) contain all the relations of equation (30) but add to the latter a qualification by introducing a trigonometric function of the angle A.

The greater simplicity of the weighted averages is not without its drawbacks. Equations (26) to (29) have to be taken simultaneously, they must be consistent; it follows that as the four left-hand side expressions are in a fourfold proportion [PQ / PdQ = QdP / dQdP] so also, for consistency, the four right-hand side summations must be in a fourfold proportion. This condition obviously restricts the validity of the definition by weighted averages: in the rare cases when the summations are proportionate, the definition is exact; when the summations are approximately proportionate, the definition is no more than an approximation; when the summations are not even approximately proportionate, the definition involves a contradiction and so is meaningless.

Naturally, a theorist is ill at ease when dealing with objects whose definition can lapse into meaninglessness and usually is at best approximate, especially when there is no saying what it approximates to. On that account one may well prefer to regard equation (30) is an alternative expression for equation (25): both of these equations have parallel variables, D^2Z, dP, dQ, though the latter adds a further initial quantity, A, to P and Q; apart from the additional initial quantity of (25), both relate variables and initial quantities in the same way; both are in the general case approximations; and both have parallel conditions of approximation, namely, a fourfold proportion involving sets of prices, quantities, price increments, and quantity increments. This parallelism should seem sufficient to provide an answer to the embarrassing question, To what do the weighted averages approximate? One may say that they are a simplified approach

to the conceptually exact vectorial averages. So much, then, for the theoretical problem of the measurement of the acceleration of the productive process: from rates of payment, DZ, and their increments, D^2Z, it is possible to proceed to rates of production, Q, and their increments, dQ.

There remains the question of the application of this method of measurement to the basic and surplus stages of the productive process. In general the discussion will centre on hypothetical smooth trends of expansion, so that instances of dp_i and dq_i will all be relatively small and the definition in terms of weighted averages will be available. The main indices to be employed will be, P', the basic selling price index and dP' its increment, Q', the index of basic quantities sold in the given interval and dQ' its increment, P", the surplus selling price index and dP" its increment, and Q", the index of surplus quantities sold and dQ" its increment. These indices are calculated from rates of payment at the basic and surplus final markets, as follows:

$$DE' = P'Q' \tag{31}$$

$$D^2E' = P'Q' \left[dP'/P' + dQ'/Q' + dP'dQ'/P'Q'\right] \tag{32}$$

$$DE'' = P''Q'' \tag{33}$$

$$D^2E'' = P''Q'' \left[dP''/P'' + dQ''/Q'' + dP''dQ''/P''Q''\right] \tag{34}$$

At times of great and abrupt change, when weighted averages cease to have a meaning, the meaning of the indices may be salvaged by shifting to the definition in terms of vectorial averages and adding to equations (31) to (34) the appropriate trigonometric functions of A and dA. On the other hand, in discussing equations of the type of (32) and (34), one may ignore the third quotient on the right-hand side, often because it is relatively small, always because it is merely the product of the

first two quotients and so does not add a further factor of variation that is different in kind.

Since Q' and Q" refer to quantities sold at the final markets, they have to be corrected by acceleration coefficients, a' and a", to give quantities under production during the contemporaneous interval. Thus, when basic quantities sold are Q', basic quantities under production will be a'Q'; similarly, when surplus quantities sold are Q", surplus quantities under production will be a"Q". Estimates of the acceleration coefficients proceed in two steps. First, one considers the series of indices for final sales over a number of intervals, say, Q'_1, Q'_2, Q'_3,... If these are about equal, the acceleration coefficient will be unity; if they are an increasing series, then a'_1 will be greater than unity; if they are a decreasing series, then a'_1 will be less than unity. Second, one adverts to the influence of speculative anticipations: the current rate of production is not based on actual but on anticipated future rates of final sales; further, when prices are rising, there is an advantage in buying long in advance, and when prices are falling, the advantage lies with minimum inventories; finally, there is a cumulative effect whenever there is a series of transitional markets, for each successive market tends to count the speculative increments of demand of later markets as part of the objective evidence, to add on a further speculative increment, and to pass on a cumulatively inflated or deflated demand to earlier markets. Hence one may characterize the acceleration coefficients as greater or less than unity according as the stages of the process are accelerating or decelerating, as notably greater than unity when current production is expanding speculatively, and perhaps as tending to be notably less than unity in the liquidation of a crisis.

11. The Cycle of the Productive Process. By a cycle is meant a more or less necessary succession of phases. By a phase is meant a series of intervals in which certain defined characteristics are verified. By a cycle of the productive process is meant a concatenation of phases defined by relations between quantity indices and their increments. The following table explores the possibility of different types of phases.

	dQ'', dQ' --	$dQ''/Q'' > dQ'/Q'$ --	$dQ''/Q'' = dQ'/Q'$ --	$dQ''/Q'' < dQ'/Q'$
I.	Unspecified.	Surplus Advantage	Proportionate Phase	Basic Advantage
II.	Neither negative.	Surplus Expansion	Proportionate Expansion	Basic Expansion
III.	Neither positive	Surplus Contraction	Proportionate Contraction	Basic Contraction
IV.	Both zero	---	Static Phase	---
V.	One positive & one negative	Mixed Phase	---	Mixed Phase

The foregoing is simply a complete list of possibilities of given type. The main criterion of division is derived from the relation between basic and surplus acceleration. In any given interval dQ''/Q'' must be greater than, or equal to, or less than dQ'/Q'. If one does not specify whether dQ' and dQ'' are positive, zero, or negative, one has three generic types of phases named respectively the surplus advantage, the proportionate phase, and the basic advantage. If however one specifies that neither dQ' nor dQ'' is negative, in the sense that at least one is positive, the phase is respectively a surplus expansion, a proportionate expansion, or a basic expansion. On the other hand, if one specifies that neither dQ' nor dQ'' is positive, in the sense that at least one is negative, the phase is respectively a surplus contraction, a proportionate contraction, or a

basic contraction. Finally, if both dQ' and dQ" are zero, there is a static phase, and if one is positive and the other negative, there is a mixed phase; the static phase and the mixed phase are likely to be mere theoretical possibilities.

The significance of the table is that it makes possible a distinction between different types of cycle. The trade cycle is a succession of expansions and contractions: it certainly is a movement up and down the table, and it may or may not also involve movements across the table. The contention of the present analysis is that there is a pure cycle at the root of the trade cycle. By a pure cycle is meant a movement across the table with no implication of a movement up or down the table. Thus the succession of surplus expansion, basic expansion, proportionate expansion, repeated as often as you please, would give a pure cycle. Of itself, it would not involve any contraction. It would be simply a matter of the intermittent emergence of acceleration lags in a general movement of expansion. Such a pure cycle can be shown to have an exigence for rather vigorous adaptation on the part of human agents as one phase succeeds another. It can further be shown that the lack of such adaptation transforms the pure cycle into a trade cycle: the free economies of the present day are over-adapted to the surplus expansion, which they exaggerate into booms, but under-adapted to the basic expansion, which they convert into slumps. Lack of adaptation thus transforms a movement across the table into a movement that also is down the table. So much, then, for the general drift of the argument in subsequent sections; present concern is the probability or necessity of pure cycles.

A first preliminary point is a distinction between the several functions of surplus final products. The aggregate of surplus final products in any given interval is measured by Q". But of this aggregate, part goes to supplying mere replacements and maintenance of existing capital equipment, while the remainder goes to supplying additional and/or more efficient equipment. Thus while part of Q" has no tendency to accelerate the process, the remainder tends to effect a long-term acceleration in either a surplus stage or in the basic stage. Let us say that in any given interval (1 - H)Q" has no accelerating effect, H"Q" accelerates the surplus stage, and H'Q" accelerates the basic stage, where $H = H' + H''$.

There immediately follows a distinction between two significantly different situations. At any given time the coefficient H may be great or small. If it is small, the possibility of a long-term acceleration of the process requires that first the surplus stage accelerate itself to make Q" and H great before turning to the long-term acceleration of the basic stage. On the other hand, if H already is great, the surplus stage may proceed at a constant rate yet have a great H'Q" to effect a notable long-term acceleration of the basic stage; and in this case the basic stage will accelerate first uniformly and then with decreasing rapidity, as the lag in additional replacement requirements gradually is overcome and H decreases.

This distinction between a high and a low potential for long-term acceleration, according as H is great or small, is to be complemented with a parallel distinction between a high and a low potential for short-term acceleration. The two types of acceleration differ, it will be recalled, inasmuch as the short-term acceleration is through the more

intense and more efficient use of existing capital equipment, while the long-term acceleration is through the introduction of additional and/or more efficient equipment; thus, the short-term acceleration is a consequent of a previous long-term acceleration and consists in exploiting it to the full; inversely, one may say that the long-term acceleration changes the basis on which short-term accelerations operate. Now at any given time the potential of the economy for short-term acceleration may be high or low. One may presume it to be high when a long-term acceleration is well advanced: then there is much new equipment; many new combinations of production factors have recently emerged; and one may expect that the full potentialities of this new situation have not yet been discovered and exploited. Again, one may expect short-term potential to be high after a crisis: for then there has been a sudden contraction of rates of production, so that the material means for increasing these rates greatly are still in existence. On the other hand, short-term potential is low if a long period has elapsed since the last long-term acceleration has taken place. For if the expansion of the process has been maintained, the potentialities of short-term acceleration will in time be exhausted; and if the expansion has not been maintained but has degenerated into a slump, the potentialities of short-term acceleration will in time be destroyed by obsolescence and liquidations.

This pair of distinctions between high and low long-term and short-term acceleration potential set the stage for a pure cycle. But the issue has yet to be clarified by further considerations. It is to be expected, in the first place, that either a long-term acceleration does not occur at all or else it occurs in a massive fashion.

There are three main reasons grounding such an expectation. First, a long-term acceleration is a matter of long-term planning: capital formation is not worth-while unless one can foresee a long period of utility for it; on the other hand, if such an anticipation is possible, then it is worth-while to do the job properly while one is about it, for one is settling one's fate for years to come. Second, the introduction of additional or more efficient capital equipment will not take place in isolated units here and there in the productive process; the supply of a single product depends upon the activities of many units; and if it is worth-while for one of them to go in for an expansion, it is worth-while for a series to do so. Third, in a long-term acceleration, demand is not for some single type of surplus product but for a ramifying variety of products; thus one may expect not merely series of units but series of series of units to expand. These considerations do not make long-term accelerations inevitably massive, but they do reveal an objective logic which is verified no less in socialist planning than in capitalist free enterprise.

In the second place, the more massive the long-term acceleration the greater will be the expansion of surplus activity. Surplus activity supplies capital equipment to the surplus stages and to the basic stage. Hence a massive long-term acceleration is a massive development of surplus activity. Further, one is not to think of this increment in Q'' as concentrated in firms of certain types. The distinction between basic and surplus is not a material nor a proprietary but a functional distinction. There are types of enterprise that in themselves are indifferently

basic or surplus and turn from one stage to the other according to the use to which their products are put: such are the extraction or production of raw materials, transportation, the supply of light, heat, power, and a variety of general services. As the quantity of surplus activity expands, there is not merely a great increase in construction, in the supply of tools and machines, and so on, but also a great diversion of indifferent activities to the surplus stage.

In the third place, it is to be observed that a series of intervals in which dQ"/Q" is constant and positive is not a series of intervals with the surplus stage undergoing uniform acceleration. For dQ"/Q" to be constant, Q", interval by interval, has to be increasing in a geometrical progression. Thus, if in an initial interval surplus activity is Q" and over a subsequent series of intervals dQ"/Q" equals k - 1, then the series of values for surplus activity will be Q", kQ", k^2Q",... k^nQ". Inversely, if surplus activity accelerates uniformly over a series of intervals, then dQ"/Q" is decreasing in geometrical progression; successive values of the ratio will be rdQ"/Q", r^2dQ"/Q",... r^ndQ"/Q", when the initial value of dQ"/Q" is 1/r - 1. Now when the surplus stage of the process is effecting a long-term acceleration of surplus activity but as yet not affecting basic activity, one may expect successive values of Q" to increase in a geometrical progression. This gives an initial period in which the graph of dQ"/Q" is approximately a level straight line. Next, as the surplus expansion develops and devotes more and more of its activity to the long-term acceleration of the basic stage, one may expect no more than an uniform acceleration of the surplus stage. This gives a second period in which dQ"/Q" is curving downwards with successive values in a decreasing geometrical progression. Thirdly, as the expansion

approaches its maximum in the surplus stage, dQ" reverts to zero and Q" becomes constant. In this third period dQ"/Q" is again a level straight line but now coincident with the x-axis; H" is zero, but H'Q" may be great for a notable period to effect a long-term acceleration of the basic stage which, however, gradually declines as replacement requirements begin to mount.

The same general principles hold with regard to dQ'/Q'. When Q' accelerates in a geometrical progression, dQ'/Q' is constant. When Q' accelerates uniformly, dQ'/Q' decreases in a geometrical progression. Further, one may expect the aggregate sum of values of the increments, dQ', over a long series of intervals to be approximately in the ratio Q'/Q" to the aggregate sum of values of the increments, dQ", over the same long series of intervals. It is indeed true that Q' is very much larger than Q", since basic activity is to surplus as, say, volume to surface. But one may expect the increment of a volume to stand to the increment of a surface as the volume does to the surface. To suppose the contrary leads to absurd conclusions. If, for instance, $dQ^{n'}/Q"$ were on a long-term aggregate much greater or much less than dQ'/Q', then a series of long-term periods would make this difference multiply in geometrical progression to effect a convergence of $Q^{n'}$ and Q' or else a geometrically mounting divergence. Such a convergence or divergence would imply that the more roundabout methods of capitalist progress were increasingly less efficient or increasingly more efficient in expanding the supply of consumer goods. Neither view is plausible. New ideas and new methods increase existing efficiency in both the surplus and the basic stages; the ratio between the quantity of surplus and the

quantity of basic products per interval is not a matter of efficiency but of the point-to-line correspondence involved in any more roundabout method, in the fact that a single surplus product gives a flow of basic products. In a word, while any concrete realization of the capitalist idea is subject first to increasing and then to decreasing returns, the series of new capitalist ideas cannot be said to be subject to either.

There is a final observation to be made. So far attention has been directed to the latter parts of the graphs of dQ''/Q'' and dQ'/Q'. It has been said that when the surplus stage devotes all its energies to self-acceleration, then Q'' will be increasing in geometrical progression and dQ''/Q'' will be a level straight line. When this period of gestation is coming to an end, the acceleration of Q'' tends to become uniform, and then gradually to decrease to zero; when it is uniform, dQ''/Q'' is decreasing in a geometrical progression, and when it is zero, dQ''/Q'' is zero. Now when the acceleration of Q'' is uniform, the long-term potential of the surplus stage is increasing and so the surplus stage is devoting more and more of its efforts to the long-term acceleration of the basic stage; then Q' will be increasing at an increasing rate, and the time series of its values may stand in a geometrical progression to make dQ'/Q' a level straight line. When, however, Q'' becomes constant, the acceleration of Q' becomes uniform and then dQ'/Q' will curve downwards in geometrical progression; and as replacement requirements begin to mount this downward curve is accentuated until dQ' reverts to zero. Thus, both dQ''/Q'' and dQ'/Q' are described as initially level straight lines that eventually curve downwards till the acceleration ratios become zero. One well may ask an account of the movement of the acceleration ratios from their initial zeros to the level straight lines.

There are two factors in such a movement: short-term acceleration and the period of generalization of a long-term acceleration. Now any long-term acceleration has to begin as a short-term acceleration. New capital equipment does not begin to accelerate rates of production until it has been produced; its production in a series of initial cases has to be a matter of the more intense or more efficient use of existing facilities, in brief, a short-term acceleration. Further, once long-term acceleration is under way, rates of production increase increasingly; their graphs are concave upwards; but the curvature moves from being flatter to rounder as the acceleration is generalized from one section to another throughout the productive process. During this period of generalization rates of production are not merely increasing in geometrical progression but moving from less to more rapid geometrical progressions.

In one very important aspect, however, the initial period of dQ'/Q' differs from the initial period of dQ"/Q". For reasons that will appear later, the basic stage will begin a short-term acceleration as soon as there is an appreciable surplus expansion. But while the short-term acceleration of the surplus stage passes automatically into a generalizing long-term acceleration, there is bound to be a lag, equal to the surplus period of gestation, before long-term acceleration can emerge in the basic stage and a further lag before it can be generalized there. Thus, the initial period of the long-term expansion will approximate to a proportionate expansion with dQ'/Q' roughly equal to dQ"/Q". But the surplus expansion would have to be quite small or the basic potential for short-term acceleration quite great, for this proportionate expansion to be maintained. Short-term acceleration can move dQ'/Q' up to a peak but

it cannot keep it at the peak; it can move it to a peak by generalizing itself throughout the basic stage; it cannot keep it at the peak, because once it is generalized, it is apt to be exhausted, and even if it is not exhausted, it cannot make the time series of values of Q' a great geometrical progression. Thus, though dQ'/Q' initially moves to a peak, it immediately begins to descent even though Q' continues to expand at an uniform time-rate of increase. It follows that the initial proportionate expansion is succeeded by a surplus expansion: dQ"/Q" is constant, because Q" is increasing in some geometrical progression; dQ'/Q' is falling from a peak, even though Q' is increasing. This situation, however, is bound to be temporary; its existence is the lag between the generalized long-term acceleration of the surplus stage and that of the basic stage. When that is overcome, dQ'/Q' moves again to a peak and remains there; and by the same token, dQ"/Q" will begin to decline. The surplus expansion is followed by a basic expansion. Finally, as replacement requirements begin to mount, the factor, H, in the product, HQ", begins to decline; the rate at which the surplus stage accelerates the basic accordingly declines; and so the basic expansion approaches its end. The ultimate situation is a static phase in which dQ' and dQ" are both zero, Q' and Q" are on new high levels but constant, and further development is awaiting new ideas, new methods, new organization.

So much for the outline of an expansive pure cycle. It assumes a long-term acceleration of the productive process and asks how such an acceleration develops. It answers by positing three periods. Generalizing short-term acceleration in both surplus and basic stages gives an initial proportionate expansion. The development of long-term accelera-

tion in the surplus stage and its lag in the basic stage gives a surplus expansion. The emergence and generalization of long-term acceleration in the basic stage, together with the impossibility of maintaining the increasing rate of acceleration in the surplus stage, gives a basic expansion. At first, dQ"/Q" is equal to dQ'/Q', then it is greater, then it is less. Without urging the necessity of such a cycle, one may say that it is solidly grounded in a dynamic structure of the productive process; and one has only to think of the practical impossibility of calculating the acceleration ratios, dQ'/Q' and dQ"/Q", to smile at the suggestion that one should try to "smooth out the pure cycle".

12. The Phases in Circuit Accelerations. On combining equations (31) and (32) and again equations (33) and (34) one obtains -

$$D^2E'/DE' = dP'/P' + dQ'/Q' \qquad (35)$$

$$D^2E''/DE'' = dP''/P'' + dQ''/Q'' \qquad (36)$$

so that, apart from price level variations, DE' varies with Q' and DE" varies with Q". The question arises, To what extent does price level variation offset or reinforce the concomitance of DE' with Q' and DE" with Q".

In the first place, variations in P' and P" will not be equal and opposite to variations in Q' and Q" to leave DE' and DE" constant. This is evident from the nature of the expressions, dP"/P' and dP"/P". When Q' or Q" are increasing in geometrical progression, P' and P" would have to be decreasing in geometrical progression. But it is normal for rates of production to increase in geometrical progression in a long-term acceleration: the greater the rate of production, the greater the capacity to increase that rate. On the other hand, falling prices are a signal for a slump. Prices falling in a geometrical progression would soon afflict enormous losses on every entrepreneur, for entrepreneurs would be making the main part of their outlays at the higher prices but collecting their receipts at the later lower prices. Under such circumstances, the long-term acceleration, if ever it began, would rapidly come to a sudden end. The fact illustrates the value of vulgar notions of money being sound because it is rigid.

In the second place, prices tend to move in the same direction as quantities. Prices rise in a boom, when quantities increase, to fall in a slump, when quantities decrease. However, the causes of such price

variation are of two kinds. There is the normal causality of increasing or decreasing scarcity. As rates of production increase, competitive demand for labour and for materials, as well as for general services such as power, transportation, credit, and so on, increase. Inversely, as rates of production decline, demand falls off. On this head one would expect price levels to mount increasingly as the expansion developed, that is, imperceptibly in the early period, in more marked fashion once expansion becomes generalized, and in a purely inflationary manner if the maximum rates of production possible were attained yet credit continued to be expanded. Thus, so far from cancelling the requirement that DE' vary with Q' and DE" with Q", one may expect price levels to reinforce and augment such variation, though in different degrees as the pressure on general markets is slight, notable, or fatuous.

These variations in DE' and DE" postulate, in turn, parallel variations in DI' and DI". The normal source of basic expenditure is basic income, and the normal source of surplus expenditure is surplus income. As was argued in section 9, a condition of successful circuit acceleration is that DO', DI', and DE' keep in step, that DO", DI", DE" do likewise, that DD', DD", and DG remain zero. Thus, the long-term acceleration of the productive process with its successive proportionate, surplus, and basic expansions can be executed successfully only if the variations in the rates of payment follow the phases of the productive cycle. There would be, for instance, a radical maladjustment between circuit and productive acceleration if when surplus rates of production were increasing more rapidly than basic, basic rates of income were increasing more rapidly than surplus. Then interval after interval, an increasingly excessive

amount of monetary income would be moving to the basic final market and there would follow a rise in prices quite different in kind from the normal rise resulting from increasing scarcity. Such a rise would not be an ordinary scarcity but at once a consequence and, as will appear, a corrective of a disproportion between monetary and real consumer income.

Not only is it true that this second type of price variation is different from the first, but also one must give it a different kind of attention. When prices rise because of real scarcity, one may speak of a requirement for variation in DE' and DE" over and above the variation postulated by dQ'/Q' and dQ"/Q". But when prices rise or fall because the distribution of income has not anticipated these requirements correctly, then price variation is not a postulate for variation in DE' and DE" but rather a spontaneous effort at adjusting what should already have been adjusted. Accordingly, such adjustment variations in prices will be ignored for the moment to be considered more in detail in the next section. Present concern will be for the type of adjustment that the successive phases of the pure cycle postulate.

The central adjustment is variation in the rate of saving. This rate may be defined, conveniently for present purposes, as the ratio of surplus income to total income. Assuming that the rate of saving will not differ appreciably because income is derived from basic or surplus outlay, we may denote this rate by the symbol, G, write

$$G = G' = 1 - G'' \qquad (37, \text{ see } 8)$$

so that

$$G = DI''/(DI' + DI'') \qquad (38, \text{ see } 2 \& 10)$$

The condition that G is increasing, constant, or decreasing is that surplus income is increasing, in proportion to its size, more rapidly than basic, or at the same rate, or less rapidly. Symbolically, if one assumes a smooth trend and differentiates equation (38), the numerator on the right-hand side will be $D^2I''/DI'' - D^2I'/DI'$ which, as it is positive, zero, or negative, makes the differential of G positive, zero, or negative.

Now in a proportionate expansion dQ''/Q'' equals dQ'/Q'. If price levels are rising at all, one may expect both basic and surplus levels to be rising equally. Hence D^2E'/DE' should equal D^2E''/DE''. Further, since rates of income should keep pace with rates of expenditure, D^2I''/DI'' should equal D^2I'/DI'. It follows that in the proportionate expansion, the rate of saving, G, should be constant.

Again, in the surplus expansion, dQ''/Q'' is greater than dQ'/Q'; if there is any divergence in the variation of basic and surplus price levels, scarcity should be felt more in the surplus than in the basic stage of the process, so that any difference between dP''/P'' and dP'/P' would have a reinforcing and not a cancelling effect. It follows, as before, that D^2E''/DE'' should be greater than D^2E'/DE', that D^2I''/DI'' should be greater than D^2I'/DI', and so that the rate of saving, G, should be increasing.

Inversely, in the basic expansion, the preceding argument is turned around to give the conclusion that the rate of saving should be decreasing. Then dQ'/Q' is greater than dQ''/Q'', prices varying from scarcity should, if anything, reinforce this difference, and so basic income and expenditure must be increasing more rapidly than surplus.

To conclude, the acceleration of the productive process, if it is to succeed and not be destroyed by circulation maladjustments, postulates that in a proportionate expansion the rate of saving be constant, that in a surplus expansion it increases, that in a basic expansion it decreases. The implications of this postulate will concern us in subsequent sections on the cycle of basic income, the cycle of pure surplus income, and the cycle of price spreads.

13. The Cycle of Basic Income. The purpose of this section is to inquire into the manner in which the rate of saving, G, is adjusted to the phases of the pure cycle of the productive process. Traditional theory looked to shifting interest rates to provide suitable adjustment. In the main we shall be concerned with factors that are prior to changing interest rates and more effective.

The simplest manner of attaining a fairly adequate concept of basic income is to divide the economic community into an extremely large number of groups of practically equal income. Among these groups it will be convenient to include a zero-income group composed of dependents, the unemployed, potential immigrants, recent emigrants, the recently deceased, and so on. In any group, i, let there be at any given time n_i members; let each member receive an aggregate (basic and surplus) income, y_i, per interval, so that the whole group receives $n_i y_i$; finally, let us say that the group directs the fraction, g_i, of its total income to the basic demand function, so that basic income per interval is given by the equation,

$$DI' = \sum g_i n_i y_i \qquad (39)$$

Next, let g_i increase by dg_i, n_i by dn_i, and y_i by dy_i in the immediately subsequent interval. However, since the number of income groups is extremely large, it should always be possible to represent an increase or decrease of an individual's income by his migration from one group to another. In this manner dy_i may be assumed to be always zero, and so one obtains for the increment per interval of basic income the simpler equation,

$$D^2I' = \sum (g_i y_i dn_i + n_i y_i dg_i) \qquad (40)$$

where the component, $y_i dg_i dn_i$, is omitted as containing no new variable. We shall consider in turn variations in basic income in virtue of dn_i and variations in virtue of dg_i.

Since there is a zero-income group one may always regard the addition of members to one group as a subtraction from other groups and vice versa. This, in fact, is always approximately true but the presence of a zero-income group provides a locus in which all error is concentrated without leading to any mis-statement about income. Consider then the migration of an individual from any group, i, to a proximate but higher group, j. Three increments are to be distinguished: the increment in the individual's total income, $y_j - y_i$; the increment in his basic income, $g_j y_j - g_i y_i$; and the increment in his surplus income $[(1 - g_j)y_j - (1 - g_i)y_i]$. Now the higher any individual's total income, the smaller will be the fraction, g, of total income going to basic expenditure. Hence, in migrations from low to less low income groups, most of the increment of individual total income becomes an increment of basic income; but in migrations from high to still higher income groups, most of the increment of individual total income becomes an increment of surplus income. Evidently, then suitable migrations are a means of providing adjustments in the community's rate of saving. To increase the rate of saving, increase the income of the rich. To decrease the rate of saving, increase the income of the poor.

The foregoing is the fundamental mode of adjusting the rate of saving to the phases of the productive cycle. It reveals that the surplus expansion is anti-egalitarian, inasmuch as that expansion postulates that increments in income go to high incomes. But it also reveals the basic expansion to be egalitarian, for that expansion postulates

that increments in income go to low incomes.

However, this fundamental mode of adjustment is complemented by a further mechanism of automatic correction. When savings are insufficient, too much money is moving to the basic final market and so the basic selling price level rises; inversely, when saving is excessive, insufficient money moves to the basic final market and so the basic selling price level falls. This movement of price levels has a double effect: it contracts or expands the purchasing power of monetary income; and it shifts the distribution of monetary income to the higher or to the lower income brackets. The latter effect is less apparent but essential, for without it there results the upward or downward price spiral.

When, then, prices rise, there is no tendency, at least in the first instance, for quantities to contract. It follows that rates of payment expand proportionately to therise of prices to give a very large increase to total outlay and income. Again, in the first instance at least, this large increase of income consists in speculative profits of the entrepreneurial class, and as one may suppose this class to be already in the higher income brackets, it follows that the increment of total income resulting from rising prices is an increment in the higher income brackets and so mainly an increment in surplus income. Thus, the mechanism of rising prices involves a shift in the distribution of monetary income in favour of the higher income brackets and so in favour of surplus income. This shift in distribution, of course, is achieved through increasing the money in circulation and not by decreasing the monetary income of other brackets. None the less, the equivalent of that effect is had by the reduction of the purchasing power of monetary income. Now the greater the rise in prices, the greater the increase in monetary income, the greater the increase in surplus income, and the greater the reduction

of the purchasing power of monetary income. Hence, a sufficient rise in prices will always succeed in adjusting the rate of saving to the requirements of the productive phase. No doubt, as prices rise, the income groups increase their respective fractions, g_i, by some positive increment, dg_i, and no doubt this involves a positive increment in basic monetary income. But also there is no doubt that as prices rise, the capacity of successive lower income groups to effect positive increments, dg_i, becomes more and more negligible; the fraction, g_i, cannot be greater than unity. Hence as prices rise, real saving is forced upon each lower group; on the other hand, as prices rise, the consequent increment in speculative profits and so of surplus income is far greater than any greater spending effected by the small numbers in the higher brackets.

The foregoing mechanism provides an automatic adjustment to an increasing rate of saving. However, its operation is conditioned. Unless the quantity of money in circulation expands as rapidly as prices rise and, as well, as rapidly as the productive expansion of quantities requires, there will result a contraction of the process: then, instead of adjusting the rate of saving to the requirements of the productive cycle, the productive cycle is arrested to find adjustment to the rate of saving. Again, unless the increment in total monetary income goes to the higher income brackets and so to surplus income, there will be no adjustment of the rate of saving: the monetary income of the lower groups increases as rapidly as the purchasing power of monetary income contracts; no real saving is forced; and, ex hypothesi, there is no anti-egalitarian shift in the distribution of income. It follows that basic income continues to be excessive and so the basic price level continues to rise indefinitely.

These two types of failure of the automatic mechanism are interrelated. Banks are willing to increase the quantity of money as long as there is no appearance of uncontrolled inflation, but they curtail and even contract loans as soon as an upward spiral of prices menaces the monetary system. Thus, the root of the failure of the mechanism is the failure to obtain the anti-egalitarian shift in the distribution of income. In any first instance, rising prices effect that shift. But the trouble is that in every second instance organized labour can point to the rising prices as palpable proof of the rising cost of living and further can point to increased profits as proof of industry's capacity to pay higher monetary wage rates. Every delay in granting wage increases is of general advantage. On the other hand, every grant of such increases may indeed shift the burden of forced saving from industrial to other lower income groups but certainly causes prices to spiral upwards and so hastens the curtailment of credit.

So far we have been considering the adjustment of the rate of saving in a surplus expansion when that rate is increasing. There remains the opposite situation of the basic expansion when the rate of saving is decreasing. Then the problem that arises is that insufficient income is moving to the basic final market. There is at hand the same automatic mechanism as before. Prices fall. This fall has the double effect of increasing the purchasing power of income and bringing about an egalitarian shift in the distribution of monetary income. The increase in purchasing power is obvious. On the other hand, the egalitarian shift in the distribution of income is, in the main, a merely theoretical possibility. The fall of prices, unless quantities increase proportionately and with equal rapidity, brings about a great reduction in total rates of

payment. Receipts fall, outlay falls, income falls. The incidence of the fall of income is, in the first instance, upon the entrepreneurial class and so in the main it is a reduction of surplus income. Thus we have the same scissors action as before: purchasing power of income increases and the proportion of basic to surplus income increases; the rate of saving is adjusted to the rates of production as soon as the selling price level falls sufficiently. But just as there is an upward price spiral to blunt the edge of the mechanism when the rate of saving is increasing, so there is a downward spiral to have the same effect when the rate of saving should be decreasing. Falling prices tend to be regarding as a signal that expansion has proceeded too far, that contraction must now be the order of the day. Output is reduced; the income of lower brackets is reduced; the adjustment of the rate of saving fails to take place; prices fall further; the same misinterpretation arises and prices fall again. Eventually, however, the downward spiral achieves the desired effect; surplus income is reduced to the required proportion of total income; and then prices cease to fall.

An account of the crisis and slump will concern us later. The present point is a very simple point. Just as the surplus expansion is anti-egalitarian in tendency, postulating an increasing rate of saving, and attaining this effectively by increasing, in the main, the income of those who already spend as much as they care to on basic products, so the basic expansion is egalitarian in tendency; it postulates a continuously decreasing rate of saving, a continuously decreasing proportion of surplus income in total income; and it achieves this result effectively by increasing, in the main, the income of those who have the maximum latent demand for consumer goods and services.

Previously I have suggested a lack of adaptation in the free economies to the requirements of the pure cycle. What that lack is, can now be stated. It is an inability to distinguish between the significance of a relative and an absolute rise or fall of monetary prices. A relative rise or fall is, indeed, a signal for a relatively increased or reduced production. If the product, i, suffers a greater increment, positive or negative, in price than the product, j, then more or less of the product, i, than of the product, j, is being demanded. As prices are in themselves relative, in so far as they express demand, so also they must be interpreted relatively with regard to expansion and contraction. When both the prices of i and of j are falling, and i more than j, it may still be true that the production of both should be increasing, though with the production of j increasing more than the production of i. For the fall of prices may be general and absolute; as such it will result not from a change in demand but from a failure in income distribution to adjust the rate of saving to the phase of the productive process; to allow such a general maladjustment to convert a basic expansion into a slump is to cut short the expansive cycle of the productive process because one has confused real and relative prices with monetary and absolute prices. Inversely, the rising prices of the surplus expansion are not real and relative but only monetary and absolute rising prices; to allow them to stimulate production is to convert the surplus expansion into a boom. This, I believe, is the fundamental lack of adaptation to the productive cycle that our economies have to overcome. The problem, however, has many ramifications of which the most important is the relativity of the significance of profits. To this we now turn.

Traditional theory looked to shifting interest rates to provide the automatic adjustment between the productive process and the rate of saving. In brief, the argument was that the rate of interest was the price of money: the higher the rate of interest, the greater the incentive to save and, on the other hand, the less the incentive to borrow; inversely, the lower interest rates, the less the incentive to save and the greater the encouragement to borrowers; in between these positions, it should always be possible to assign some equilibrium rate of interest equating the supply of money with the demand for it. The difficulty with this theory is that it lumps together a number of quite different things and overlooks the order of magnitude of the fundamental problem. What the surplus expansion calls for is not simply more saving but a continuously increasing rate of saving: the problem is not that the rate of saving, G, has to be bigger in a surplus expansion but that it has to be becoming bigger and bigger all the time; dG is positive as long as $dQ''/Q'' - dQ'/Q'$ is positive. Hence if there is to be any relevance to increments in interest rates, one has to envisage not intermittent increments but rather a rate of increase of interest rates. Again, to speak of interest rates providing an incentive to saving is true enough as far as it goes; but it misses the magnitude of the problem which is to effect an anti-egalitarian shift in the distribution of income. To increase the rates of interest will effect some modification of instances of dg_i in favour of reduced basic income; but it would take enormous interest rates backed by all propaganda techniques at our disposal to effect the negative values of dg_i that are required interval after interval as the surplus expansion proceeds; what is needed is something in the order of "incentives to save" that is as rapid and as effec-

tive as the reduction of purchasing power by rising prices.

But not only does the concept of an equilibrium rate of interest miss the magnitude of the problem. It also involves an indiscriminate lumping together of quite different things. One cannot identify a reduction of basic income with an increase in the supply of money, for a reduction of basic income is only one source of such supply; moreover, it is neither the normal nor the principal source of such supply; normally, surplus final products are purchased with surplus income which is just as much a circular flow as the purchase of basic final products by basic income; principally the increase in the supply of money is due to the expansion of bank credit, which is necessary to provide the positive DS' and DS" needed interval after interval to enable the circuits to keep pace with the expanding productive process. In the concrete problem under examination there is an abundant supply of money for all purposes; the one difficulty is that the division of income into basic and surplus is not parallel to the division of productive activity into basic and surplus; a general operation upon the supply of money seems to be a rather roundabout and inept procedure to correct an error in distribution.

The ineptitude of the procedure arises not only from its inadequacy to effect a redistribution of income of the magnitude required but also from its effects upon the demand for money. Four types of such demand may be distinguished: demand for basic final products; demand for surplus final products; demand for maintaining or increasing the turnover magnitudes of units of enterprise; and demand for redistributional purposes. The effect of rising interest rates on consumer borrowing will

be excellent as far as it goes; for it cannot but reduce consumer borrowing; on the other hand, one may doubt if such reduction is very significant, for an inability to calculate is a normal condition of consumer borrowing, and rising interest rates hardly exert a great influence on people who cannot calculate. The effect of rising interest rates on the demand for surplus final products is great: one may say that the initiation of further long-term expansion is blocked; to increase the interest rate from 5% to 6% increases by 10% the annual charge upon a piece of capital equipment paid for over a period of twenty years. Thus rising interest rates end further initiation of long-term expansion; on the other hand, expansion already initiated, especially if notably advanced, will continue inasmuch as an increased burden of future costs is preferred to the net loss of deserting the new or the additional enterprise. The effect of rising interest rates on turnover magnitudes depends upon the turnover frequency of the enterprise. If the frequency is once every two years, 1% increase in the rate of interest is a 2% increase in costs; if the frequency is once every month, 1% increase in the rate of interest is 1/12 of 1% increase in costs. Effects of the latter order are negligible when prices are rising. Indeed, then, even a 2% increase might be disregarded; but the combination of the 2% increase in costs with the uncertainty of what prices will be in two years' time is a rather powerful deterrent. The effect on turnover magnitudes, accordingly, is great when the frequency of the turnover is low but negligible when the frequency is high. Finally, as to the effect on redistributional borrowing, there are a variety of complications: gamblers on the stock market will continue to gamble; new flotations of stock will

be discouraged for the same reason as the purchase of surplus products; the international position of the country will be affected, a point from which the argument has prescinded so far and which can be considered only later.

However, the following conclusions seem justified. When the rate of saving is insufficient, increasing interest rates effect an adjustment. This adjustment is not an adjustment of the rate of saving to the productive process but of the productive process to the rate of saving: for small increments in interest rates tend to eliminate all long-term elements in the expansion; and such small increments necessarily precede the preposterously large increments needed to effect the required negative values of dg_i. Finally, the adjustment is delayed and it does not deserve the name of adjustment. It is delayed because the influence on increasing interest rates on short-term enterprise is small. It does not deserve the name adjustment because its effect is not to keep the rate of saving and the productive process in harmony as the expansion continues but simply to end the expansion by eliminating its long-term elements.

14. The Cycle of Pure Surplus Income. A condition of circuit acceleration was seen in section 9 to include the keeping step of basic outlay, basic income, and basic expenditure, and on the other hand the keeping step of surplus outlay, surplus income, and surplus expenditure. Any of these rates may begin to vary independently of the others and adjustment of the others may lag. But any systematic divergence brings automatic correctives to work. The concomitance of outlay and expenditure follows from the inter-action of supply and demand. The concomitance of income with outlay and expenditure is identical with the adjustment of the rate of saving with the requirements of the productive process. It follows that one may legitimately project a division of expenditure into a division of income, and it is in this manner that we arrive at the concept of a pure surplus income.

Pure surplus income may be defined, for present purposes, as a fraction of total surplus income. This fraction will be denoted by the symbol, H, where H is the fraction of surplus expenditure that goes to new fixed investment. All surplus final expenditure may be termed a "fixed investment" to distinguish it from the outlay of units of enterprise and their transitional payments which may be called "liquid investment." Further, fixed investment may be divided into the purchase at the surplus final markets of replacements and of maintenance and, on the other hand, new fixed investment. Thus, in each interval the rate of surplus expenditure, DE", consists of two parts: one part, (1 - H)DE", goes to the replacement and maintenance of old fixed investment; the other part, H.DE", goes to new fixed investment.

Now, when DI" is keeping pace with DE", so that DD" is zero, one may make a parallel distinction in surplus income, naming (1 - H)DI" as ordinary surplus income and H.DI" as pure surplus income. This pure surplus income is quite an interesting object. When H is greater than zero, it is a rate of income over and above all current requirements for standard of living, since that is provided by DI', and as well over and above all real maintenance and replacement expenditure, since that is provided by (1 - H)DI". Thus, one may identify pure surplus income as the aggregate rate of return upon capital investment: entrepreneurs consider that they are having tolerable success when they are not merely "making a living", no matter how high their standard of living, and not merely obtaining sufficient receipts to purchase all the equipment necessary to overcome obsolescence, but also receiving an additional sum of income which is profit in their strong sense of the term. An aggregate profit in that sense is precisely what we have found pure surplus income to be. Further, unlike other income, pure surplus income need not be spent currently without effecting a reduction of total income; it is possible to divert pure surplus from the circuits to the redistributional function without causing a negative DD" because in the redistributional function there is an organization of promoters, underwriters, brokers, and investors who there mobilize sums of money and move them along DD" from the redistributional function to the surplus demand function where they are spent as new fixed investment. Thus, it is pure surplus income, as a concrete fact, which has given rise to and has sustained the ideal of the "successful man" in our culture. For the "successful man" is a man who, of course, enjoys a very high standard of living but who measures his success in quite other terms, namely, in

the industrial power of ownership which he wields, in the financial power of possession of large blocks of readily negotiable securities, and in the social prestige that may be buttressed by the purchase of the most conspicuous products of human art and ingenuity in the past history of man. For there to be successful men of this type and for them to attain their success through industry and commerce, it must be possible to derive from the circuits a rate of income that can be moved, without conflicting with circuit requirements, from the circuits to the redistributional function where alone industrial stocks, negotiable securities, and the products of the process in the remote past are now on sale.

Enough, perhaps, has been said to show that pure surplus income is at the nerve centre of free economies. We have now to advert to the fact that it is subject to cyclic variation in the long-term acceleration of the productive process. The symbol, H, in the product, H.DI", has already been met. It is the measure of the long-term acceleration potential of the surplus stage of the productive process. The higher the rate of new fixed investment, the greater the rate at which long-term acceleration of the process is proceeding and, as well, the greater the rate of pure surplus income. But the long-term acceleration of the process involves a cycle and this cycle cannot but effect the rate of pure surplus income. To this we direct attention.

Let the symbol, F, denote the ratio of pure surplus income to total income, so that

$$F = H.DI''/(DI' + DI'') \qquad (41)$$

whence by equation (38)

$$F = GH \qquad (42)$$

On assuming a smooth trend and differentiating, one finds as a condition for a maximum of F that

$$0 = H.dG + G.dH \qquad (43)$$

As long as the right-hand side of this equation is positive, the ratio, F, is increasing; when it becomes negative, F begins to decrease.

Now the ratio, G, is at its maximum ($dG = 0$), when the process turns over from a surplus to a basic expansion: throughout the surplus expansion, G increases; throughout the basic expansion, G decreases. On the other hand, the maximum of H depends upon two somewhat independent factors: (H increases as long as Q" increases) H begins to decrease either because Q" begins to decrease or because the rate of replacement requirements begins to rise. On the assumption of the pure cycle, Q" does not decrease but reaches a maximum and then levels off into a straight line parallel to the time axis; in that case, the maximum of H arises subsequently to the maximum of G when, during the basic expansion, the rate of replacements begins to rise or, if Q" is still increasing, when the rate of replacements begins to increase more rapidly than Q". If, however, the surplus expansion was over-ambitious and expanded the surplus stage of the process excessively, then Q" is bound to fall sharply at some time or other. This will occur prior to the ordinary maximum of H to bring about a premature maximum of that ratio. It may occur after the maximum of G to make the maximum of F not a smooth turning point but a sharp break and fall. It may occur earlier, bringing G to a premature maximum and suddenly changing F from a rate of rapid increase to a rate of still more rapid decrease. Thus, in general, there are three types

of maxima for F. There is the ideal maximum when the turn is due to replacements absorbing the capacity of the surplus stage for effecting an acceleration of the process. There is the slightly premature maximum when the turn is due to an over-expansion of the surplus stage but occurs after the maximum of G when the rate of increase of F is already small. There is the extremely premature maximum of F when the turn is due to a great over-expansion and occurs when the rate of increase of F is still great; in this case the maxima of F, G, and H coincide. By over-expansion is meant simply the fact that the surplus rate of production, Q", falls.

To visualize this cycle, let us say that f_i is the pure surplus income per interval received by the unit of enterprise, i, and that o_i is the outlay per interval of the same unit of enterprise. Then

$$F = GH = \sum f_i / \sum o_i = f_i/o_i \qquad (44)$$

Here, $\sum f_i$ is identical with H.DI" and $\sum o_i$ is identical with (DO' + DO"). On the other hand, f_i/o_i may be taken as simply a representative ratio of pure surplus to total outlay among units of enterprise. In any given unit of enterprise, according to its advantages or disadvantages, the particular ratio, f_j/o_j, will be greater or less than the average, f_i/o_i.

Now in the proportionate expansion at the beginning of the pure cycle, the ratio, G, is constant: proportionately, the surplus stage is increasing as rapidly as the basic. However, the fraction, H, will be increasing, for the surplus stage is then increasing its potential for long-term acceleration. It follows that the ratio, F, and the average, f_i/o_i, are increasing as H increases. Further, since both basic and surplus stages are accelerating, $\sum o_i$ is increasing; and so the absolute quantity of pure

surplus, $\sum f_i$, is increasing as the product of two increasing factors, namely, H and $\sum o_i$. In so far as prosperity is measured in terms of pure surplus income, prosperity has begun.

The proportionate expansion is based on the capacity of the process for short-term acceleration. If a great long-term acceleration develops, that is, a transformation of the capital equipment of the surplus stage, then dQ'/Q' will lag behind dQ''/Q'' and a surplus expansion will result. Then both G and H are increasing. The ratio, F, and the average, f_i/o_i, will be increasing as the product of two increasing factors, namely, both G and H. The absolute quantity of pure surplus income, $\sum f_i$, will be increasing as the product of three increasing factors, namely, G, H, and $\sum o_i$. The rewards of entrepreneurial initiative are munificient.

It is to be observed that this phase has no necessary implication of an inflationary rise in prices. That occurrence is conditioned by the failure of the rate of saving to keep increasing rapidly enough. If the pure surplus is captured by the higher income brackets alone, the anti-egalitarian shift in the distribution of income is being achieved. If not, saving is insufficient; prices rise; total income increases; and this increment, at least in the first instance when it appears as a broader price spread, will go to the higher income brackets to combine an anti-egalitarian shift with a reduced purchasing power which pinches the lower income groups.

However, the surplus expansion is only an acceleration lag. The greater it is and the longer it lasts, the greater the potential for basic expansion that is created. Obviously, it is not created and then left unused. It is put to work as rapidly as possible, and so the basic stage accelerates at an ever greater pace while the surplus stage begins

to realize that it has acquired as great a potential as possibly can be used. There results the basic expansion with the basic stage accelerating, proportionately, more rapidly than the surplus. G has passed its maximum.

In the early part of the basic expansion, F is still increasing though at a reduced rate; for the rate of decrease of G is cutting against the rate of increase of H which now may be less rapid. It follows that the average, f_i/o_i, is also increasing still. On the other hand, the absolute sum of pure surplus, $\sum f_i$, is increasing as the product of two increasing factors, namely, F and $\sum o_i$. On the supposition of a pure cycle, in which Q" does not decrease, the maximum of F is intermediate between the maximum of G and the maximum of H. It is a smooth turn that decreases pure surplus not by diminishing receipts but by changing the function of surplus income from being the "money to invest" of pure surplus to the mere replacement income that has to be spent on overcoming mounting obsolescence. However, while the ratio, F, and the average, f_i/o_i, decrease after the smooth maximum of F, the absolute quantity of pure surplus income continues to increase up to the maximum of H, which, ex hypothesi, is later. Thus, two periods are to be distinguished subsequent to the maximum of F. A first period in which average pure surplus is decreasing though aggregate pure surplus continues to increase; and a second period in which both average and aggregate pure surplus income are decreasing. In the second of these periods the ratio, F, and the average, f_i/o_i, are decreasing as the product of two decreasing factors, namely, G and H; if $\sum o_i$ is still increasing, $\sum f_i$ will be decreasing at a slower rate; but in any case F, H, and $\sum f_i$ are reverting to zero which they reach as dQ', following dQ", reaches zero.

The foregoing is an outline of perfect adaptation to the pure cycle of the expanding productive process. However, the actual course of events is governed by the actual lack of adaptation to the pure cycle. This lack of adaptation is multiple and so we treat successively and as distinct though conjoined phenomena the long, drawn-out depression and the short, violent crisis.

At the root of the depression lies a misinterpretation of the significance of pure surplus income. In fact, it is the monetary equivalent of the new fixed investment of an expansion: just as the production of new fixed investment is over-and-above all current consumption and replacement products, so pure surplus income is over and above all current consumption and replacement income; just as the products of new fixed investment emerge in cyclic fashion, so also does pure surplus income emerge in cyclic fashion. It is mounting from zero at a moderate pace in the proportionate expansion; it is mounting at an enormous pace in the surplus expansion; but in the basic expansion first, average, and then, aggregate pure surplus begin to decline and eventually they have reverted to zero. Now it is true that our culture cannot be accused of mistaken ideas on pure surplus income as it has been defined in this essay; for on that precise topic it has no ideas whatever. However, the phenomena here referred to by the term, pure surplus income, are not, as is the term, a creation of our own. The phenomena are well known. Entrepreneurs are quite aware that there are times of prosperity in which even a fool can make a profit and other mysterious times in which the brilliant and the prudent may be driven to the wall. Entrepreneurs are quite aware of the ideal of the successful man, a man whose success is measured not by a high emergent

standard of living nor by the up-to-date efficiency of some industrial or commercial unit but by increasing industrial, financial, and social power and prestige. In the old days when the entrepreneur was also owner and manager, pure surplus income roughly coincided with what was termed profit. Today, with increasing specialization of function, pure surplus income is distributed in a variety of ways: it enters into very high salaries of general managers and top-flight executives, into the combined fees of directors when together these reach a high figure, into the undistributed profits of industry, into the secret reserves of banks, into the accumulated royalties, rents, interest receipts, fees, or dividends of anyone who receives a higher income than he intends to spend at the basic final market. For pure surplus income, as distributed, is the remainder of income that is not spent at the basic final market either directly by its recipient or equivalently through the action of others spending more than they earn. Thus, pure surplus income may be indentified best of all by calling it net aggregate savings and viewing them as functionally related to the rate of new fixed investment.

The consequence is that net aggregate savings vary with new fixed investment, and the complaint is that there exists, in the mentality of our culture, no ideas, and in the procedures of our economies, no mechanisms, directed to smoothly and equitably bringing about the reversal of net aggregate savings to zero as the basic expansion proceeds. Just as there is an anti-egalitarian shift to the surplus expansion, so also there is an egalitarian shift in the distribution of income in the basic expansion. But while we can effect the anti-egalitarian shift with some measure of success, in fact the egalitarian shift is achieved only through the contractions, the liquidations, the blind stresses and strains

of a prolonged depression. Once F has passed its maximum, the average ratio of pure surplus to the outlay of an entrepreneurial unit, f_i/o_i, has to decrease. Once H has passed its maximum the aggregate of pure surplus, $\sum f_i$, has to decrease. There is operative a general "squeeze". There is no mechanism for providing adaptation to this "squeeze". There follows chaos.

In the first place there are a number of sources of pure surplus income, as distributed, that are relatively invulnerable. Individuals may hold fixed claims of income against industrial or commercial units. In any particular case these fixed claims, whether against one or against a number of units, may amount to a claim to surplus income. The obvious instance is had in interest-bearing bonds. But there exists a series of more or less analogous instances of pure surplus income in the form of fees or of salaries and the less these instances are directly derived from industry, commerce, or financial services, the less they can be controlled by their real though remote sources. The significance of such relative invulnerability is that such instances of pure surplus income are the last to feel the "squeeze", and, what is more important, that the pressure of the "squeeze" is all the stronger and more relentless on other instances.

Beside this first degree of invulnerability there is a second. The same reasons that enabled some units of enterprise to recapture more than an average share of pure surplus income during the surplus expansion, now will enable them to resist a proportionately more than average reduction of their share of pure surplus. Thus the "squeeze" is operative most of all upon the firms that have a less than average share of pure surplus. As it proceeds, it will eliminate not merely any pure surplus

they receive but as well their replacement income and part of their basic income. Such relative invulnerability brings the circuits to a distorted quasi-equilibrium in which an artificial rate of pure surplus income is sustained by a rate of losses. Individuals continue to receive more income than they spend at the basic or at the surplus final markets. There is no compensating rate of new fixed investment to offset this drain. There results a negative value of DD", but the "squeeze" gives positive values of DS" and particularly DS' as embarrassed entrepreneurs undergo a continuous and equal stream of losses. In this fashion, the required reduction of the rate of savings is effected by creating losses to supply the invulnerable rate of savings. From a different view-point one may say that the outlay of some firms exceeds their receipts to enable the outlay of other firms to contain an artificial pure surplus income. But however the matter is expressed, the rate of losses has to equal the emergence of more pure surplus income than the process in the given interval is generating; and, if at any time, the rate of losses proves insufficient, the familiar mechanism of falling prices, decreased total income, and increased purchasing power comes into play either to decrease the rate of savings or to increase the rate of losses.

Evidently, the systematic requirement of a rate of losses will result in a series of contractions and liquidations. Any particular firm may succeed in strengthening its position. But that only transfers the incidence of the squeeze elsewhere. Any number of firms may go bankrupt and be liquidated. But until the position of the strong

is undermined by the general and prolonged contracting, the requirement for the rate of losses continues and with it the depression.

It is quite true that, were a long-term acceleration to get under way, the situation would be remedied, for sooner or later the weaker firms would begin to obtain sufficient receipts to make ends meet. But the difficulty is that a long-term acceleration has been under way quite recently, that it was approaching completion in the surplus stage of the process, and that it was at least partially completed in the basic stage. Further acceleration of the process, from the nature of the development attained, would be a basic expansion, and it would have to be a short-term basic expansion before it could develop into a long-term basic expansion; things have to be going fairly well before a general movement to transform capital equipment can be initiated. Now, whenever the basic stage accelerates more rapidly than the surplus stage, the rate of savings has to decrease continuously. But in the depression there is already an excessive rate of savings, and only a distorted equilibrium is had through the simultaneous existence of a rate of losses. Further decrease in the required rate of savings only intensifies the problem; spontaneously it will work out through the mechanism of falling prices and contracting total income; that under current inadaptation an expansion could be expected against such difficulties is evidently preposterous. On the other hand, increasing contraction and liquidation tends to reduce the requirement for a rate of losses: with the surplus stage already operating at a minimum, any further reduction of the basic stage means that a zero dQ''/Q'' is greater than a negative dQ'/Q'; this postulates an in-

creasing rate of savings and, under the circumstances, this increase of required savings (since actual savings already are too great) is a reduction of losses. Thus, the greater the contraction, the less the rate of losses required; again, the greater the contraction, the weaker the position of the initially invulnerable; in the limit the rate of losses will disappear and a distorted equilibrium give place to a true equilibrium. Meanwhile, obsolescence will have mounted and so as orders for replacements begin to increase they will be accompanied by surplus purchases that are new fixed investment; H begins to increase, and the proportionate expansion of the revival is under way.

Later we shall consider the effect of a favourable balance of foreign trade or of deficit government spending in mitigating the depression's requirement for a rate of losses. The present point, however, should be repeated. It is that in the later stages of a long-term acceleration, even if there is no crisis or general break-down, there is required a continuously decreasing rate of net aggregate savings so that, at the end of the expansion and until a new expansion gets under way, net aggregate savings or pure surplus income have to be zero. The phenomena of our depressions can be explained by our lack of any mechanism that will reduce net aggregate savings smoothly and equitably. There results a distorted equilibrium conditioned by a rate of losses. This rate of losses forces the series of contractions and liquidations that characterize the depression. Further, under such circumstances, it is vain to expect a solution or remedy by the emergence of a new cycle of expansion; that might be expected if an extremely premature

crisis arose but not if the process gets into difficulties after the surplus expansion has largely been completed; in the latter case, supposing current adaptation, it is only the prolonged contraction undermining the position of the strong and reducing the requirement for an impossibly low rate of net aggregate savings that end the depression. Even after the distorted equilibrium through a rate of losses has been eliminated, it is impossible for the expansion to begin if the real situation is such as to favour a basic expansion; for that would only renew the old difficulties. But with the passage of time obsolescence will become great enough to make the situation favour a surplus expansion, a great long-term acceleration; then the trade cycle recommences.

It will be convenient to reserve to the next section an account of the more violent phenomena of the crisis.

15. The Cycle of the Aggregate Basic Price Spread. There is a sense in which one may speak of the fraction of basic outlay that moves to basic income as the "costs" of basic production. It is true that that sense is not at all an accountant's sense of "costs": for it would include among costs the standard of living of those who receive dividends but not the element of pure surplus in the salaries of managers; worse, it would not include replacement costs, nor the part of maintenance that is purchased at the surplus final market, nor the accumulation for sinking funds which is a part of pure surplus income. But however remote from the accountant's meaning of the term, costs, it remains that there is an aggregate and functional sense in which the fraction of basic outlay moving to basic income is an index of costs. For the greater the fraction that basic income is of total income (or total outlay), the less the remainder which constitutes the aggregate possibility of profit. But what limits profit may be termed cost. Hence we propose in the present section to speak of $(1 - G')D0'$, and as well of $G''DO''$, as costs of production, having warned the reader that the costs in question are aggretate and functional costs in a sense analogous to that in which forced savings are savings.

In any given interval, the rates of outlay, $D0'$ and DO'', are functions, not of the indices of quantities sold at the final markets, Q' and Q'', but of these indices corrected by the acceleration factors, a' and a''. Thus, when the productive process is expanding or contracting, $D0'$ is some price level index multiplied by $a'Q'$, and DO'' is some price level index multiplied by $a''Q''$. In expansions a' and a'' are greater

than unity, since current production is for future greater sales; in contractions a' and a" are less than unity since then current production is for future reduced sales. Let us now introduce two cost price indices, p' and p", which are defined by the equations,

$$(1 - G')DO' = p'a'Q' \tag{45}$$

$$G"DO" = p"a"Q" \tag{46}$$

whence by equation (3)

$$DI' = p'a'Q' + p"a"Q" \tag{47}$$

Now, when DD' satisfies general conditions of circuit acceleration by being zero, so that DE' equals DI', then since DE' equals P'Q' one may write

$$P'Q' = p'a'Q' + p"a"Q" \tag{48}$$

Dividing through by p'Q' one may write

$$J = P'/p' = a' + a"R \tag{49}$$

where J is the basic price spread ratio, being the selling price index, P', divided by the cost price index, p', and R is the ratio of surplus to basic activity indicated by the fraction, p"Q"/p'Q'. It follows that the basic price spread ratio, J, is the sum of the basic acceleration factor, a', and of the product of the surplus acceleration factor, a", with the surplus-to-basic ratio, R.

Variations in R involve no new elements. At a first estimate R will be increasing during the surplus expansion when Q"/Q' is increasing, but decreasing during the basic expansion when Q"/Q' is decreasing. Taking into account the further quotient, p"/p', one would expect it to be constant, inasmuch as cost prices in basic and surplus units have the same general determinants; and inasmuch as there arose any divergence between p" and p', one would expect it to reinforce our initial estimate; p"/p' would increase, if anything, in the surplus expansion, but would decrease, if anything, in the basic expansion.

The influence of R on the aggregate basic price spread is obvious. The greater the fraction of total basic income that is derived from surplus outlay, the less the fraction of total basic income that is derived from basic outlay. But total basic income becomes basic expenditure and basic receipts. And the source of basic price spread is the difference between basic receipts and the fraction of basic outlay going to basic income. A very rough illustration may be had if we identify basic income with aggregate wages and aggregate wages with costs of all production and, as well, with the receipts of basic sales. Then the greater surplus activity, the greater surplus aggregate wages, the smaller the fraction of total wages paid by basic producers, the smaller the fraction of total costs paid by basic producers, the smaller the fraction of basic receipts required to meet basic costs.

The influence of the acceleration factors is also easily understood. The greater current production relative to current final sales, then the greater the price spread provided that all current income is spent for the relatively smaller quantity that is finished and now on

sale. The exact behaviour of the acceleration factors, however, introduces a new element for our consideration. Introducing the symbol, q', as identical with a'Q', and differentiating the consequently identity, one obtains,

$$da' = a'(dq'/q' - dQ'/Q') \qquad (50)$$

and by changing (') to (") one has the parallel equation for da". Hence, for the acceleration factor, a', to be increasing, it is necessary for da' to be positive and so for (dq'/q' - dQ'/Q') to be positive*. This means that the acceleration factor can be positive only when the rate of current production of basic quantities is increasing more rapidly in proportion to its size than the rate of current sales of basic quantities is increasing in proportion to its size. Thus, if one supposes that q' moves ahead of Q', the acceleration factor moves above unity; but as soon as the quantities under production reach the final market, Q' accelerates; if then, q' is accelerating at the higher rate proportionate to its greater size, a' will be at a maximum and remain constant as long as the acceleration of q" increases with a'; but as soon as the acceleration of q' ceases to mount ever more rapidly, a' begins to fall. The same holds for the surplus acceleration factor, a". Evidently, the acceleration factors are magnificently unstable. The initial lag of quantities sold behind quantities produced enables them to rise above unity. But merely to keep them constant once quantitiessold begin to mount means that quantities under production have to increase in a

* N.B. Q', q' and a' are always positive.

geometrical progression for the rest of the expansion. Any failure to maintain this brilliant pace means that the acceleration factors, and so the basic price spread, drop.

Now in any expansion it is inevitable that quantities under production run ahead of quantities sold. Current production is with reference to future sales and, if there is an expansion, then future sales are going to be greater than current sales. But in the free economies the acceleration factors are not held down to the minimum that results from this consideration. During the surplus expansion the basic price spread ratio, J, will increase from an increase of R, of a", and also of a'. The advance of the price spread ratio will work out through a rise of basic price level and selling prices generally will mount. Now when prices are rising and due to rise further, the thing to be done is to buy now when prices are low and sell later when they are high. There results a large amount of speculative liquid investment. Each producer orders more materials, more semi-finished goods, more finished goods, than he would otherwise. Moreover, he makes this speculative addition to a future demand estimated upon current orders received, so that the further back in the production series any producer is, the greater the speculative element contained in the objective evidence of current orders received, the more rosy the estimate of future demand, and the greater the speculative element he adds to this estimate when he places orders with a producer still further back in the series.

Thus, an initial rise in prices sets going a speculative expansion that makes the acceleration factors quite notable, expands the price

spread still more, and stimulates a pace of further acceleration that it will be quite impossible to maintain. Differentiating equation (49) one has

$$dJ = da' + Rda'' + a''dR \qquad (51)$$

Here the cyclic factors are R and dR: in the surplus expansion R is increasing and dR is positive; in the basic expansion R is decreasing and dR is negative. R is a fractional quantity and dR the increment of a fraction. On the other hand, as long as expansion continues, the surplus acceleration factor, a", will be greater than unity. Upon this background enters the performance of da' and da", with the former preponderant since the coefficient of da" is the fraction, R.

Now during initial proportionate expansion dR will be zero, but da' and da" will be positive for a while as a short-term acceleration develops. At least in the basic stage it will prove impossible to maintain a generalized rate of expansion in a geometrical progression, so that da' will become negative. The event will probably take place when the surplus acceleration factor, a", has reached a high level rate so that da" is zero. It follows that dJ becomes negative with da' and in this dJ will be all the more negative if there is any faltering in the surplus stage to give a negative da" as well. Thus, the price spread ratio, J, contracts; the basic price level falls; speculators are disillusioned. There is a minor crisis: first, speculative assets are frozen as every one wishes to sell before prices fall further and no one wishes to buy until they fall further; then there is a period of liquidation as liquid assets are sold for whatever price they will fetch. The gravity of this first crisis will depend exclusively upon

the magnitude of the speculative development, the solvency of speculators, and their ability to weather the storm without liquidating their stocks. Whether it is a squall or a tempest, the underlying long-term development soon sets things right. For as the surplus stage generalizes long-term acceleration, R increases and dR becomes positive to expand again the price spread and to keep it expanding. As this proceeds, there develops another speculative boom. The surplus acceleration factor, a^{II}, mounts and remains constant at its maximum; the basic acceleration factor mounts and then contracts; previous phenomena are repeated with the difference that the negative da' is mitigated by a positive dR, and that throughout this crisis there is at work a positive dR to bring things back to an even keel. When the rate of expansion is restored, the basic stage will move into a general long-term acceleration; for a while yet dR will remain positive and a third speculative boom develops. This boom suffers no restructions from a limited potential for short-term acceleration, since both stages are now expanding in long-term style. Both acceleration factors can mount to that maxima and remain at the summits with da' and da" both zero. Further variations of the price spread thus depend exclusively upon dR, and this becomes negative as the surplus expansion gives place to a basic expansion. When then prices begin to fall to effect the continual reduction of the price spread, there follows sooner or later the real and final crash. Speculative embarrassment makes both da' and da" negative to augment the rate of contraction of the price spread and intensify the embarrassment. Assets are frozen and then

liquidated in a great drop of prices. Worse, there is no recovery; for the remainder of the cycle should be a basic expansion which our ill-adapted economies transform into a depression.

It may be noted that the triple crisis per cycle may perhaps correspond to Prof. Schumpeter's combination of three small cycles named Kitchens in one larger cycle named a Juglar which has a ten-year period. The pattern of six Juglars in one sixty-year Kondratieff would seem to result from the quasi-logical connection between successive long-term accelerations. A fundamental transformation of the capital equipment of an economy needs preparatory long-term accelerations that open the way for it; and once the fundamental transformation is achieved, there are other subsidiary transformations that for the first time become concrete possibilities. Such a time series has more affinities with a philosophic theory of history than the merely mechanical structures that we have been examining. A theory of the Kondratieff is in terms of the precise nature of the fundamental transformation, e.g. railroads, but the theory of the Juglar and Kitchen that has been developed here depends solely upon the structure of the productive process and the measure of human adaptation to the requirements of an acceleration in that structure.

It is to be recalled that the account given of the cycle of the basic price spread ratio supposes DD' to be zero throughout. A speculative boom in the stock market which encourages basic spending may be represented by a positive DD': there is an excess release of money from the redistributional function to the basic demand function. Alternatively, it may be represented by an upward revision of the fractions, g_i, of total current income going to basic demand, while the

fact that the surplus final market suffers no contraction then results from the excess of the rate of new fixed investment over the rate of pure surplus income, so that DD" is positive. In either case, a movement of this type with its basis in redistributional optimism will offset any tendency towards a contraction of the price spread and will reinforce any tendency of the price spread to expand. On the other hand, the subsequent stock market break intensifies the crisis of the circuits, removing the props that had hitherto swollen expansive tendencies, and leaving the system with a greater height from which to fall.

16. Superposed Circuits. There are sets of phenomena, notably the favourable and unfavourable balances of foreign trade, deficit government spending and the payment of public debts by taxation, that are analogous to the phenomena of the cycle. It is proposed to deal with them under the general title of "superposed circuits". In our general account of the monetary circulation, two circuits, a basic and a surplus, were distinguished. They were inter-connected with a cross-over. But they involved no regular flow through the redistributive function; that function stood, as it were, outside the circuits, a source of more money for expansions and a refuge for money during contractions, but not a regular stop in the circulation of money as far as the productive process was concerned.

There is, however, no impossibility of the redistributive function becoming a point through which a circuit regularly passes. On the other hand, such a circuit both presupposes and is distinct from the basic and surplus circuits already considered. Hence, the name of superposed circuits, and also the mode of treatment. For any superposed circuit may be represented by rates of payment, DZ' and DZ", per interval added to variables of the circulation diagramme as follows:

1) $DD' + DZ' \quad -- \quad DD'' + DZ''$

2) $DE' + DZ' \quad -- \quad DE'' + DZ''$

3) $G'DO' + DZ' \quad -- \quad (1 - G'')DO'' + DZ''$

4) $DD'' - DZ' - DZ''$

The foregoing additions and, in the last case, subtractions are supposed to be made to or from the other rates, DD', DD", DE', DE", etc., as they are determined generally. No doubt the additions or subtractions modify these rates, reinforce or counter-act the tendencies of whatever phase may be in progress. Our purpose in representing them as above is not at all to deny such inter-action but rather to gain a view-point from which such inter-action may be studied. The view-point adopted is that of the circuit: the circular route of DZ' and DZ" is a different route from that of basic or surplus expenditure, outlay, or income; there exists a partial coincidence, but its significance varies with the nature of the superposed circuit; and there is never a total coincidence since the redistributive function is a regular port of call in the superposed circuit.

In any given interval DZ' is the same value no matter whether it is added to DD' or DE' or G'DO' or subtracted from DD". Further, the addition or subtraction always occurs in each of the four cases. These two conditions are necessary to have a circular movement of a sum of money, DZ', per interval. The same holds for DZ". On the other hand, from one interval to another, the quantity represented by DZ', or by DZ", may vary. However, since our interest is to examine the superposed circuit in itself rather than the effect of its variations, in general it will be convenient to suppose that DZ' and DZ" are constant over a series of intervals. Finally, there never is any need of DZ' and DZ" being equal.

As represented by the list of additions to the circuit diagramme, a superposed circuit consists of the following eight movements per

interval: from the redistributive function DZ' to basic demand and DZ" to surplus demand; from basic demand DZ' to basic supply, and from surplus demand DZ" to surplus supply; from basic supply DZ' to surplus demand, and from surplus supply DZ" to surplus demand; from surplus demand DZ' and DZ" to the redistributive function. In any given interval either DZ' or DZ" may be zero; but if both are zero, there is no superposed circuit.

In studying the superposed circuits one may begin at any function to move in either direction. One may begin anywhere because the total movement is circular. One may move in either direction, for one may ask where the money goes or where it is coming from. Finally, one may regard the eight movements as simultaneous: they all occur within the same interval; the condition of a circulation is satisfied if they occur within the interval; and the condition of a circulation is the one condition required. In fact, a certain amount of short-term financing will be required to enable some function to pay before it receives its DZ' or its DZ" either in whole or in part; or else the superposed circuit will be a circuit in virtue of a lag; but such minor phenomena need not be discussed in the general inquiry.

17. The Balance of Foreign Trade. There is an evident analogy between the rate of new fixed investment and a favourable balance of foreign trade. In both cases the rates of current production exceed, within the given area, the sum of the rate of current consumption and of the rate of capital replacements and maintenance. In both cases there results accordingly a rate of pure surplus income which really is the new fixed investment or the excess export but has as well a monetary equivalent in the difference between total outlay, which is proportionate to total production, and total consumption and replacement income, which are proportionate to a fraction only of total production.

The interest of the free economies in a favourable balance of foreign trade has a very solid foundation. Prior to the full development of monetary techniques, an excess export of goods and services was balanced by an excess import of gold; this increased the quantity of money available in the economy; and this increase in the economy made possible an equal increase in the circuits. But the expansion of the circuits is, in large part, conditioned by the possibility of increasing the quantity of money available for the transactions of the circuits. Thus, a favourable balance of trade, balanced by a favourable balance of gold imports, was a means of satisfying a principal condition for economic expansion.

However, this monetary interest in a favourable balance of trade is far from the sole interest in it. The favourable balance adds an equal amount to the rate of pure surplus income; with pure surplus

income at the nerve centre of economies based more and more on the ideal of the "successful man", this addition to the rate of pure surplus was, while it lasted, an unmitigated blessing. It augmented the rate of pure surplus in surplus expansions. It offset the rate of losses in depressions, and it did this in two distinct ways: first it tended to cancel out any rate of losses that otherwise would appear; second it tended to prevent such an hypothetical appearance. The first point is obvious. The second follows from the fact that the rate of losses results from the economy's inability to reduce sufficiently the rate of net aggregate savings; but the need of bringing about such a reduction rests on the fact that basic quantities are increasing more rapidly than surplus; evidently, in the measure in which the production of increasing basic quantities may be replaced by the production of increasing quantities of goods and services for an increasing favourable foreign balance, in that measure the turn of the process towards basic expansion is eliminated; and there follows the elimination of a tendency towards decreasing savings with the consequent rate of losses.

The theoretical significance of the foregoing is considerable. It provides an explanation both of nineteenth century practice and of nineteenth century theory. The nineteenth century economy did not need, as we need, a rigorous adaptation to the pure cycle of the productive process because then the phenomena of the pure cycle could be covered over by the favourable balance of foreign trade. Further, under such circumstances a theorist would not have his attention directed to cycles as matters of scientific moment, for the very good reason that, since their phenomena were covered over in part, they would be

regarded naturally and spontaneously as incidental complexes of relatively arbitrary events. Accordingly, we turn to a more detailed consideration of the circuits involved in a favourable balance of foreign trade.

The assumption of the closed economy is now dropped. One supposes the existence of a number of economies, each with its redistributive function and its basic and surplus circuits. It will be convenient to assume that transactions between economies take place between their redistributive functions: thus goods and services leaving one economy for the benefit of another leave the one as redistributive goods or services and enter the other as redistributive goods or services; similarly, payments enter and leave by the redistributive function.

Consider, then, an economy that, over a series of intervals, has a favourable balance of foreign trade of $DZ' + DZ''$ per interval. Then in each interval it produces, over and above all domestic requirements, DZ' worth of basic goods and services and DZ'' worth of surplus goods and services. Exporters purchase these products by moving from the redistributive function to basic demand, DZ', and to surplus demand, DZ''; both sums are there spent to give $DE' + DZ'$ and $DE'' + DZ''$. The resultant receipts contain $DZ' + DZ''$ of surplus income, that is, of income that need be spent at neither final market; hence we have the movements $G'DO' + DZ'$ and $(1 - G'')DO'' + DZ''$ and then $DD'' - DZ' - DZ''$ as the surplus income is counted pure surplus and moved from surplus demand to the redistributive function. To close the circuit it is necessary to connect this movement of pure surplus income to the redistributive

function with the movement by exporters of an equal sum from the redistributive function to the final markets.

Such a connection can be operated in a variety of ways. The exporters receive from abroad either a gold import or a foreign debt or the cancellation of a domestic debt abroad. For such payment to be acceptable to the exporters, it must be negotiable on the domestic redistributive market. The general condition of negotiability is that the exporters by their subsequent use of the money they receive do not drain the redistributive function of its funds. This general condition is satisfied by the movement of the pure surplus income into the redistributive function at the same rate as exporters move money out of the redistributive function. Provided then there exist markets in short-term bills and long-term securities or for gold, and provided the pure surplus is spent on these markets, the general condition will be satisfied.

The international monetary phenomena are quite simple. In a first period payments are made in gold. The countries with the favourable balance are thus enabled to undertake expansions in virtue of their increased stocks of money. The countries with the unfavourable balance suffer equal contractions, until they discover the cause of the trouble. Then they practice the doctrine of mercantilism: foreign trade is controlled so that there is no unfavourable balance of trade. In the long run the only countries that will balance an excess import by the export of gold are either gold-producing countries or else backward economies in which there exist stocks of gold which can be dehoarded. In a second period there develops the practice of foreign

lending. Countries with unfavourable balances of trade have bills of exchange pile up against them in the exporting countries; these are liquidated by floating long-term foreign loans or, when an economy which previously enjoyed a favourable balance turns to an unfavourable balance, by selling domestically owned foreign securities.

Some of the domestic features of an economy enjoying a favourable balance have already been noted. The rate of excess export involves an equal rate of pure surplus income that augments the benefits of an expansion, provides a substitute for them when there is no expansion, counter-acts the tendency for a rate of losses in a basic expansion, and tends to eliminate basic expansions by directing into an increasing excess export what otherwise would have been an increasing rate of domestic consumption with consequently contracting savings. Thus, an economy operating with a favourable balance enjoys a cushioned domestic cycle. As far as the domestic cycle is concerned, it can proceed on the principles of increasing thrift and enterprise which are normative generally only in the surplus expansion. On the other hand, the favourable balance itself will be conditioned by the cycles in foreign economies. If the importing countries are sufficiently developed exchange economies to experience the cycle and if the volume of international trade is sufficiently large to effect a general synchronism of cycles, then so far from mitigating domestic cycles the effect of foreign trade will be to reinforce them tremendously. On the other hand, when the synchronism is lacking and still more when the importing countries are colonial economies with little domestic

commerce or industry, such reinforcement does not occur. The existence of the cushioning effect would seem established by the fact that in England basic wages rates did not begin to rise until 1870; that would suggest that previous basic expansions had been avoided successfully by diverting increased potential into an increased excess export. And to some extent, at least, the same fact confirms the advantage of conducting foreign trade with colonies and primitive countries.

The inverse phenomena to the favourable balance result from the unfavourable balance of foreign trade. Then either or both the emergent standard of living and the increment of capital equipment of the economy are in excess of its basic and surplus rates of production. In so far as the excess import does not enter domestic channels of industry and commerce, there is no superposed circuit: importers purchase and use or consume the excess import within the redistributive function. However, in that case they are not importers in the sense of a class of dealers; no large rate of import can be managed in that fashion, for large imports have to be sold on the regular final markets of the domestic economy. Let then the rate of the excess import sold on the domestic final markets be once more DZ' and DZ". Then domestic entrepreneurs direct part of their gross receipts, as though they were pure surplus income, to surplus demand and thence to the redistributive function. This gives elements 3) and 4), namely, G'DO' + DZ', (1 - G")DO" + DZ", and DD" - DZ' - DZ". Thus domestic entrepreneurs purchase the excess import from the importers in the redistributive function and transfer it to the stocks of the domestic basic and sur-

plus markets. There it is sold to the domestic public, to give DE' + DZ' and DE" +DZ". It is true that the domestic public will pay more than DZ' and DZ"; however, the difference will be the wages, rents, and interest due to domestic production factors; it will circulate in the ordinary fashion; and so we need not be concerned with it. On the other hand, the DZ' and DZ" ends up in the redistributive function where it pays the importers who pay the foreign sellers with gold, with the contraction of foreign debts, or with the sale of domestically owned foreign securities. The problem of the unfavourable balance is to close the circuit by moving to the domestic public the money the importers receive from domestic entrepreneurs and pay to domestic sellers of gold or securities. This involves the DD' + DZ' and the DD" + DZ".

The DD" + DZ" is analogous to the rate of new fixed investment in the domestic expansion. Domestic surplus demand is borrowing from the redistributive function at the rate DZ" per interval to purchase goods or services for the maintenance, replacement, or net increment of domestic capital equipment. But there is a grave difference. In the domestic expansion or in the purchase through borrowing (which may include borrowing from one's own holdings in the redistributive function) of domestically produced replacements, the rate of movement from the redistributive function to surplus demand is balanced by a rate of income moving from surplus demand to the redistributive function. But in the present case, the balancing movement is not a rate of income, for the goods sold were not produced domestically and so generate no income; the balancing rate is simply a rate of payment for the current supply

of the goods and services of the excess import. The consequence is that, if the excess import is replacement goods, then domestic industry does not pay its own way but has to borrow to the extent, DZ" per interval, to keep its capital equipment up to date. And if the excess import is an increment of existing capital yielding an acceleration of the process, then the economy conducts a long-term acceleration at the rate, DZ" of new capital equipment per interval, without enjoying any pure surplus income such as is enjoyed when the increment of equipment is domestically produced. Hence, the greater DZ" is relatively to DE", the greater the difficulty of investors contemplating the maintenance, replacement, or increment of capital equipment; for evidently if capital notably fails to support itself and yields only a mediocre flow of pure surplus income, investment is unattractive. Hence, just as the favourable balance of trade intensifies the joy of expansion, so the unfavourable balance dims that joy. With foreign debts mounting or foreign holdings decreasing, the economy with an unfavourable balance reacts very sluggishly indeed to opportunities for expansion. And while brilliant prospects of great developments in the future may overcome this sluggishness in a young country, the matter is quite different in an old country that once was a creditor but since has become a rentier to the world.

Even more intractable is the the other component of the movement from the redistributive function to demand, DD' + DZ'. The possibility of such a transference arises mainly in two cases; there is the case of oriental princes dehoarding gold to purchase occidental trumperies;

there is the case of the rentier class living on the interest or principal of foreign holdings. In either case money is moved at a rate, say DZ', from the redistributive function to basic demand. On the other hand, it is to be noted that rentier spending of interest on domestic industrial bonds, for instance, does not meet the requirements of the problem: such interest is a part of domestic income and must be spent interval by interval either in itself or equivalently by others spending more than they earn; hence it does not create the possibility of an additional movement from the redistributive function to basic demand.

Now evidently it may happen easily that the movement DD' + DZ' fails to occur either in whole or in part. The consequences of such a failure vary with the country's balance of foreign payments and with the phase in which the economy is moving. Let us first suppose that the unfavourable balance of trade is necessary for the balance of payments; we deal then with an economy that once was a creditor but since has become a rentier; opportunities for foreign lending no longer keep pace with the interest and dividends due to former loans made abroad, and so if there is to be payment by foreign economies, the payment now must be in goods and services. In such a situation the failure of DD' + DZ' may occur during a surplus expansion; then the required rate of savings tends to exceed the actual rate of savings, and so the failure is all to the good, for the excess import of basic products makes up for excessive monetary basic income. However, in so far as the excess import includes surplus goods and services, there are apt to be special difficulties in surplus expansion occurring, as was argued above; and so the problem of DD" + DZ" can make this happy solution of

the failure of DD' + DZ' somewhat rarer than might be anticipated.

Apart from the occurrence of a surplus expansion, the failure of DD' + DZ' generates the phenomena of a depression. More goods and services are moving to the basic final market than there is monetary income to pay for them at current prices. The situation is repeated in each successive interval, and so prices fall continuously. Further, as they fall aggregate outlay and income shrink, both from the contraction of the price index and from the consequent reduction of scales of operation; hence the DZ' becomes relatively more and more important. Now if prices are allowed to fall and the domestic economy to contract sufficiently, there comes a time when the excess import can no longer be sold on the domestic final market; it cannot compete with domestic prices and it cannot be demanded by domestic rates of income. This, however, not only is a painful operation upon the domestic economy but also it will force foreign debtors to repudiate their debts since they no longer have any possibility of paying them in goods and services. The alternative to such a doubly unpleasant decision is to force the recipients of interest and dividends on foreign holdings to spend their income on the basic final market. Since such recipients will be relatively few in number, they cannot undertake personally so great a rate of consumer expenditure. However, the depression has notably augmented the numbers of the unemployed, and so the brilliant expedient of a steep income tax on the rich to provide a dole for the poor will effect the required DD' + DZ'; the upper leisure class of rentiers is recruited from a lower leisure class of unemployed. Obviously an economy that has worked itself into this impasse is not to be regarded as a

model of enlightened legislation for other economies more fortunately placed; its "social security" and other programmes may or may not be defensible from the view-point of the difficulties they solve; but such a defence cannot be applied to mimic procedures in totally different situations.

So much for the unfavourable balance of trade that effects a balance of payments. When the unfavourable balance of trade means that a rate of foreign borrowing is needed to effect the balance of payments, phenomena are simpler inasmuch as the foreign borrowing can be ended by the introduction of sufficiently vigorous controls. The fact that Australia rationed the import of automobiles is suggestive. Modern ideas on "managed money", that is, of an expansion of credit in accordance with the needs of domestic industry and commerce, have to be complemented with the fear that the monetary expansion may stimulate the purchase of imported goods more than the industrial and commercial expansion stimulates the export trade. When such a fear proves grounded, there results an unfavourable balance; and the bold ideas on money, especially when put forward by confiscators of privateproperty, do little to reassure foreign lenders. With foreign lenders not forthcoming, the unfavourable balance of trade has to end, and if the "managed money" is to be maintained, it postulates a government control of imports and an orientation towards economic autarky. However, the issue before us is the movement from the redistributive function to the circuits that gives a $DD' + DZ'$ while the unfavourable balance of trade persists. In the situation of a bold monetary expansion stim-

ulating the purchase of imports, the movement from the redistributive function is to the supply and not to the demand function; it is a DS' + DZ' or a DS" + DZ' and not a DD' + DZ'. This movement initially finances an increment in entrepreneurial scales of operation, but instead of this increment being sold at the final markets, there is sold the excess import. The resultant contraction may be delayed, however, by a fuller boldness of monetary policy. As long as the increment in production is to be sold at surplus markets, it can be bought by borrowers, so that the problem of providing a DD'+ DZ' is being solved by providing both a DS" + DZ' and a DD" + DZ'; the former DZ' expands turnover magnitudes, becomes basic income, is spent for the excess import, and so moves back to the redistributive function; the latter DZ' purchases the increment in the rate of production and then circulates normally to maintain that increment. This is a case of surplus expansion not yielding pure surplus income: the DZ' that moves to the redistributive function is not income but payment for the excess import; and it is accompanied by an increase in debts of 2DZ' per interval, apart from the increase due to DZ". When however the domestic expansion puts goods on the basic final market, contraction results. The only escape is for these goods to be exported, and that will end the unfavourable balance of trade. Thus, it should seem that a debtor country can meet the requirement for a DD' + DZ only during an expansion of the surplus stage of its productive process, and only by paying for the excess basic import by increasing its long-term capital debt by DZ' per interval.

18. Deficit Spending and Taxes. Deficit spending and the taxes which sustain it reproduce simultaneously the phenomena of both the favourable and the unfavourable balances of foreign trade. Let us suppose a public authority to borrow and spend DZ' per interval at the basic final market and DZ" per interval at the surplus final market. Let us suppose that the taxation to meet interest and provide amortization against past and present borrowing is DY' per interval derived from the basic circuit and DY" per interval derived from the surplus circuit. Then the superperposed circuits will be:

1) DD' + DZ' + DY' -- DD" + DZ" + DY"

2) DE' + DZ' + DY' -- DE" + DZ" + DY"

3) G'DO' + DZ' + DY' -- (1 - G")DO" + DZ" + DY"

4) DD" - DZ' - DZ" - DY' - DY"

We shall consider first the government spending, second the taxes, and third the ultimate alternative between bankruptcy and vigorous retrenchment, that is, the disappearance of DZ' and DZ" and the intensification of DY' and DY".

Government spending is simple. In each interval DZ' is spent at the basic final market for any type of goods or services that have no tendency to accelerate the productive process while DZ" is spent at the surplus final market for goods and services with that tendency. There results a corresponding increment in income which, as it has nothing to buy at either final market, is counted as surplus and is moved to the redistributive function where directly or

indirectly it purchases government securities. Thus, in each interval, labour, land and capital are providing DZ' + DZ" of goods and services. Those who do the required monetary saving are built into a solid and richly endowed rentier class at the rate DZ' + DZ" per interval. The community possesses the goods and services but, unless it is going into business deliberately, their productive value will be slight. Finally, the public debt mounts by the same rate, DZ' + DZ" per interval.

The rate of debt servicing, DY' + DY", becomes more and more significant as the rate of deficit spending is maintained over a longer period. The movement from the circuits to the redistributive function causes no difficulty. Income is taxed, directly or indirectly, to give the third and fourth elements in this circuit. In the redistributive function, DY" per interval is paid to amortization, and DY' per interval is paid as interest to the rentiers. However, if money is to be moved from the circuits to the redistributive function without causing a contracting, it is necessary that the in-flow be balanced by an equal out-flow.