

“An Essay in Dynamic Theory”: 1938 Draft

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1. The following pages constitute a tentative and preliminary attempt to give the outline of a “dynamic” theory. Static theory consists of a classification of terms with a view to systematic thinking together with the extraction of such knowledge about the adjustments due to a change of circumstances as is yielded by the “laws of supply and demand.” It has for some time appeared to me that it ought to be possible to develop [sic] a similar classification and system of axioms to meet the situation in which certain forces are operating steadily to increase or decrease certain magnitudes in the system. The consequent “theory” would not profess to determine the course of events in detail but should provide a framework of concepts relevant to the study of change analogous to that provided by static theory for the study of rest.

The axiomatic basis of the theory which I propose to develop [sic] consists of three propositions, namely (i) that the level of a community’s income is the most important determinant of its supply of saving, (ii) that the rate of increase of its income is an important determinant of its demand for saving, and (iii) that demand is equal supply [sic]. It thus consists in a marriage of the “acceleration principle” and the “multiplier” theory, and is a development and extension of certain arguments advanced in my Essay on the Trade Cycle.^{1a}

1. Especially in chap. 2, sects. 4–5. The “Acceleration Principle” was there designated the *History of Political Economy* 28:2 © 1996 by Duke University Press.

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2. Attempts to construct a dynamic theory have recently been proceeding upon another line, namely by the study of time lags between certain adjustments. By the introduction of an appropriate lag the tendency of a system to oscillate can be established. In these studies there is some doubt as to the nature of the trend on which the oscillation is super-imposed. Supposing damping measures could be introduced, to counteract the oscillation caused by the lag, would the system be stationary or advancing? And at what rate? Dynamic theory in my sense may throw some light upon this.

Moreover it is possible, and this the following argument seeks to establish, that the trend of growth may itself generate forces making for oscillation. This, if so, would not impair the importance of the study of the effect of lags. But it may be that the attempt to explain the trade cycle by *exclusive* reference to them is an un-necessary tour de force. The study of the operation of the forces maintaining a trend of increase and the study of lags should go together.

3. The significance of what follows should not be judged solely by reference to the validity or convenience of the particular equations set forth. It involves something wider, a method of thinking, a way of approach to certain problems. It is necessary to "think dynamically." The static system of equations is set forth not only for its own beauty but also to enable the economist to train his mind upon special problems when they arise. For instance an economist may pose to himself the question, what would be the effect on the system of an increase of exports or of a labour-saving invention? By reference to the static equations he then proceeds to work out the new equilibrium position supposing the new higher level of exports to be maintained in perpetuity or the labour saving invention to be incorporated in the productive technique once for all.

But let the question be: suppose the level of exports begins and continues to increase steadily, or suppose its rate of increase to increase, or

"Relation." There is an objection to the use of the term acceleration in this connexion. The study of the condition in which demand and supply are flowing at an unaltered rate has long been known as Static Theory: this implies that the equilibrium of prices and quantities resulting therefrom is regarded as analogous to a state of rest. By analogy therefore a steady rate of increase of demand, which is our first matter for consideration in dynamic theory and a major effect of which is expressed by the "Relation", should be regarded as a velocity. Acceleration would be a rate of change in this.

However, the use of the expression Acceleration Principle in the sense of my Relation is rapidly accelerating in current literature and I reluctantly bow to the force majeure of usage.

suppose labour-saving inventions begin to be made in a steady or growing stream; then the static method will not suffice. The static theorist may hope to reduce this supposed steady increase to a succession of steps up, each having the same effect. But if the following argument is correct, the effect on the moving equilibrium of advance may often be in the opposite direction to each of the steps considered singly. A new method of approach, indeed a mental revolution, is needed.

Once the mind is accustomed to thinking in terms of trends of increase, the old static formulation of problems seems stale, flat and unprofitable. This is not to deny to static theory its own appropriate sphere. It will become apparent which kind of problem belongs to each branch of study.

4. I now propose to proceed directly to the Fundamental Equation, constituting the marriage of the acceleration principle and the multiplier theory. This probably gives too much importance to the acceleration principle and the necessary modification is introduced subsequently.

Let G stand for the geometric rate of growth of income or output in the system, the increment being expressed as a fraction of its existing level. G will vary directly with the time interval chosen, e.g. 1% per annum = $\frac{1}{12}$ % per month. Let G_w stand for the warranted rate of growth. The Warranted rate of growth is taken to be that rate of growth, which if it occurs will leave all parties satisfied that they have produced the right amount.^b I use the unprofessional term warranted instead of equilibrium or moving equilibrium, because, although every point on the path of output described by G_w is an equilibrium point in the sense that producers will be satisfied, the equilibrium is,^c for reasons to be explained, a highly unstable one.

If x_0 is output in period 0 and x_1 output in period 1, $G = \frac{x_1 - x_0}{x_0}$. Since we suppose the period to be short, x_0 or x_1 may alternatively stand in the denominator.

x_0 and x_1 are compounded of all individual outputs. I neglect questions of weighting. Even in a condition of growth, which, generally speaking, is steady, it is not to be supposed that all the component individuals are expanding at the same rate. Thus even in the most ideal circumstances conceivable G , the actual rate of growth, would diverge from time to time from G_w , the warranted rate of growth, for random or seasonal causes.

Let s stand for the fraction of income which individuals and corporate bodies choose to save. s is total saving divided by x_0 or x_1 . This may be expected to vary, with the size of income, the phase of the trade cycle, institutional changes, etc.

Let C stand for the value of the capital goods required for the production of a unit increment of output. The unit of value used to measure this magnitude is the value of the unit increment of output. Thus, if it is proposed in month 1 to raise the output of shoes, so that in month 1 and all subsequent months output is one pair higher than in month 0, and the machine required to do this—neglecting all other capital that may be required—has a value 48 times the value of a pair of shoes, C per month = 48. The value of C is inversely proportional to the period chosen. C per annum = 4 in this case.^{2d} The value of C depends on the state of technology and the nature of the goods constituting the increment of output. It may be expected to vary as income grows and in different phases of the trade cycle; it may be somewhat dependent on the rate of interest.

Now, it is probably the case that in any period not the whole of the new capital is destined to look after the increment of output of consumers' goods. There may be long range plans of capital development or a transformation of the method of producing the pre-existent level of output. These facts will be allowed for in due course. For the moment let it be assumed that all new capital goods are required for the sake of the increment of output of consumers' goods accruing.

Reserving proof for the next paragraph, we may now write the Fundamental Equation in its simplest form:^e

$$G_w = s/C \quad (1)$$

It should be noticed that the warranted rate of growth of the system appears here as an unknown term the value of which is determined by certain "fundamental conditions," namely the propensity to save, the state of technology etc. Those who define dynamic as having a cross reference to two points of time will not regard this equation as dynamic; that particular definition of dynamic has its own interest and field of reference. I prefer to define dynamic as referring to propositions in which a rate of growth appears as an unknown variable. This equation is clearly more fundamental than those expressing lags of adjustment.

2. If a month is the unit, the number of shoes added per period is 1, if a year, 144. The value of G per annum is 12 times as great as G per month. The number of machines added per month is $1 \equiv 48$ shoes = 48 units of increment of output. The number of machines added per year is $12 \equiv \frac{48}{12}$ shoes. Thus the value in shoes of the annual increment of capital required to produce an annual increment of 144 shoes is 48×12 units. Therefore C per annum = $\frac{(48 \times 12)}{144} = 4 = \frac{1}{12}$ of C per month.

5. The proof is as follows. Let C_p stand for the value of the increment of capital stock in the period divided by the increment of total output. C_p is the value of the increment of capital per unit increment of output actually produced. Circulating and fixed capital are lumped together.

$$G = s/C_p \quad (1a)$$

is a truism, depending on the proposition that actual saving in a period (excess of the income in that period over consumption) is equal to the addition to the capital stock. Total saving is equal to sx_0 . The addition to the capital stock is equal to $C_p(x_1 - x_0)$. This follows from the definition of C_p . And so,

$$\begin{aligned} sx_0 &= C_p(x_1 - x_0) \\ \frac{s}{C_p} &= \frac{x_1 - x_0}{x_0} = G. \end{aligned}$$

G is the rate of increase^f which actually occurs; C_p is the increase in the stock of capital divided by the increase in total output which actually occurs. If the value of the increment of the stock of capital per unit increment of output which actually occurs (C_p) is equal to the amount of capital required by technological and other conditions^g per unit increase of output (C), then clearly the increase which actually occurs is equal to the increase which is justified by the circumstances. This means that, since C_p includes all goods (circulating + fixed capital) and is in fact production minus consumption per unit increment of output during the period, the sum of decisions to produce to which G gives expression are on balance justified—i.e., if $C = C_p$ then $G = G_w$, and

$$\therefore G_w = s/C.$$

This is the fundamental equation, stated in paragraph 4, which determines the warranted rate of growth. To give numerical values to these symbols, which may be fairly representative of modern conditions: if 10% of income were saved and the capital coefficient per annum (C) were equal to 4, the warranted rate of growth would be $2\frac{1}{2}\%$ per annum.^h

6. To use terminology recently employed by distinguished authorities, C_p is an ex-post quantity. I am not clear if C should be regarded as its corresponding ex ante. C is rather that quantity of capital goods, which, if producers foresaw the total development during the period, they would produce, or that which, if they do produce it, makes them feel satisfied that

they have neither exceeded nor fallen short of the mark. For convenience C in this sense will be referred to as ex-ante C in this article.ⁱ

The truism stated above, (1a), gives expression to Mr. Keynes' proposition that saving is necessarily equal to investment, that is to ex-post investment. Saving is not equal to ex-ante investment in this sense, since unwanted accretions or depletions of stocks may occur or equipment may be found to have been produced in excess of or short of requirements.

If ex post investment is less than ex ante investment, this means that there has been an undesired reduction of stocks or insufficient provision of productive equipment, and there will be a stimulus to further expansion of output; conversely if ex post investment exceeds ex-ante investment. If ex post investment is less than ex-ante investment, saving is less than ex ante investment. In his *Treatise on Money* Mr. Keynes formulated a proposition, which has been widely felt to be enlightening, though experience has led him subsequently to condemn the definitions employed as more likely to be misconstrued than helpful. He said that if investment exceeded saving, the system would be stimulated to expand and conversely. If for the definitions on which that proposition was based, we substitute the definition of ex ante investment given above, it is true that if ex ante investment exceeds saving, the system will be stimulated and conversely. This truth may account for the feeling of satisfaction which Mr. Keynes' proposition originally evoked and the reluctance to abandon it at his behest. In many connections we are more interested in ex-ante than in ex-post investment, the latter including as it does unwanted accretions of stocks. Mr. Keynes' proposition of the *Treatise* may still be a useful aid to thinking, if we substitute for "Investment" in it ex ante investment as defined above.

7. Two minor points may be considered before we proceed with the main argument.

(i) It may be felt that there is something unreal in this analysis, since the increase in capital which producers will regard as right in period 1 is in the real world related not to the increase of total output in period 1 but to prospective increases in subsequent periods. This objection may be divided into two parts. (a) In view of the fact that much of the outlay of capital is connected with long range planning, it may be held that the fundamental equation gives too much weight to the short period effect of the acceleration principle. This objection is freely admitted and allowed for in the subsequent modification of the equation. (b) It may further be objected that even in the sphere in which the acceleration principle holds

there must be some lag between the increased provision of equipment (and stocks?) and the increased flow of output which they are designed to support. There may be some force in this. But the point is deliberately neglected in this^k argument, along with all questions of lags. The study of these lags is of undoubted importance, but a division of labour in analysis is indispensable, and in this case the neglect is necessary in order to get the clearest possible view of the force determining the trend and its influence as such. Moreover the lag referred to in this sub-heading (b) may properly be regarded as unimportant, since, in the event of a steady advance, G , being maintained, the difference between $x_1 - x_0$ and $x_2 - x_1$ will be of the second order of magnitude. In other words, it matters not whether we regard the increment of capital as required to support the increment of total output in the same period or in the one immediately succeeding it.

8. (ii) In the demonstration given above (paras. 6 and 7) reference was made to the distinction between the ex-post and the ex-ante increase of capital goods. No reference was made to the distinction between ex-post and ex-ante saving.^l Suppose that G is not equal to G_w , might not the discrepancy show itself on the other side of the equation not in any divergence of C_p from C but in ex-post saving not being equal to ex-ante saving?

I have no very clear view as to possible causes likely to operate in a systematic way to distort ex-post from ex-ante saving, or of the probable importance of such distortions. It is said for instance that in a time of rising prices, fixed income classes will not adapt their modes of life simultaneously and so may save less than they would be disposed to do had they clearly foreseen the impending rise. Per contra variable income classes may not foresee their own rise of income and so spend less than they would have been disposed to do.

This question of the possible divergence of ex-post from ex ante saving must be kept entirely distinct from that of the variations in s in the different phases of the trade cycle, which not only are admitted but also play a part in the argument. s may vary because the level of income or of profit is abnormally swollen or depressed.

The neglect of these possible divergences has no importance for the argument, since they will have the same effect on growth as the divergences of C_p from C for which they may serve as substitute. Thus if G exceeds G_w the right hand side of the equation must exceed s/C . If the whole of this effect is found in C , ex-post C (C_p) will^m be less than C and

this is a stimulus to expansion. Firms finding themselves short of stock or equipment will increase their orders. If on the other hand the whole of this effect is found in a divergence of ex-post s from ex ante s , ex-post s will be *greater* than ex-ante s . Savers will find that they have saved more than they would have done, had they foreseen their level of income or the level of prices correctly. Consequently they will be stimulated to expand purchases and orders for goods will consequently be increased. Throughout the following pages the reader, whenever he finds a reference to the excess or deficiency of C_p compared with C , may substitute, if he prefers it, a supposed deficiency or excess of ex-post saving compared with ex-ante saving, without affecting the course of the argument.

9. We now come to a point of major importance, constituting the difference between the dynamic equilibrium (warranted rate of growth) and the static equilibrium. The latter is stable and the former unstable. This gives a *prima facie* reason for regarding the dynamic analysis as a necessary propædetic to trade cycle study.

Some recent writers have been disposed to urge that the static equilibrium is not so stable as is sometimes claimed. Suppose that an increased output of a commodity, constituting a departure from equilibrium, is tried, so that its supply stands at a point at which the supply curve is above the demand curve. It is argued that, instead of a relapse at once occurring, reducing supply to the point of intersection of the supply and demand curves—this showing the stability of the old equilibrium—, the upshot depends on how all parties now proceed. It is suggested that there may be a tendency to waltz round the point of intersection, or, more broadly, that in the backward adjustment there may be wide repercussions disturbing the whole system. It is even held that the whole question of the stability of the static equilibrium in the sense of the tendency of a relapse to it when a random departure occurs, is itself a dynamic problem, which cannot be looked after by the system of static equations. I have the impression that this type of criticism exaggerates the importance of this problem, and constitutes to some extent a failure to see the wood for the trees, and that on its own ground the theory of static equilibrium is well able to hold its own.

But when we look at the dynamic equilibrium, new vistas are opened. The line of output traced by the warranted rate of growth is a moving equilibrium, in the sense that it represents the one level of output at which producers will feel in the upshot they have done the right thing.ⁿ Stock in hand and equipment available will be exactly at the level which they

would wish to have them. Of course what applies to the system in general may not apply to each individual separately. But if one feels he has over-produced or over-ordered, this will be counterbalanced by an opposite experience of an equal importance in some other part of the field.

But now suppose that there is a departure from the warranted rate of growth. Suppose an excessive output, so that G exceeds G_w . The consequence will be that C_p , the actual increase of capital goods,^o falls below C , that which is desired. There will be in fact be [*sic*] an undue depletion of stock or shortage of equipment and the system will be stimulated to further expansion. G instead of returning to G_w will move farther from it in an upward direction, and the farther it diverges the greater the stimulus to expansion will be. Similarly, if G falls below G_w , there will be a redundancy of capital goods and a depressing influence will be exerted; this will cause a further divergence and a still stronger depressing influence; and so on. Thus in the dynamic field we have a condition opposite to that which holds in the static field. A departure from equilibrium instead of being self-righting will be self-aggravating. G_w represents a moving equilibrium, but a highly unstable one. Of interest this for trade cycle analysis!

Suppose an increase in the propensity to save, which is expressed by s .^p This necessarily involves, *ceteris paribus*, a higher rate of warranted growth. But if the actual growth was previously equal to the warranted growth, the immediate effect is to raise the warranted rate above the actual rate. This state of affairs sets up a depressing influence which will drag the actual rate progressively further below the warranted rate. In numerous cases we shall have occasion to observe that the movement of a dynamic determinant has an opposite effect on the warranted path of growth to that which it has on its actual path. How different from the order of events in static theory!

The reader may have some difficulty in the expression "stimulus to expansion." What is the significance of this, in view of the fact that some growth is assumed as a basic condition? It must be remembered that the value of G depends on aggregates x_0 and x_1 . These are sums of numerous quantities for which individuals are responsible. It must be supposed that at all times some individuals are jogging on at a steady level, others are risking an increase of orders or output, others are willy-nilly curtailing. G is the resultant of their separate enterprises. Some are in any event likely to be disappointed. If G is equal to warranted G , $(G_w)^q$, it is to be supposed that the general level of enterprise undertaken in period 0,

including in sum a certain increase over that in the preceding period, is found to be satisfactory. Those running short of stock balance those with surpluses. This justifies further action on similar lines, though the individuals increasing orders for stock in trade or planning new equipment in period 1 may not be identical in person with those doing so in period 0. If an expansive force is in operation more individuals or individuals having greater weight will be induced by their trading position to venture increases than did so in the preceding period. Conversely if a depressing force is in operation. (The meaning of our symbolism when G acquires a negative sign—output is receding—is explained fully in a later paragraph.)

The dynamic theory so far stated may be summed up in two propositions. i. A unique warranted line of growth is determined jointly by the propensity to save and the quantity of capital required by technological and other considerations per unit increment of total output. Only if producers keep to this line will they find that on balance their production in each period has been neither excessive nor deficient. ii. On either side of of [*sic*] this line is a "field" in which centrifugal forces operation [*sic*], the magnitude of which varies directly as the distance of any point in it from the warranted line.^f The moving equilibrium of advance is thus a highly unstable one.^g

Consideration of how these centrifugal forces are eventually checked will lead me outside the strictest part of the dynamic theory and involve a certain element of conjecture. But before proceeding to that question, it may be well to introduce further terms into our equation to reduce the influence of the acceleration principle.

10. Some outlays of capital have no direct relation to the current increase of output. They may be related to a prospective long-period increase of activity and be but slightly influenced, if at all, by the current increase of trade. Or they may be induced by new inventions calculated to cheapen production or change consumers' modes of spending their income, so that they are not related to increments of output but are designed to revolutionize the methods for producing some portion of already existing output or to substitute one line of goods for another in the consumers' budget. There are doubtless numerous factors^h affecting the volume of such outlay. It may suffice for the purpose in hand to divide it into two parts.

One part, K , is conceived to be quite independent both of the current level of income and its current rate of growth. The other, expressed as

a fraction of income, k , is conceived to vary with the current level of income, as distinct from its rate of growth. This seems a reasonable assumption. Long period anticipations are bound to be influenced by the present state of prosperity or adversity; even public authorities are apt to reduce the volume of Public Works in a slump. Companies may relate their expenditure on long range plans to the current state of their profit account.

Having regard to the principle that the total increase of capital is equal to the total saving in the period, our fundamental equation may be modified as follows:

$$G = \frac{s - k - K/x}{C} . \quad (2a)^{3u}$$

It must be noticed that C now stands not for the total increase of capital per unit increment of output, but only for the net increase of capital after the capital represented by k and K has been subtracted.

In order to reduce the number of terms as far as possible with a view to an easy conspectus, we may write s' for the *net* proportion of income saved, this being the actual proportion minus the proportion of income devoted to that part of capital output conceived to depend on the level of income. We then have:

$$G_w = \frac{s' - K/x}{C} . \quad (2)$$

k which has been compounded into s' may of course vary with the level of income. But so too may s' .^v

It may be noticed that the larger the volume of outlay, which will be sustained independently of the current rate of growth, the *smaller* is the warranted rate of growth. A larger part of savings being absorbed in such outlay, there will be a smaller part to be looked after by the acceleration principle.

11. To complete the picture foreign trade must be taken into account. It is reasonable to measure exports, including invisible exports and the earnings of foreign investments, in absolute terms. The value of income which may be earned in this way may be conceived to be independent

$$\begin{aligned} 3. \quad & sx_0 = C_p(x_1 - x_0) + kx_0 + K \\ \therefore & \frac{s - k - K/x_0}{C_p} = \frac{x_1 - x_0}{x_0} = G \\ \therefore & G_w = \frac{s - k - K/x_0}{C} \end{aligned}$$

both of the level of activity at home and of its growth (though in so far as the trade cycle is world wide, its value will be de facto related to income). Let E stand for this value. Imports on the other hand are better taken as a fraction (i) of the current level of income. We then have, by parity of reasoning,

$$G_w = \frac{s' + i - K/x - E/x}{C}; \quad (3)^4$$

i need not be equal to E/x ; the difference represents an international movement of capital. The influence of the various magnitudes on the warranted rate of growth is shown by the equation. The strict part of the theory ceases here.^w

12. The next topic is how the forces driving growth away from the warranted rate are eventually checked. In the case of the upward movement the matter is simple. Growth is eventually limited by the productive resources of the system.

Alongside the concept of Warranted rate of growth, we may introduce another, to be called the Natural rate of growth. This is the maximum rate of growth allowed by the increase of population, accumulation of capital, technological improvement and the work/leisure preference schedule, supposing that there is always full employment in some sense.^x

When the rate of growth is driven upwards away from the warranted rate and progressively accelerated, full employment is eventually reached. At this point the actual rate cannot exceed the Natural rate. If the natural rate is less than the warranted rate, the actual rate must fall below the warranted rate and so enter the field in which forces drive it progressively downwards. If on the other hand the natural rate is not less than the warranted rate an immediate reverse is not necessary. Inflation is likely to be set up in the manner described in paragraph [18].^y

13. It has already been explained that the values of the terms in the Fundamental Equation and therefore the warranted rate of growth might itself be expected to change in the various phases of the trade cycle.^{5z} C and s may both assume quite special values at the bottom of a depression

4. The principle now is that saving plus income expended on imports must be equal to the increase of capital in the country plus income derived from abroad. This is deducible from the fact that income derived from the sale of home made goods to consumers at home is equal to the income devoted to their purchase. Thus: $-s'x_0 + ix_0 = C_p(x_1 - x_0) + K + E$.

5. This idea is analogous to that propounded by Mr. D. H. Robertson that the so-called natural rate of interest may be expected to vary in different phases of the trade cycle. Cf. Economic Journal.

or at the height of a boom. It is desirable to entertain the idea of a *normal* value of the warranted rate of growth. This special value of G_w may best be thought of as that which would obtain if the actual rate of growth had coincided with the warranted rate for some time. When income has been accruing and rising steadily and there is no inflation of prices or of profits owing to high pressure working, the value of s may be expected to represent the normal habits of individuals and companies with regard to saving. Similarly C will attain quite odd values during a recession and will be influenced for some time afterwards by the existence of surplus capacity. When C is normal, it may be supposed to be influenced mainly by technological considerations and the regular trend of consumers' choice. It is not necessary to the argument to define this normal value for G_w very precisely. It is that warranted rate of growth which would obtain if only[?] the system advanced steadily along its warranted rate. Displacements in the actual rate may be conceived to distort the warranted rate from its normal value.

14.^{aa} The theory of the cycle now to be sketched out consists of two parts. i. There is the circumstance already referred to in paragraph 12 that if the natural rate is less than the normal warranted rate, expansion must eventually hit a ceiling, with the consequence that the actual rates [*sic*] falls below the warranted rate and this makes progressive recession inevitable. This was the theory of recession propounded at some length in my book on the Trade Cycle.

ii. For the rest, it is to be supposed that when the actual rate has for some time been displaced from the warranted rate, the warranted rate may itself become displaced from its normal value. In this case the warranted rate may chase the actual rate upwards or downwards. If the former eventual [*sic*] overtakes the latter a new equilibrium is achieved and if the former goes beyond the latter forces are generated setting up a reverse movement.

15. The slump. The following account neglects all questions connected with the balance between depreciation allowances and actual replacements. These are undoubtedly relevant and important, but are passed over in order not to swell this article unduly. Attention is concentrated on certain other forces tending to depress the warranted rate during the recession and to bring it eventually below the actual rate, which is the condition for recovery.^{bb} There appear to be three forces at work all tending to depress the warranted rate as income falls.

(i) The two terms K/x_0 and E/x_0 automatically increase as x_0 falls. If

they increase sufficiently they may rise above $s' + i$ and the right-hand side of the equation acquires a negative value. (C remains positive: this is explained under iii.) Thus long range capital outlay and exports serve as cushions mitigating the worst ravages of depression. If there is a world slump, E may of course shrink as quickly as or more quickly than x_0 and to that extent the salvaging effect of exports is inoperative. The long range capital outlay within the country will anyhow be of service, and will be a better cushion the larger it is in relation to normal income.

(ii) It is probable that s will shrink as incomes fall, particularly if the recession involves a disproportionate fall in the incomes of the saving classes. The theory underlying the "shift away from profits"^{cc} is not entirely cleared up, but we may assume from experience that there is a force of this sort in operation. The decline in s helps the right hand side of the equation to become negative at an earlier stage. The sooner it becomes negative the sooner will the slump be arrested.

(iii) With regard to C it is necessary to elucidate the notation. C has a positive value for expansion and contraction alike. In the case of expansion it is the amount of extra capital required per unit increment of output; in the case of contraction it is the amount of capital that can most conveniently be disposed with. C_p on the other hand, which occurs in the tautological equation (1a), may have a negative value. It will have a negative value, if output recedes (negative G) while the numerator of the right hand side (saving less long range capital outlay etc) remains positive. When C_p has a negative value, this does *not* mean that there is a reduction of capital, but that the volume of capital goods is moving in the opposite direction to total output.⁶ Thus if actual growth is negative, and C_p has a negative sign, this means that there is a net increase of capital, the amount of the increase being denoted by the arithmetical value of C_p . If on the other hand growth were positive and C_p had a negative value (as it would have if the numerator were negative) this would mean that there was a net decrease in capital. It will be remembered that the capital here referred to *excludes* the capital measured by k and K (cf. para 10).^{dd}

6. $sx_0 = C_p(x_1 - x_0)$. If sx_0 is positive, there is a positive capital accumulation; the right hand side is positive. If in these circumstances $(x_1 - x_0)$ is negative, C_p must be negative. This does not mean that there is decumulation of capital, but that the change in capital (in this case accumulation) is in the opposite direction to that required. If $(x_1 - x_0)$ is negative, so long as sx_0 is positive, there is an accumulation when a decumulation is required. For so long, therefore, there is a depressing force in operation.

If sx_0 is negative and $(x_1 - x_0)$ positive, C_p has a negative sign. This means that there is a decumulation when an accumulation is required. In this case there is a stimulus to expansion.

What precisely happens in a depression, that is when G , the actual rate of growth is negative? So long as the numerator of the right hand side is positive, C_p must be negative; there is an accumulation of capital of this sort when a decumulation is required; this involves a depressing force. But if and when the numerator acquires a negative value C_p becomes positive again. This means that a decumulation is actually acted [*sic*]. In an advance a value of C_p below C , actual accumulation below that required, entails expansion. But in a recession a value of C_p below C , actual decumulation below that required, entails further contraction. The downward pressure can only be arrested if and when C_p rises to C . A Growing arithmetical value of G_w (rate of recession) tends to depress C_p ; but, given G_w , a rising arithmetical value of the right hand numerator tends to raise C_p . It is a race between these two forces. As s shrinks and K/x_0 rises, the arithmetical value of the numerator rises.

In these circumstances it may be of great help if C , the required decumulation, is abnormally depressed. And this in fact happens in a recession owing to the fact that much fixed equipment cannot be liquidated.^{ee} Capital may be divided into circulating and fixed, cC and fC . Normally $C = cC + fC$. Suppose that we take the extreme hypothesis that no fixed equipment can be liquidated. Then it may be legitimate to regard C as equal to cC . When the actual decumulation C_p attains a value equal to this, the actual rate of growth (algebraic value of G_w) ceases to be below the warranted rate and a moving downward equilibrium is attained. As soon as the value of C_p —achieved decumulation—exceeds C , the actual rate (algebraic value of G_w) is above the warranted rate, and the downward impetus is reversed.

It might be objected that it cannot be right to exclude [fC], the desired liquidation of fixed capital equipment, from C , since entrepreneurs will influenced [*sic*] by the fact the outstanding value of fixed equipment is too great. This does not matter, if they can do nothing about it. Once they find that circulating capital has fallen too far, they will decrease their rate of reduction of orders for it. No doubt they would like to continue reducing their fixed capital and they will do this at the greatest rate technically possible. When the decrease of circulating capital becomes excessive there will be a reversal of trend, regardless of the fixed capital position. To be stricter, we should include in C all that part of total capital reduction which is technically possible. Thus C is depressed during the recession. (It is also depressed in the early stages of the revival owing to the existence of surplus capacity.)

It is possible that the modern tendency to a quicker turnover of equipment, by increasing the value of C in a depression, tends to aggravate it. The right hand numerator has to acquire a larger arithmetic value, before C_p is raised to the value of C .

The fall of G_w (algebraic value) below G does not indicate the bottom of the slump, but the highest rate of recession. Thereafter the dynamic determinant works to check the rate of recession, and, eventually if the algebraic value of the warranted rate remains below the actual rate, to stimulate revival.^{ff}

16. During the revival the algebraic value of the right hand term will recover. K/x_0 will automatically fall, and if the domestic revival is more rapid than the world revival E/x_0 also. It may be presumed that as profits improve s' will tend to rise. Meanwhile if there is considerable surplus capacity, C will for some time remain low. It appears that there may be a danger point during the early recovery, if there is a long way to go before a reasonably large proportion of industrial plant is working up to capacity. The warranted rate of growth will for the time be abnormally high, since the amount of new saving required by the acceleration principle to support a given rate of growth is abnormally depressed; and the amount of growth required to absorb the saving is pro tanto increased. If the warranted rate of growth rises appreciably above the actual growth, recovery will be checked and depression will ensue. It may be hazarded that this is what happened in the United States in 1937.⁷

17. If this danger point is passed and the normal warranted rate of growth is reasonably low, the recovery may proceed until it hits the ceiling of⁸⁸ full or fairly full employment, and the actual rate of growth is reduced to the natural rate.

Even if the danger point referred to in paragraph 16 is passed, trouble may arise if the normal warranted rate is very high compared with the natural rate. For then the warranted rate may easily rise above the actual rate before the ceiling is reached. *If a country repeatedly finds revival checked before fairly full employment is attained, it may reasonably suspect that its normal warranted rate of growth is considerably in excess of its natural rate.*

7. It is usually said that the cessation of extraordinary government expenditure precipitated the recession. But it may be that this effect would not have resulted from the cessation, if sufficient time had elapsed for C to recover its normal value. C being still abnormally low, the warranted growth was abnormally high and dangerously near the actual growth. The cessation of extraordinary expenditure, involving a sharp decline in K , sent the warranted rate above the actual rate and so precipitated the slump.

18. If the normal warranted rate is below the natural rate, trouble of a different sort may appear. If the system runs on for a time at fairly full employment, there will be a chronic shortage of stocks and equipment, unfulfilled orders will mount and inflationary conditions may set in. It may be hazarded that this was more typical of the old-fashioned boom, when the natural rate was still ample and the normal warranted rate more moderate. Inflation by bringing about a shift to profit distorts the warranted rate upwards (increase of s). If the pressure on means of production is intense, inflation is likely sooner or later to force the warranted rate above the natural (\equiv , at this stage, the actual) rate, and so bring about the slump.

Thus if the explanation of the beginning of a recession given in paragraph 12 fails owing to the fact that the natural rate is above the warranted rate, the ultimate break of the boom is explained by the distortion of the warranted rate upwards from its normal value by the inflationary forces which inevitably in those circumstances come into being.

The inflation is not directly due to banking policy. The inflation is the consequence of the continued pressure of unfulfilled orders. It is true, however, that if a restrictive policy is pursued in this phase, it may also serve to break the boom, by twisting the warranted rate upwards in its own way, i.e. by a high in interest rates or rationing of credit, it may reduce C or K . Thus we have the paradox that inflationary or deflationary developments in this phase both serve to break the boom, one being in some sense an alternative to the other.

A too mechanical application of the ideas of inflation and deflation obscures the fundamental difference between a boom in which the normal warranted is above the natural rate and that in which it is below. In the former case *inflationary* measures may be most beneficial in the later stages of the boom to keep the warranted rate down to the natural rate. In the latter case deflationary measures will be beneficial as constituting a better and less self-inflammatory way of forcing the warranted rate up to the actual rate, than that of an inflation of prices spontaneously generated within the system. The effects of deflation may be kept under control and limited to the required amount, while those of self-generated inflation cannot be.

19. It may be objected that, despite disclaimers, a lag is essential to this account of oscillatory behaviour. For if there were no lag there would always be an immediate adjustment to the new warranted position. Throughout the period in which the actual rate diverges from the warranted rate, producers are releasing output, which, if they had a cor-

rect view of requirements in the succeeding period, they would realize to be wrong. The objection must be admitted; a lag is implied. It is only in the formulation of the fundamental equation in its different forms for determining the warranted rate of growth that consideration of lags is rigidly excluded. This is dynamic because it embodies rate of growth as an unknown variable [*sic*]; and the whole of the argument which follows depends upon it. It provides a framework of thought, within which the significance of lags, the importance of which is not denied, may be fruitfully considered.

20.^{hh} It is time to reconsider the forces which determine the normal warranted rate and the effect of possible changes.

It is essential as a preliminary to grasp the point that a change in the fundamental conditions tends to have the opposite effect on the actual rate to that which it has on the warranted rate. An increasing propensity to save, a decreasing amount of long range capital outlay, a decreasing capital coefficient (new capital required per unit increment of output) and a declining active balance or growing passive balance on international current accounts,⁸ all tend to *increase* the warranted rate; but they all tend to have a depressing effect on the actual rate. If the actual rate is equal to the warranted rate, by raising the warranted rate above it, they precipitate a downward movement. If the actual rate is above the warranted rate, by raising the warranted rate, they reduce the gap and so diminish the drive to expansion. If the actual rate is below the warranted rate they increase the gap and so increase the forces of depression. These propositions are all connected with the instability of the moving equilibrium. In the "field" on either side of the warranted line of growth, there are centrifugal forces, which increase with the distance of the actual output from the warranted output.

It is often felt that a high propensity to save should warrant a great increase in the output of wealth, and this induces an extreme aversion to accept Mr. Keynes' view that excessive saving in the modern age is hostile to prosperity. The feeling is justified to the extent that higher propensity to save does in fact *warrant* a higher rate of growth. Trouble arises if the rate of growth which it warrants is greater than that which the increase

of population and the increase of technical capacity render permanently possible. And the fundamental paradox is that the more ambitious the rate *warranted* is, the greater the probability that the actual rate will from time to time and even persistently fall below not only the warranted rate but that rate of increase which the productive capacity of the population would allow.

21.^{hh} Policy in this field is usually appraised by reference to its power to combat tendencies to oscillation. Our demonstration of the inherent instability of the dynamic equilibrium confirms the importance of this. But there is another aspect of policy which may be still more important. It may be directed to influence the relation between the normal warranted rate of growth and the natural rate.

If in the absence of interference the normal warranted rate is substantially above the natural rate, the difficulties may be too great to be dealt with by a mere anti-cycle policy. In the first place there is the probability of a slump occurring before full employment is reached. Secondly there is the acute problem when the actual rate reaches the ceiling of the natural rate. An attempt may then be made to drag down the warranted rate below its normal level by increasing Public Works (*K*). But the difficulty of the normal warranted rate being above the natural rate will be chronic, and this means that only by keeping in being a large and growing volume of public works can the slump be prevented. In fine the anti-cycle policy has to be converted into a permanent policy for keeping down the normal warranted rate.

The first duty of the authorities would then appear to be to get some estimate of the relation of the normal warranted rate to the natural rate, and, if it finds the former substantially above the latter, to embark on a permanent long range policy to reduce it.

22. Advocates of anti-cycle policy leap[?] in the forefront the necessity for combating inflation from time to time. But it is possible that in the case of a country, the normal warranted rate of which is above the natural rate, fears of inflation are quite out of date. Inflation is a symptom of the natural rate being above the normal warranted rate (see paragraph 18). The persistent upward drive during a boom away from the equilibrium (warranted rate) *then* entails chronic pressure on the means of production. With a high normal warranted rate such a situation is not likely to arise because a boom is likely to be checked before or as soon as it hits the ceiling; in that event the antiinflation talk is mere waste of words. In war time such a situation does arise because public expenditure provides

8. This may be the most fundamental rational explanation of the common view that it is dangerous for an old country to be a larger importer of capital. For this involves a high warranted rate of growth; and it is dangerous to have a high warranted rate when the natural rate is low. Per contra for a young country, whose natural rate is high, it is considered healthy and proper to have a large import of capital.

a chronic stimulus to the actual rate, while keeping the warranted rate abnormally low.

23.ⁱⁱ The ideal policy would be to manipulate the normal warranted rate so that it should be equal to the natural rate. If this could be achieved—but in fact only a rough approximation would be possible—an anti-cycle policy would none the less be an indispensable supplement. For the warranted rate is bound to be disturbed by the varying incidence of inventions and fluctuations in the foreign account. An anti-cycle policy would be necessary to combat the run-away forces which come into being as soon as a substantial change occurs in the warranted rate.

24. A low rate of interest makes for a low warranted rate of increase, by encouraging high values of K and C and, possibly also, by having a depressing influence on s . Since the effects of changes in the rate of interest are probably slow-working, it may be wise to use the rate of interest as a long-range weapon for reducing the warranted rate of growth, and to reserve suitable public works for use against the cycle. It is not suggested, however, that a low rate of interest has sufficient power of its own to keep down the warranted rate without the assistance of a programme of public works to be kept permanently in operation.

If permanent public works activity and a low long-term rate availed to bring the normal warranted rate into line with the natural rate, variations in the short-term rate of interest might come into their own again as a method of combating occasional tendencies to inflation, which might in those circumstances once more be possible.^{jj}

25. This essay has only touched in the most tentative way on a small fraction of the problems, theoretical and practical, which the enunciation of a dynamic theory makes it possible to formulate. In the closing paragraphs it has been rather dogmatically assumed that our present situation is one of a relatively high normal warranted rate. The evidence for this comes from inside and outside the dynamic theory itself. According to the dynamic theory, the tendency of a system to relapse into depression before full employment is reached in the boom indicates that its normal warranted rate exceeds its natural rate. Outside evidence includes the known decline in the growth of population which involves a decline in the natural rate. More controversial points are the tendency of a more wealthy population to save a larger fraction of its income (high value of s involves high warranted rate), and the tendency of modern progress to depress rather than elevate the value of C (low values of C involve high warranted rate).

Sceptics, however, with regard to this diagnosis may regard the concluding sections of this article as serving merely to illustrate how the tool of dynamic analysis might be applied.^{kk}

Editor's Endnotes

a. Harrod 1936.

b. In the final version, the passage reads: "they have produced neither more nor less than the right amount. Or, to state the matter otherwise, it will put them into a frame of mind which will cause them to give such orders as will maintain the same rate of growth" (Harrod 1939, 16). This is one of the extra clauses Harrod inserted specifying the meaning of his warranted growth rate in response to Keynes's doubts.

c. In the final version, the words "producers, . . . the equilibrium is" are replaced by "producers, if they remain on it, will be satisfied, and be induced to keep the same rate of growth in being" (Harrod 1939, 16). This change also was made in response to Keynes.

d. In the final version, Harrod added a specification to footnote 2 to meet Marschak's remark that the discussion given was not easy to follow.

e. In the final version, the following footnote was inserted at this point to meet one of Keynes's objections: "Since the value of G_w varies directly and that of C inversely with the unit period chosen, and the value of s is independent of the unit, the validity of the equation is independent of the unit period chosen" (Harrod 1939, 17 n.2).

f. At Keynes's suggestion, the words "in total output" were inserted here.

g. In the final version, the passage was formulated slightly differently, and the following specification was added after "other conditions" to meet Keynes's point that confidence and the rate of interest were not mentioned: "(including the state of confidence, the rate of interest, etc.)" (Harrod 1939, 18). See endnote t.

h. In the published version, the section concludes with an additional paragraph, introduced to meet one of Keynes's objections:

It may be well to emphasise at this point that no distinction is drawn in this theory between capital goods and consumption goods. In measuring the increment of capital, the two are taken together; the increment consists of total production less total consumption. Some trade-cycle theorists concern themselves with a possible lack of balance between

these two categories; no doubt that has its importance. The theory here considered is more fundamental or simple; it is logically prior to the considerations regarding lack of balance, and grasp of it is required as a preliminary to the study of them. (Harrod 1939, 18–19)

i. To meet Keynes's objection regarding Harrod's peculiar use of the term *ex ante*, in the final version, the last two sentences were modified as follows: "C is rather that addition to capital goods in any period, which producers regard as ideally suited to the output which they are undertaking in that period. For convenience the term *ex ante* when employed in this article will be used in this sense" (Harrod 1939, 19).

j. In the final version, the word "necessarily" was inserted here.

k. In the final version, the words "part of the" were inserted at this point.

l. In the final version, the following footnote was inserted here to meet Keynes's objection that *ex ante* saving is a chimera: "Be it noted that *ex ante* is here used of saving in a sense analogous to that defined in the expression *ex ante* investment; it is the saving which savers would choose to make in any period, were they able to adapt expenditure simultaneously with the changing circumstances of the period" (Harrod 1939, 20 n.1).

m. In the final version, the words "in C_p it will" are substituted for the words "in C , *ex post* $C(C_p)$ will." This change followed a suggestion by Marschak relative to an analogous formulation where G and G_w were involved (Harrod 1939, 21). See endnote q.

n. In the final version, the words "and which will induce them to continue in the same line of advance" were inserted again in response to Keynes (Harrod 1939, 22).

o. In the final version, on Marschak's suggestion the words "per unit increment of output" were inserted (Harrod 1939, 22).

p. In the final version, following Marschak's suggestion the words "means that the values of s are increased for all levels of income" are substituted for "is expressed by s " (Harrod 1939, 22).

q. In the final version the words "warranted G ," and the parentheses are deleted following Marschak's suggestion (Harrod 1939, 23).

r. In the final version, the sentence "Departure from the warranted line sets up an inducement to depart farther from it" was inserted at this point (23).

s. From this point on, the text differs substantially between the two drafts: in the final version the next two sentences are substituted by the longer conclusion of section 9 (Harrod 1939, 23–24), and sections 10 and

11 (24–26) are introduced *ex novo* (section 10 in order to meet Keynes's objection), as well as being an introductory sentence to the next section (26).

t. In the final version, the following words were inserted: "including the state of confidence and the rate of interest" (Harrod 1939, 26–27; see endnote g).

u. The formula in the text gives the conditions for G_w , not G ; the mistake was rectified in the published version (Harrod 1939, 27).

v. Harrod crossed out the following sentence: " s' will probably be more stable in the different phases of the trade cycle than s ." This paragraph was deleted in the final version.

w. From this point to section 20, the text of the manuscript and that of the final version are entirely different.

x. The following observations were crossed out and the new section was written around it.

Application of the static theory has suggested the optimistic view that a system, in which mobility of resources and flexibility of prices were at their maximum, would, given a reasonable allowance for lags and frictions, adjust itself to this natural rate of increase. Consideration of the dynamic equation suggests (i) that there will be self-aggravating movements away from the equilibrium position. The facts indeed have forced static theorists to admit that there must be present some self-aggravating forces of this kind. But the analysis undertaken in terms of the static equations falls short of full cogency, having to call in aid assumptions with regard to lags suggested by what they are intended to prove. Per contra the tendency to a self-aggravating departure follows directly from the dynamic equation. It also suggests (ii), as will presently be shown, that in certain circumstances there may be impediments to full unemployment ever being reached. This seems to go farther than anything which may legitimately be deduced from static theory.

y. Harrod left this space blank, suggesting that this draft was the first one.

z. This footnote was not preserved in the final version. He is referring to Robertson 1934.

aa. Harrod crossed out the following alternative opening of section 14:

The natural rate of growth and the normal warranted rate of growth will probably not co-incide. At first blush it might be thought a healthy

condition for the normal warranted rate to be slightly greater than the natural rate, since it would appear that in that case there would normally be a force chronically pressing towards full employment. The reverse is probably the case. If the normal warranted rate exceeds the natural rate, the actual rate can only be equal to the normal warranted rate when there is a slack of resources to be taken up. If advance proceeds in this condition, the actual rate must inevitably hit a ceiling when the slack is taken up and full or fairly full employment reigns, and then, in falling to the natural rate it will fall below the normal warranted rate. But this will entail a self-aggravating movement downwards. If, on the other hand the normal warranted rate is not above the natural rate, the attainment of full employment need not immediately bring about a reverse.

bb. The following tentative beginning for section 15 was eventually crossed out by Harrod: "It may be useful at this point to give attention to the slump. We suppose that the actual rate has fallen away from the warranted rate and is moving progressively downwards. In this case there is no floor for it to hit other than that of zero output. What saves us from this calamity?"

cc. This refers to Harrod 1936, 69, 74–88.

dd. The following passage was crossed out on pp. 16 and 17 of the manuscript:

In a recession C is likely to shrink considerably, anyhow for a time. C then represents the reduction in capital which satisfies entrepreneurs as sufficient. In a backward movement it may be impossible to liquidate much of the fixed equipment. This leaves the question of how much circulating capital is reduced as the crucial determining one. Suppose an extreme case in which no liquidation of fixed equipment is possible; the reduction of capital will take exclusively the form of a reduction of circulating capital per unit decrement of output. Suppose that the numerator has already acquired a negative value; the value of C_p , which in this case will be positive, will represent the value of the reduction of circulating capital. This is likely to reach the desired reduction of circulating capital more quickly than it would if the given value of C_p were divided between a reduction of fixed capital and a reduction of circulating capital. Thus the fact that fixed capital cannot be rapidly reduced in a slump may help matters. To put this point rather differently, the warranted rate of decrease will shrink as

low as the actual rate, when the actual decline of circulating capital becomes as great as the decline called for by the falling turnover of total output. The net dis-saving represented by the negative value of the numerator measures the total reduction of capital. The reduction of circulating capital will be greater the smaller the proportion of this total represented by a reduction of fixed capital. Therefore the smaller this proportion the more rapidly will the volume of circulating capital shrink to that required, i.e. the more quickly will the warranted rate of decrease fall as low as the actual rate.

When the warranted rate reaches the actual rate, we reach not the bottom of the slump but the most rapid rate of decline. Therefore the dynamic determinant works in the opposite direction, namely to reduce the rate of decline, and, eventually, if the algebraic value of the warranted rate of growth remains below that of the actual rate, to stimulate revival.

ee. The following passage was crossed out on pp. 16a and 16b of the manuscript:

This fact entitles us to concentrate attention on circulating capital; once the rate of decumulation of stocks exceeds the required decumulation, the downward movement will be checked, even is [*sic*] there is a volume of unwanted fixed equipment outstanding. Thus we may consider C in the recession as abnormally depressed, and as consisting mainly of the required decumulation of circulating capital. This helps C_p to rise to the required value. (C remains low in the early stages of revival owing to the existence of circulating capital). Thus the fixity of fixed equipment helps the recession to reach its lowest point.

This rather difficult point may be put in another way. The total amount of decumulation of capital is represented by the negative value of the right hand numerator of the equation, namely the net dis-saving (positive saving less the long range capital outlay that is independent of the phase of the cycle). If this given dis-saving were divided proportionately between a reduction of equipment and a reduction of stocks, the reduction of stocks would be pro tanto reduced and would be less likely to be as great as the required reduction of stocks. The concentration of depletion on the side of stocks, owing to the technical impossibility of reducing equipment, accelerates the reduction of stocks and speeds up the process of getting the actual reduction up to the required reduction. The fact that there is all the more unwanted

equipment does not matter for this purpose. (The complicated question of the balance between replacements and depreciation allowances is neglected in this article, though it is doubtless of great importance).

When the actual depletion of stocks becomes as great as the required depletion, the warranted rate of decline is equal to the actual rate. When the actual depletion becomes greater, the arithmetical value of G is [*sic*] becomes less than that of G_w . The algebraic value of G is now greater than that of G_w . But this is the condition for a reversal of movement.

ff. Harrod crossed out "the natural rate of growth" here.

gg. This section is similar in content to section 17 of the final version (30–31), although the form is relatively different.

hh. This section is similar in content and in form to section 18 of the final version (31–32). But it must be noted that in the published version the notion of "proper warranted rate" (which in the final version was introduced in section 16; Harrod 1939, 30) was substituted for the notion of "normal warranted rate" appearing here. Both Keynes and Marschak remarked that the notion of "normal warranted rate" was quite confusing.

ii. From this point on, the text of the final version largely corresponds in content and form to the text of the manuscript.

jj. In the final version, the words "a method . . . be possible" were replaced by the words "an ancillary method of dealing with oscillations" (Harrod 1939, 32).

kk. In the final version, the last paragraph of the manuscript was replaced by: "The main object of this article, however, is to present a tool of analysis, not to diagnose the present situation" (Harrod 1939, 33).

Editor's References

Harrod, Roy. F. 1936. *The Trade Cycle*. Oxford: Clarendon.
 ———. 1939. An Essay in Dynamic Theory. *Economic Journal* (March): 14–33.
 Errata (June): 377.
 Robertson, D. H. 1934. Industrial Fluctuations and the Natural Rate of Interest. *Economic Journal* 44 (December): 650–56.

Appendix: Table of Concordances

The following table represents the concordances between the contents of the manuscript and the text that appeared in the March 1939 issue

Table 1 Comparison between the 1938 and 1939 versions.

1938 draft	par.	par. 1939 published version
Definition of the axioms	1 ——— 1	Definition of the axioms
Comparison with lag theories	2 ——— 2	Comparison with lag theories
Dynamics as a Method of thinking	3 ——— 3	Dynamics as a Method of thinking
Definition of magnitudes and Fundamental Equation	4 - - - - 4	Definition of magnitudes, Fundamental Equation, and equilibrium behavior
Proof of Fundamental Equation	5 - - - - 5	Proof of Fundamental Equation; on the distinction between capital and consumption goods
Discussion of the Treatise in terms of ex post and ex ante I and S	6 - - - - 6	Discussion of the Treatise in terms of ex post and ex ante I and S; specification on the use of ex ante
On expectations: long-range plans and time lags	7 - - - - 7	On expectations: long-range plans and time lags
Ex post and ex ante saving	8 - - - - 8	Ex post and ex ante saving; on the use of the latter notion
Statics, dynamics and stability: the instability principle	9 - - - - 9	Statics, dynamics and stability: the instability principle. Overproduction and underproduction
Long-run capital outlays; reduced formula	10 - - - - 10	Reaction time and marginal saving do not invalidate the stability principle in ordinary conditions
Foreign trade	11 - - - - 11	The accelerator over-explains the cycle
Limits to the cumulative process: the natural rate of growth	12 - - - - 12	Long-range capital delays
Normal value of the warranted trade	13 - - - - 13	Long-range plans might challenge the instability condition
Instability and the cycle (intro.)	14 - - - - 14	Foreign trade
The slump: the forces depressing the warranted rate during the recession. Negative values of C and G. Circulating and fixed capital.	15 - - - - 15	Sketch of the cycle
The Factors influencing the warranted rate during recovery	16 - - - - 16	The natural and the "proper" warranted rates of growth: the downward turn
The ceiling of full employment	17 - - - - 17	Stimulants of growth acting on the fundamental condition
Inflation due to the normal warranted rate being below the natural rate	18 - - - - 18	Warranted and natural rates of growth and anti-cycle policies; inflation
Dynamics, lags and oscillations	19 - - - - 19	Ideal Policy
Stimulants of growth acting on the fundamental conditions	20 - - - - 20	Policies based on the rate of interest and on public works
Warranted and natural rates of growth and anti-cycle policies	21 - - - - 21	Theoretical and empirical evidence on the warranted and natural rates of growth
Anti-inflationary policies	22 - - - - 22	
Ideal Policy	23 ——— 19	
Policies based on the rate of interest and on public works	24 - - - - 20	
Theoretical and empirical evidence on the warranted and natural rates of growth	25 - - - - 21	

of the *Economic Journal*. Thick lines indicate strict correspondence of content and form; dotted lines indicate that some deletion, specification, or amendment occurred, or that additional material was added. Thin lines indicate the existence of a partial correspondence between the topics and the arguments between paragraphs, although often this material appears in the final version in an extremely condensed or attenuated form.

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