COLLECTED
ECONOMIC
PAPERS

VOLUME II

JOAN ROBINSON

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COLLECTED ECONOMIC PAPERS

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Volume Two

INTRODUCTION

My first volume of collected papers (published in 1951) was culled from the work of more than twenty years. The bulk of the present volume was written within the last five years, and all but one piece within the last eight. It belongs to the field of what is sometimes called post-Keynesian economics.

The first eight papers discuss problems of development under capitalism and socialism in a broad way, and may be of some general interest. The second group is highly scholastic. It consists of various chips from the block from which I hacked my *Accumulation of Capital*.

The third and fourth groups, on imperfect competition and on interest and employment, contain some attempts to link older questions to the requirements of a type of economic analysis which has freed itself from the need to assume conditions of static equilibrium.

I am indebted to the editors of: Occasional Papers, Delhi School of Economics; *Science and Society; Economic Journal; Annales de la Faculté de Droit de Liège; Review of Economic Studies; Oxford Economic Papers; Economie Appliqué; Rivista di Politica Economica; Il Mercurio; Bulletin of the Oxford Institute of Statistics*; and to Messrs. Routledge for permission to republish articles. Two pieces are taken from *The Rate of Interest and Other Essays* (Macmillan), which has been allowed to go out of print as the main part has been rendered obsolete by my *Accumulation of Capital*. The Philosophy of Prices, here published for the first time, will appear in Polish in *Ekonomista*.

Dr. A. K. Sen of Trinity College has kindly read the proofs.

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JOAN ROBINSON

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CAMBRIDGE

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I

PART I

MARX, MARSHALL AND KEYNES

THREE VIEWS OF CAPITALISM

THESE three names are associated with three attitudes towards the capitalist system. Marx represents revolutionary socialism, Marshall the complacent defence of capitalism and Keynes the disillusioned defence of capitalism. Marx seeks to understand the system in order to hasten its overthrow. Marshall seeks to make it acceptable by showing it in an agreeable light. Keynes seeks to find out what has gone wrong with it in order to devise means to save it from destroying itself.

To summarize in few words a whole complex structure of ideas is necessarily to falsify by over-simplification, but so long as we recognize the danger it may be legitimate to set out in a crude way the essential contrast between the economic theories which are the bases of these three points of view.

The central contention of Marx's scheme as we find it in Volume I of *Capital* is that, under capitalism, the real wages of the workers tend to be held permanently at a low level, while the capitalists receive as profit the excess of product over wages. The capitalists, he maintains, are not much interested in a luxurious standard of life for themselves. Under pressure of competition and the greed for more and more profit they invest the surplus in more and more capital, and they strive with each other each to raise the productivity of his own workers, so that the total product is ever increasing. Over the long run, the level of real wages is more likely to fall than to rise. The share of profits in total output grows ever greater as productivity increases and the rate of accumulation rises, until the inner contradictions of the system cause it to explode and a socialist revolution brings a new system into being.

Marshall's view of wages, profits and accumulation cannot be so clearly seen, partly because he concentrates attention on the details of relative prices, the fortunes of individual firms and supply and demand of particular commodities, while leaving the main outline into which these details fit extremely hazy. And partly because his whole system is based upon an unresolved conflict. The hard core of logical analysis in the *Principles* is purely static—it applies to an economy in which accumulation has come to an end—while all the problems that he discusses are connected with an economy in which wealth is growing as time goes by. In his view there is a *normal rate of profit* which represents the *supply price of capital*, but it is never clear whether this is the supply price of a certain amount of capital—the rate of profit at which there is neither growth nor decline in the total stock of capital—or whether it is the supply price of a certain rate of accumulation of capital. Profit is the *reward of waiting*—that is, of refraining from present consumption in order to enjoy future wealth—but it is never clear whether *waiting* means maintaining a stock of capital by refraining from consuming it or whether it means saving and adding to capital. It seems to mean sometimes one, sometimes the other and sometimes both at once, though Marshall is uneasily aware that they are not the same thing. This haziness makes his system impossible to describe in a clear way. But he states definitely enough that *waiting* is a factor of production and that the *real costs* of production are made up of efforts and sacrifices—efforts of the workers and sacrifices of the capitalists. The efforts are rewarded by wages and the sacrifices by profits. Taking the spirit of the argument which applies to a growing economy rather than the strict logic which requires a static economy, the capitalists invest and accumulate because profit is sufficient to counterbalance a sacrifice of present consumption. This causes total wealth to grow; the workers share in the benefit because wages rise with productivity while the supply price of capital remains more or less constant.

Keynes draws a sharp distinction between the two aspects of accumulation: saving—that is, refraining from consumption—and investing—that is, increasing the stock of productive capital. Marx's capitalists automatically save because they want to invest, so as to acquire more means of production in order to employ more labour and gain more profit. Marshall's capitalists auto-

matically invest because they want to save, that is, to own more wealth.

Keynes points out that in a developed capitalist economy the two sides of accumulation are not automatically connected. Saving means spending less on consumption and narrowing the market for commodities, so that it reduces the profitability of investment. Investment means employing labour to produce goods which are not available to be consumed and so increases demand relatively to supply. The two sides of the process of accumulation are not linked together in such a way as to keep them in harmony. On the contrary, the very nature of private enterprise causes them to have a chronic tendency to get out of gear. At some time the economy is trying to invest more than it can; the demand for labour for consumption and investment taken together exceeds the available supply and there is inflation. But this is rare apart from war-time. Normally the reverse situation prevails; investment is less than it easily could be and potential wealth is wasted in unemployment.

Each point of view bears the stamp of the period when it was conceived. Marx formed his ideas in the grim poverty of the forties. Marshall saw capitalism blossoming in peace and prosperity in the sixties. Keynes had to find an explanation for the morbid condition of 'poverty in the midst of plenty' in the period between the wars. But each has significance for other times, for in so far as each theory is valid it throws light upon essential characteristics of the capitalist system which have always been present in it and still have to be reckoned with.

Each, moreover, is bound up with a particular political attitude to the economic system which is highly relevant to the problems that confront us to-day.

Marx maintained that capitalism is bound to develop in such a way as to bring about its own destruction, and urged the workers to organize themselves to hasten its overthrow. Marshall argued that, in spite of some blemishes, it is a system which promotes the good of all. Keynes shows that it has deep-seated defects which, however, he believed are capable of being remedied. Marx is making propaganda against the system. Marshall is defending it and Keynes is criticizing in order to improve it.

Economic doctrines always come to us as propaganda. This is bound up with the very nature of the subject and to pretend that

it is not so in the name of 'pure science' is a very unscientific refusal to accept the facts.

The element of propaganda is inherent in the subject because it is concerned with policy. It would be of no interest if it were not. If you want a subject that is worth pursuing for its intrinsic appeal without any view to consequences you would not be attending a lecture on economics. You would be, say, doing pure mathematics or studying the behaviour of birds.

The once orthodox *laisser-faire* theory evaded the issue by trying to show that there is no problem about choosing policies. Let everyone pursue his own self-interest and free competition will ensure the maximum benefit for everyone. This obviously cannot apply where any over-all organization is necessary—the banking system, the railways, the national exchequer. But even where it is technically possible to run the system on a basis of catch-as-catch-can, there is an inconsistency at the very root of the argument. In pursuing self-interest individuals find that it assists them to combine and agree not to compete. Monopolies, trade unions, political parties, arise out of the very process of competition and prevent it from being effective as a mechanism for ensuring the general good. Pure untrammelled individualism is not a practicable system, and the coherence of an economy depends upon the acceptance of limitations upon it. There must be a code of rules of the game, whether established by law or agreed by common consent. No set of rules of the game can ensure a perfect harmony of interests between all the groups in society, and any set of rules will be defended by those whom it favours and attacked by those whom different rules would suit better.

Economic theory, in its scientific aspect, is concerned with showing how a particular set of rules of the game operates, but in doing so it cannot help but make them appear in a favourable or an unfavourable light to the people who are playing the game. Even if a writer can school himself to perfect detachment he is still making propaganda, for his readers have interested views. Take, for example, a piece of pure analytical argument such as that the operation of the gold standard secures stability of the exchanges provided that money-wage rates are flexible. This means that it will not function well where Trade Unions are strong and prevent wages from falling when the preservation of the exchange rate requires that they should. This is a purely

scientific statement and there is not much room for disagreement about it regarded as a description of the way the system works. But to some readers it will appear as strong propaganda against the trade unions, to others as strong propaganda against the gold standard.

This element of propaganda enters into even the most severely technical details of the subject. It cannot fail to be present when the broad issue of the operation of the system as a whole is under discussion.

Each of our three economists is concerned with describing the rules of the capitalist game, and therefore with criticizing or defending them. Marx shows that the rules are unfavourable to the workers, and for that very reason will not be tolerated for long. Marshall argues that the rules are framed in such a way as to produce the greatest possible growth of wealth, and that all classes benefit from sharing in it. Keynes is showing that the rules need to be amended so as to ensure that wealth will continue to grow.

The description and the evaluation cannot be separated, and to pretend that we are not interested in the evaluation is mere self-deception.

Marx is quite clear about his purpose. He is on the side of the workers and he makes the case against capitalism in order to encourage the workers to overthrow it.

Marshall was not openly and clearly on one side or the other in the clash of interests between workers and capitalists. His case is rather that if everyone will accept the system and not make a fuss about it, all will benefit together.

> In regard to sectional interests. Nearly all of them are changing their character and becoming increasingly plastic: but the chief change is the assimilation of the training, and consequently the capacity, of the working classes generally to those of the well-to-do. . . .
> We are indeed approaching rapidly to conditions which have no close precedent in the past, but are perhaps really more natural than those which they are supplanting—conditions under which the relations between the various industrial strata of a civilized nation are being based on reason, rather than tradition. . . . It is becoming clear that this and every other Western country can now afford to make increased sacrifices of material wealth for the purpose of raising the quality of life throughout their whole populations.[1]

[1] *Industry and Trade*, pp. 4–5.

Keynes is against waste and stupidity and unnecessary poverty. He is not so much interested in who gets the benefit of increased production, as in making sure that it takes place. He regards a greater equality of income as desirable but his attitude is 'moderately conservative'[1] and he holds that if only capitalism could be made to function efficiently it would be better than any alternative.

The burden of Marx's propaganda is that capitalism is pernicious and should be destroyed; of Marshall's, that it is beneficial and should be preserved; of Keynes', that it could be made fairly tolerable if people had a little sense.

Each of the three is trying to justify a particular view of the system and so is making propaganda for it. But each has sufficient faith in his own view to believe that the truth will bear him out, and each is trying to make a genuinely scientific approach to economic problems. They cannot help being propagandists, but they are scientists as well. To learn from them we first have to see what it is that they are driving at. Then we can make use of them as scientists while reserving the right to have our own opinion on questions of politics.

IDEAS AND IDEOLOGY

We must admit that every economic doctrine that is not trivial formalism contains political judgments. But it is the greatest possible folly to choose the doctrines that we want to accept by their political content. It is folly to reject a piece of analysis because we do not agree with the political judgment of the economist who puts it forward. Unfortunately, this approach to economics is very prevalent. The orthodox school has been largely stultified by refusing to learn from Marx. Because they do not like his politics they attend to his economics only to point out some errors in it, hoping that by refuting him on some points they will make his political doctrines harmless.

Thus the discussion of Marx has been mainly confined to criticizing the Labour Theory of Value. The labour theory is an omnibus title used to cover a number of aspects of the Marxian doctrine. One element in it is the theory of what determines the relative prices of commodities in long-run equilibrium. The

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[1] *General Theory*, p. 377.

orthodox economists can easily show that the view that prices are proportional to labour-time required for production is not an adequate theory of relative prices. By concentrating upon this question they succeeded in carrying the argument into a sphere where they could score a number of superficial points against the Marxists. They were not in the least interested in trying to learn from Marx or in inquiring what the relevance of these points was to the main issue.

In this they were very much helped by the Marxists, who instead of replying to all the intricate arguments about the theory of prices: so what? allowed themselves to be drawn into a number of sophistries in an endeavour to defend Marx even when he was not defensible.

Under the dust of all this controversy about inessentials the most valuable parts of Marx's theory was lost to sight by both parties.

To take one instance, the schema for expanding reproduction provide a very simple and quite indispensable approach to the problem of saving and investment and the balance between production of capital goods and demand for consumer goods. It was rediscovered and made the basis for the treatment of Keynes' problem by Kalecki and reinvented by Harrod and Domar as the basis for the theory of long-run development. If Marx had been studied as a serious economist, instead of being treated on the one hand as an infallible oracle and on the other as a butt for cheap epigrams, it would have saved us all a great deal of time.

The Marxists have been just as bad as the orthodox economists in refusing to learn from those whose political views they dislike. Feeling on the defensive, they regard it as a kind of treachery to admit any point made by Marx's critics, and insist upon defending him in every detail, so that they will not even concede to Marshall that the Labour Theory of Value is a crude account of the determination of relative prices which requires to be amended and elaborated in certain respects.

This inflexibility is particularly marked in their reaction to Keynes. Because they reject the idea that capitalism can be rescued from crises by economic measures carried out by governments they deny the logic of Keynes' argument. They point out that Keynes is subject to an illusion when he appeals to the State

as though it were a benevolent impartial arbiter which can be relied upon to do the best for everyone if only it can be made to understand how to set about it. They maintain that the State is an organ of the capitalists and that therefore it is vain to look to it to carry out policies to prevent unemployment for the benefit of the workers.

There is much force in the first part of the argument but the second is a *non sequitur*. Capitalists do not like having crises. Unemployment is accompanied by losses. And nowadays they have a very strong reason to dislike unemployment itself, for it provides dangerous ammunition to their political enemies. In preventing unemployment the governments would be doing for them something that they want done but cannot do for themselves.

Marx in his day had a far more penetrating and subtle insight into the workings of the system than his modern followers. In discussing the legal limitation of the working day he showed how each individual capitalist had an interest in preventing legislation that would limit his power to exploit his workers. Yet collectively it favoured their interests, for excessive exploitation ruins the labour force on which they all depend. Thus, under the guise of resisting the demand for labour legislation put forward by the workers and the humanitarians, they allowed it to be carried out.

In the same way, while declaiming against Keynesian policies as an illegitimate interference with the proper functions of private enterprise, they in fact rely upon it to save them from themselves.

The foolishness of rejecting economic analysis because of the political doctrines with which it is associated is shown by the fact that, as it happens, the aspect of capitalism which each of the great economists illuminates provides the basis for political conclusions the opposite of his own.

The best defence of capitalism as an economic system can be made on the basis of Marx's analysis. This was realized by Schumpeter, and recently carried a stage further by his disciple Professor Galbraith.[1] They provide a tough, cynical and intelligent defence of the capitalist rules of the game which is far more effective than the soft, sophistical special pleading of the orthodox school.

Marx emphasizes the manner in which the capitalist rules of the game foster accumulation and technical progress. His

[1] *American Capitalism.*

capitalists are not interested in luxurious living. They exploit labour in order to accumulate, and they increase productivity in order to have a greater surplus to invest. 'The productiveness of labour is made to ripen as if in a hot-house.' They prevent the workers from receiving any share in the increased production, for if the workers consumed more there would be less accumulation and the growth of total wealth would be impeded.

This provides an account of the function of exploitation. It explains, incidentally, why in a socialist economy which is undertaking rapid development the standard of life rises at first very slowly, and why it is necessary, when private profit does not create a gap between wages and prices, for a gap to be created by taxation in order to provide the funds for accumulation.

When Keynes was describing the flourishing capitalism of the pre-1914 world, before he became preoccupied with the problem of unemployment, he set out an analysis which is essentially the same as that of Marx.

> Europe was so organized socially and economically as to secure the maximum accumulation of capital. While there was some continuous improvement in the daily conditions of life of the mass of the population, Society was so framed as to throw a great part of the increased income into the control of the class least likely to consume it. The new rich of the nineteenth century were not brought up to large expenditures, and preferred the power which investment gave them to the pleasures of immediate consumption. In fact, it was precisely the *inequality* of the distribution of wealth which made possible those vast accumulations of fixed wealth and of capital improvements which distinguished that age from all others. Herein lay, in fact, the main justification of the Capitalist System. If the rich had spent their new wealth on their own enjoyments, the world would long ago have found such a régime intolerable. But like bees they saved and accumulated, not less to the advantage of the whole community because they themselves held narrower ends in prospect.
>
> The immense accumulations of fixed capital which, to the great benefit of mankind, were built up during the half-century before the war, could never have come about in a Society where wealth was divided equitably. The railways of the world, which that age built as a monument to posterity, were, not less than the Pyramids of Egypt, the work of labour which was not free to consume in immediate enjoyment the full equivalent of its efforts.

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In writing thus I do not necessarily disparage the practices of that generation. In the unconscious recesses of its being Society

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knew what it was about. The cake was really very small in proportion to the appetites of consumption, and no one, if it were shared all round, would be much the better off by the cutting of it. Society was working not for the small pleasures of to-day but for the future security and improvement of the race—in fact for 'progress'.[1]

There is no disagreement here with Marx's analysis, though the purpose of the argument is to explain why capitalism survived rather than to show why it ought to be overthrown.

In order to make the case against capitalism it is necessary to turn to Marshall's argument. It is true that, in the main, profit is desired for the purpose of accumulation, but that is not the whole truth. Profit is also the basis for consumption by capitalists. They have to be 'rewarded for waiting' and they will not save, or even preserve wealth accumulated in the past, unless they are fattened up to a certain point by a high standard of life for themselves. For society to pay for saving by permitting a great inequality in consumption is a very wasteful and expensive method of getting the job done. It would be far more economical to dispossess the capitalists, put past accumulated wealth into the safekeeping of society where no one can get at it, to consume property 'in immediate gratification' at the expense of the future, and to decide the rate of accumulation to be carried out on a general view of the development of the economy as a whole rather than according to the whims of individuals.

Marshall's analysis can be used to show why socialism is necessary. According to Marshall's own argument, a greater real benefit is gained from a given income if it is equally distributed than if some individuals are enjoying such a luxurious standard of life that saving is no effort to them, while others are struggling to survive. If the object of production is to provide for the welfare of human beings it is very uneconomic to have the fruits of a given rate of production unequally distributed. But if incomes are equally distributed there would not be enough saving done to permit development. In order to be able to have a more economic distribution of income it is necessary for saving to be collective, and if the saving is done collectively, capital must be owned collectively.

If the capitalists fully lived up to Marx's description and really invested the whole surplus there would be no need for socialism.

[1] *Economic Consequences of the Peace*, pp. 18–21.

It is the rentier aspect of profit, as a source of private wealth, which Marshall emphasizes, that makes the strongest case for socialism; and the entrepreneur aspect of profit as the source of accumulation, which Marx emphasizes, that makes the strongest case for capitalism.

Keynes' analysis also provides a case for the opposite political conclusions. He shows, first that there is a natural tendency for an advanced capitalist economy to run into chronic stagnation, with permanent unemployment, and that it is by its very nature highly unstable. He argues that some measure of interference with the pure private-enterprise system is necessary to keep it running efficiently. In particular, governments must undertake a sufficient amount of investment to make up for the failure of private capitalists to keep investment continuously at the desirable level. But so long as a large part of investment is left in private hands it is necessary that the interference must not lead to a state of affairs in which the private section invests less just because governments are investing more. A high rate of accumulation necessarily leads to a decline in the profitability of further investment. It follows that, to keep up the level of demand for labour, wasteful investment is more effective than useful investment. 'Two pyramids, two masses for the dead, are twice as good as one; but not so two railways from London to York.'[1]

> In so far as millionaires find their satisfaction in building mighty mansions to contain their bodies when alive and pyramids to shelter them after death, or, repenting of their sins, erect cathedrals and endow monasteries or foreign missions, the day when abundance of capital will interfere with abundance of output may be postponed. 'To dig holes in the ground', paid for out of savings, will increase, not only employment, but the real national dividend of useful goods and services.[2]

Keynes' own purpose was to illustrate the paradoxes of capitalism and to plead for a rational control over investment, but the effect of his argument is to explain why it is that modern capitalism flourishes when governments are making investments in armaments. Instead of being a ruinous burden on a highly developed economy, the apparent economic waste of armaments is really a method of maintaining prosperity. It follows that if there were no need for armaments it would be necessary to make useful

[1] *General Theory*, p. 131.   [2] Ibid., p. 220.

investments and so to encroach upon the power and independence of the capitalists. The capitalists therefore prefer a situation in which armaments do seem necessary. This cure, most of us would agree, is even worse than the disease, and on the basis of Keynes' reasoning it can be argued that capitalism will not save itself from the tendency to unemployment by any other means.

Marx's analysis of capitalism shows its strong points, although his purpose was to attack it. Marshall's argument inadvertently shows the wastefulness of capitalism, although he meant to recommend it. Keynes in showing the need for remedies to the defects of capitalism also shows how dangerous the remedies may be.

To learn from the economists regarded as scientists it is necessary to separate what is valid in their description of the system from the propaganda that they make, overtly or unconsciously, each for his own ideology. The best way to separate out scientific ideas from ideology is to stand the ideology on its head and see how the ideas look the other way up. If they disintegrate with the ideology, they have no validity of their own. If they still make sense as a description of reality, then there is something to be learned from them, whether we like the ideology or not.

The Great Contradictions

It is foolish to refuse to learn from the ideas of an economist whose ideology we dislike. It is equally unwise to rely upon the theories of one whose ideology we approve.

An economic theory at best is only a hypothesis. It does not tell us what is the case. It suggests a possible explanation of some phenomenon and it cannot be accepted as correct until it has been tested by an appeal to the facts. The business of the disciples of a great economist is not to propagate his doctrines but to test his hypotheses. If the facts turn out not to fit an hypothesis, the hypothesis must be rejected. It is of no use to choose an hypothesis by the colour of the economist who puts it forward and then to reject the facts that do not agree with it.

Marx's hypothesis, in the simple form of his theory that he worked out and published in Volume I of *Capital* is that, taking it by and large, with exceptions and qualifications, it is to be expected that under capitalism real wages will remain more or less constant. He has two grounds for this point of view. One is

purely metaphysical. Everything exchanges at its value; that is, for the product of an amount of labour-time equal to that which is required to produce it.

> The value of labour-power is determined, as in the case of every other commodity, by the labour-time necessary for the production, and consequently also the reproduction, of this special article. So far as it has value, it represents no more than a definite quantity of the average labour of society incorporated in it.[1]

This is a metaphysical approach to the problem of the determination of wages. When we ask *why* do you believe that labour power exchanges for its value? he replies: Everything that is exchanged is exchanged for its value.

But he also has an analytical answer. The workers are weak and unorganized. Employers can make wages as low as they please subject to the technical necessity to keep the labour force in being. Thus wages are set at the conventional subsistence level. When an excess demand for labour due to rapid accumulation tends to drive them up, or when trade unions face the employers with bargaining power equal to their own and extort concessions from them, the system reacts in such a way as to bring wages down again. First, the mere fact that wages are higher means that there is less accumulation. When population is growing, a slowing up in accumulation causes the demand for labour to lag behind the supply. Secondly, to overcome a threatening scarcity of manpower, labour-saving inventions are made; output per head rises and a given amount of capital employs less labour. The consequent unemployment undermines the bargaining power of the workers. Thus the real-wage rate can never for long be maintained much above the level at which it was first established 'when the class of free labourers was formed'; that is, when capitalism first took over from peasant and artisan production.

Now, by and large, this hypothesis has failed to be verified. In fact, in the developed capitalist economies the level of wages has risen. The rise in productivity has been sufficient to permit both accumulation *and* a rise in the standard of life of the workers.

Lenin tried to explain this away, and latter-day Marxists have a stock answer which they always produce when challenged on this point. The rise in wages, they say, applies only to the

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[1] *Capital* (The Modern Library), p. 189.

imperialist countries. Profits have been maintained by colonial exploitation and the capitalists could therefore indulge the workers at home by allowing them higher wages. They are pampered 'palace slaves' sharing in the exploitation of the colonial workers.

This argument smacks of special pleading—an attempt to force the facts to fit the hypothesis instead of reconsidering the hypothesis in the light of facts. The argument that the high rate of profit obtainable from exploiting low-wage labour in the colonies raises home wages does not seem very plausible. Capitalists expect to get more or less the same rate of profit wherever they invest; if profits abroad are high they do less investment at home. The demand for labour at home is therefore reduced, not increased, by the existence of cheap labour abroad.

There is no doubt that home labour in the imperialist countries has gained from colonial exploitation, but by a different mechanism. Low colonial wages have helped to make raw materials cheap and so have made the terms of trade favourable to the industrial nations. No doubt also some advantage to the workers spills over from the wealth of capitalists who have made fortunes abroad, through their taxable capacity, charity and the demand for services. But it would be absurd to suppose that more than a small fraction of the rise in the standard of life of the industrial workers, especially in America, can be accounted for in this way. Wages have risen because of the great technical productivity which has been fostered by capitalism and because the system operates in such a way as to keep the share of wages in the growing total of production more or less constant.

The fact of rising real wages requires a very important modification of the central thesis of Marx's theory. It has turned out not to be the case that increasing misery drives the workers to rebellion. The capitalists have succeeded in buying them off by giving them a share in the product which capitalism brings into being. Moreover, the workers become saturated with capitalist ideology and look at life in terms of capitalist values. They have developed a state of mind in which they do not want the rules of the game to be altered. It is very noticeable to-day that Marxism flourishes best in countries where capitalism is least successful.

Marx himself became aware that this was going on during his own lifetime.

The English proletarian movement in its old traditional Chartist form must perish completely before it can develop itself in a new form, capable of life. And yet one cannot foresee what this new form will look like. For the rest, it seems to me that [the new policy] is really bound up with the fact that the English proletariat is becoming more and more bourgeois, so that this most bourgeois of all nations is apparently aiming ultimately at the possession of a bourgeois aristocracy and a bourgeois proletariat as well as a bourgeoisie.[1]

This is even more true of modern America than it was of England in the sixties.

Marx never succeeded in completing his great plan. The last two volumes of *Capital* are compilations from his notes, not fully worked out and to some extent confused and inconsistent. It has often been suggested that the reason why Marx was held up was because he could not find a way through the contradiction between his hypothesis and the facts around him.

The contradiction is much more striking to-day. It is now clear that the revolutionary transition to socialism does not come in the advanced capitalist nations, but in the most backward. It is easy enough to say, being wise after the event, that it is natural to expect 'the weakest link in the chain to break'. But there is much more in it than that. Current experience suggests that socialism is not a stage beyond capitalism but a substitute for it—a means by which the nations which did not share in the Industrial Revolution can imitate its technical achievements; a means to achieve rapid accumulation under a different set of rules of the game. This makes a drastic reconsideration of Marx's central hypothesis necessary. There is much to be learned from Marx's analysis of capitalism, but if we simply swallow it whole we are liable to be seriously misled.

On the question of the standard of life, Marshall's theory stands the test of experience better than Marx's. But Marshall's theory also contained a fatal flaw. The unemployment of the inter-war period revealed the crack in his system which Keynes penetrated in order to explode it.

Marshall, like Marx, failed to complete the great three-volume work that he projected.[2] Like Marx, he himself saw the weak

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[1] *Marx Engels' Selected Correspondence* (Lawrence & Wishart), p. 115.
[2] He did, indeed, publish *Money, Credit and Commerce*, but it is a pale ghost of the third volume of the *Principles* which he originally intended it to be.

spot in his own theory. His whole argument depends upon the beneficial effect of accumulation. But abstaining from present consumption in order to save is not the same thing as adding to the stock of capital. Marshall was aware of this flaw in his system, and anticipated Keynes' exposure of it.

> But though men have the power to purchase they may not choose to use it. For when confidence has been shaken by failures, capital cannot be got to start new companies or extend old ones. . . . Other trades, finding a poor market for their goods, produce less; they earn less, and therefore they buy less: the diminution of the demand for their wares makes them demand less of other trades. Thus commercial disorganization spreads: the disorganization of one trade throws others out of gear, and they react on it and increase its disorganization.
> The chief cause of the evil is a want of confidence. The greater part of it could be removed almost in an instant if confidence could return, touch all industries with her magic wand and make them continue their production and their demand for the wares of others. . . . But the revival of industry comes about through the gradual and often simultaneous growth of confidence among many various trades; it begins as soon as traders think that prices will not continue to fall: and with a revival of industry prices rise.[1]

Here is the germ of the theory to account for crises and chronic stagnation with which Keynes exploded Marshall. Perhaps Marshall, like Marx, was frustrated by seeing the contradiction in his theory without being able to see a way through it.

The inadequacy of Keynes' doctrine does not lie in an inconsistency in the theory but in its narrow range. Keynes is discussing the problem of unemployment in a developed economy where there is productive capacity already in existence and all that is needed is a profitable market for its potential product. He is trying to find a cure for the diseases that beset wealthy nations. His argument throws little direct light on the problems of a country which suffers from a lack of productive capacity or on the kind of unemployment (which Marx deals with) that arises from having too little capital to be able to offer work to all available labour. It is of no use to apply Keynes' prescriptions in situations which they do not suit. Where lack of productive capacity is the problem, merely generating demand only leads to inflation, and expenditure for its own sake—building pyramids instead of railways—is clearly not what the situation demands.

[1] *Principles*, pp. 710–11. (8th Edition, original.)

In short, no economic theory gives us ready-made answers. Any theory that we follow blindly will lead us astray. To make good use of an economic theory we must first sort out the relations of the propagandist and the scientific elements in it, then by checking with experience, see how far the scientific element appears convincing, and finally recombine it with our own political views. The purpose of studying economics is not to acquire a set of ready-made answers to economic questions, but to learn how to avoid being deceived by economists.

NOTES ON MARX AND MARSHALL

MARX

VALUE

THE 'Keynesian Revolution', which divides the General Theory as much from Marx as from Ricardo, was the adoption of the money-value of labour (the wage rate) in place of the labour-value of money as the unit of account. The labour-value of money is a purely mythical conception, for money has no cost of production. It is a social convention, comparable to an alphabet. True, it is an institution which has a certain cost of upkeep (just as an alphabet requires maintenance by school teachers). In this cost labour in gold-mining plays a part. But even if every transaction involving money had to be made by passing gold from hand to hand, still the value of money would not depend upon the cost of mining. Each generation inherits a stock of gold from the past which is a 'free gift' from history (to make a convenient medium of exchange a commodity must be highly durable, so that when it has been in use for some time, its stock is large relatively to its rate of production) and if the stock is inconveniently small, even an unsophisticated community soon finds ways to augment it with acceptable tokens. Money is a creation of society, and the most essential element in the purchasing power of money is its purchasing power over one's neighbours' time.

Marx took over from Ricardo the conception of the labour-value of money and added to the mystification by reckoning in terms of the labour-value of value. But when we reckon in terms of the money-value of labour the time-honoured conundrum: Where did value come from? vanishes and we are left confronting an actual question: How are money prices related to money wages; that is, how does the wage of labour in terms of commodities behave as capital accumulates? Marx assumed, at least in Volume I of *Capital*, that, by and large, real-wage rates tend to be constant, so that, as capitalism develops and output per

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These notes formed part of the 'Acknowledgments and Disclaimers' in my *Rate of Interest and Other Essays.*

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man-hour rises, the gap between the real income of workers and of capitalists grows ever wider. At this time of day it appears a more plausible generalization that real-wage rates tend to rise with productivity. But in any case, the choice between these two hypotheses is a question of fact, not of metaphysics.

CAPITAL

The labour theory of value has another aspect. The assertion that it is only labour which produces value means that it is not correct to treat capital as a 'factor of production'. For some purposes we may use the word 'capital' in a concrete sense, to mean the stock of equipment and work-in-progress the use of which enables labour to produce output, and which is in turn produced by labour with its own use. When the word is taken in this sense it seems rather a hair-splitting question to dispute whether capital is productive itself, or only assists labour to be productive. But certainly a great deal of confusion has flourished in economic theory as a result of treating labour and capital as symmetrical concepts.

When by capital we mean finance, it is clearly inappropriate to regard it as a factor of production, though a distribution of wealth favourable to enterprise, and ease of borrowing due to a well-organized financial system and a favourable state of confidence, facilitate the development of productivity.

There is certainly a sense in which accumulation may be said to promote productivity, but saving cannot be treated as a factor of production symmetrical with labour (though it might be treated as symmetrical with the birth rate). The concept of capital as *waiting* is useful for propaganda rather than logical analysis.

Thus Marx's refusal to treat capital as a factor of production seems well founded. Whether it is right to regard natural resources in the same way is more dubious, though to do so may have been a helpful stage in the development of thought. In general, Marx very much played down the influence of geography upon human affairs. In this respect the balance was redressed by Rosa Luxemburg, and where her treatment of the subject departs from his, she seems to me to have improved it.

THE THREE RATIOS

Marx's analytical system is built up by means of three ratios: the rate of exploitation, the rate of profit on capital and the organic composition of capital. He divides gross annual output of industry as a whole into: (1) constant capital used up and replaced—that is, raw materials entering into final output and wear and tear of plant, represented by the symbol c; (2) variable capital—that is, the annual wage bill, v; and (3) surplus—that is, interest, rent and profits, s. But constant and variable capital have other meanings as well. Variable capital stands for that part of the value of work in progress which is made up of wages costs, and constant capital stands for the rest; that is, stocks of materials and fixed equipment. This division corresponds to the idea that capital laid out in employing labour enables the capitalist to acquire surplus value, while materials can yield only their own value.

Marx writes s/v for the rate of exploitation and $s/(c + v)$ for the rate of profit on capital (not for the ratio of surplus to costs of production). He uses one set of symbols for two meanings. Let us write C and V for constant and variable capital in their aspect as divisions of the stock of capital, and c and v when they appear as elements in gross income. Now clearly s/V has no significance. The amount of surplus a capitalist gets out of his workers is not related in any particular way to the amount of capital he has invested in a wages fund. For instance, workers normally advance one week's worth of wages fund to their employers, and they would be more, not less, exploited if they were paid at longer intervals, so reducing the amount of their employers' capital locked up in V. It is variable capital in its aspect as wages per annum that yields surplus. The rate of exploitation, then, is s/v, the ratio of surplus per annum to wages per annum.

From a formal point of view it is only another way of expressing the share of profit in net output, but it has a political meaning. It implies that the workers are paying too high a fee for the accumulation, maintenance and management of the stock of capital, and that there is a cheaper and better way of getting the job done than by allowing this share in the product to entrepreneurs and owners of wealth.

The rate of profit on capital means much the same in Marx's system as in any other. The meaning of the third ratio, the

organic composition of capital, is not so easy to recognize and must be discussed at greater length.

Organic composition of capital is the ratio of constant to variable capital. In which sense should we take it? It sounds as though it referred to the division of the stock of capital into its two parts, so that it should be written C/V. But this will not do. The central proposition in Marx's theory of profits is that as capital accumulation goes on, the organic composition of capital rises, and that, if the rate of exploitation remains constant, the rate of profit on capital falls. This is expressed in the formula—with s/v constant and c/v rising through time, $s/(c + v)$ is falling through time.[1] But s/v constant, C/V rising, then s/(C + V) falling, is a *non sequitur*. Marx assumes, merely for convenience, that the wages fund happens to be equal to one year's wages bill (v = V) so that it is easy to slip from one to the other without noticing the change of meaning; but neither meaning makes sense of the formula, for c/v, C/v and C/V are all equally nonsensical.

But there is no point in wrangling with the symbols. We must try to find the meaning of organic composition which fits the central proposition.

A constant rate of exploitation means that the share of surplus in net output is constant. Now, in terms of the categories used in modern economics,* when the rate of profit is constant, neutral innovations leave the share of capital constant, and capital-using innovations raise it. But if the rule is that the relative shares do not vary with the technique employed, then capital-using innovations (those which increase capital per unit of labour when capital is measured in wage units) reduce the rate of profit. Thus it makes sense of the central proposition if we identify rising organic composition with an increase in capital per unit of labour.

This seems quite straightforward as far as the formal analysis is concerned. The difficulty about the 'law of falling profits' lies in postulating a constant share of capital in net output when capital per unit of labour is rising. Where the real-wage rate is constant (as Marx usually assumed it to be) any type of innovation which is not heavily capital-using must raise the rate of profit.

[1] *Capital*, Volume III, chapter 13.

* Cf. p. 178.

MARSHALL

Marshall acknowledged with great candour that he was flummoxed by the problem of dynamic analysis. After discussing the problem of equilibrium with falling supply price he writes: 'But such notions must be taken broadly. The attempt to make them precise over-reaches our strength.'[1] And again: 'The unsatisfactory nature of these results is partly due to the imperfections of our analytical methods. . . . We should have made a great advance if we could represent the normal demand and supply price as functions both of the amount normally produced and of the time at which that amount became normal.'[2]

His difficulty is clearly seen in the famous diagram in appendix H to the *Principles*, where he draws a branched supply curve showing that an increase in output reduces supply price by more than a decrease raises it. This, of course, is a totally illegitimate use of a plane diagram, and has caused generations of smart Alecs to mock.

What he was trying to say is fairly clear, and may perhaps be put as follows: If the demand for a commodity is such, in situation Alpha, that the rate of output is, has long been, and is expected to continue at the rate $M + \triangle M$ per week, costs will be lower than it is in situation Beta, with output equal to M. Now if a change were to occur in situation Beta such as to carry output to $M + \triangle M$, then, after a little time, costs would fall to the level found in situation Alpha; whereas a change in situation Alpha which caused output to contract to M would not lead to a rise in cost to the level found in situation Beta, but to something lower.

There are other indications that Marshall habitually thought of a movement to the right along a supply curve (output increasing) as a movement forward through time.[3] This accounts for the extraordinary importance that he attached to what now seems a mere *curiosum*—economies of large-scale industry in competitive conditions.[4] The reason is that he somehow boiled the effect of technical progress going on through time into the movement down his supply curve.

[1] *Principles*, p. 460.   [2] Appendix H, p. 809.
[3] See Shove, 'The Place of Marshall's *Principles* in the Development of Economic Theory', *Economic Journal*, December 1942, p. 312.
[4] Cf. Sraffa, 'The Laws of Returns under Competitive Conditions', *Economic Journal*, December 1926.

The dilemma in which Marshall found himself between a static analysis and a dynamic picture of the world comes to the surface in the definition of normal profits. If a given rate of profit is the supply price of a given quantity of capital and enterprise, then supply is constant when profits are normal, and it requires super-normal profits to call forth an increase in the stock of capital. But if accumulation is normally going on, 'normal profits' must mean the level of profits calling forth a normal rate of accumulation.[1] This conflict is nowhere resolved.

Marshall's plan was to deal with the prices of particular commodities in Volume I of the *Principles*, and to leave the problem of the general price level and the total of output for a later volume. At the end of Volume I he foreshadows the General Theory, and looks for the key to fluctuations in total output in the inducement to invest in fixed capital,[2] but when the ghost of his projected treatment of the subject finally appeared as *Money, Credit and Commerce*, the General Theory was still to write.

What provisional assumptions he was meanwhile making about the behaviour of output as a whole cannot be said, and any view of what Marshall *really meant* can always be countered by quotations from the *Principles* which show conclusively that he meant just the opposite. All the same it may be worth while to try to find assumptions that fit what seem to be the main dynamical elements in Marshall's scheme of ideas.

Imagine an economy in which there is no bottle-neck of equipment or specialized skill in the capital-goods industries to limit the possible rate of investment. (This would be found if investment consisted mainly in appropriating hitherto unused natural resources such as timber, with the aid only of simple tools, as in Marshall's archetypal example of investment—a peasant building himself a weather-proof hut.[3]) Nor does finance set a limit. Any entrepreneur can borrow as much as he pleases at the ruling rate of interest. Ordinary labour is the only bottle-neck.

As in a golden age,[4] the rate of profit expected on new capital in the future is equal to the rate ruling in the present. So long as the rate of interest does not exceed the rate of profit, there is an

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[1] Cf. Shove, 'Mrs. Robinson on Marxian Economics', *Economic Journal*, April 1944, p. 60.

[2] pp. 710–11.   [3] *Principles*, p. 233.

[4] Cf. my *Accumulation of Capital*.

indefinitely large increase in the stock of capital which entre-
preneurs would like to make. The rate at which investment
plans can be carried out is limited solely by the availability of
labour. The amount of labour available for investment is the
total *minus* that employed in consumption-goods industries. We
must suppose that when normal prices prevail there are sufficient
frictions to prevent workers employed in consumption-goods
industries from being enticed away by investment-goods entre-
preneurs, otherwise the situation would be chronically unstable.
But the investment-goods industries readily take on any workers
who happen to come into the labour market. Thus full employ-
ment always prevails. Capital accumulates at the rate dictated
by the full-employment rate of investment, and since investment
always fills whatever gap there may be between consumption and
full-employment output, there is never any problem of a defi-
ciency of effective demand. (But here the unresolved conflict
between static and dynamic theory leaves a hazy patch in the
analysis.)

On these assumptions the demand for labour at any moment
is perfectly elastic to the rate of interest, at the value of the rate
of interest which coincides with the (actual and expected) rate
of profit. For, if the rate of interest chanced to fall below this
level, the price of existing capital goods would rise above the
cost of production of new ones, excess demand in the capital-goods
industries would break through the frictions in the labour market
and an inflationary rise in wages and prices would set in. Con-
versely, if the rate of interest chanced to rise, new investment
plans would cease to be made, the rate of investment would
rapidly decline, and unemployment would occur. But in the first
case, a rise in demand for money due to the rise in wages would
quickly drive the rate of interest up, and in the second, a fall in
demand for money due to the fall in employment would quickly
drive it down, so that it could not remain, for more than a passing
flutter, at any level except that corresponding to the rate of profit.

The above seems to fit Marshall's view that the normal long-run
level of the rate of interest is determined by the profitability of
capital, and that any monetary disturbance which causes the
market rate of interest to depart from this normal level generates

a cumulative movement of prices which brings the market rate of interest back to equality with the rate of profit.[1]

There is an important element in common between this conception of a full-employment economy and an imagined golden age. In both the continuance of accumulation requires faith. Everything depends upon entrepreneurs acting on the belief that the present rate of profit will continue to be obtainable in the future. This is in accordance with Marshall's conception that slumps are caused by a failure of confidence and recoveries by its rebirth.[2]

The main difference between the model of a golden age and this system of ideas arises from the central point of the General Theory. In the golden-age model a rise in thrift above the level to which the system is adjusted plunges the economy into a slump. In this one, an increase in thrift releases labour which is immediately used to speed up the rate at which investment plans are carried out, and from the point of view of effective demand the distinction between consumption and saving is of no importance. This fits Marshall's 'familiar economic axiom that a man purchases labour and commodities with that portion of his income which he saves just as much as with that which he is said to spend'.[3]

There is one part of Marshall's system which does not fit into this interpretation: that is the conception of the rate of interest as the supply price of 'waiting'. 'The supply price of waiting' must surely mean the rate of interest at which owners of wealth are just willing to refrain from consuming their capital in 'present gratifications'; that is, the rate of interest at which there would be zero net saving.[4] For accumulation to be taking place, the rate of profit, and therefore the rate of interest, must be above this level. The zero-saving rate of interest may well be negative—if there were no other way to carry wealth from the present to the future its owners would be willing to pay safe-deposit keepers to mind it for them. Thus a great part, or more than the whole, of what the owners of wealth receive for the service of 'waiting' is a pure economic rent.

[1] See 'Evidence before the Committee on Indian Currency', *Official Papers*, p. 274. Cf. Wicksell, *Interest and Prices*, p. 95.

[2] *Principles*, p. 711.   [3] *Pure Theory of Domestic Values*, p. 34.

[4] Mr. Shove (op. cit.) challenged this view, but his argument on this point is excessively obscure.

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The notion that interest measures the 'real cost' of the 'sacrifices' of owning wealth belongs to the static layer in Marshall's thought and makes no sense when it is transplanted into a dynamic setting.

THE PHILOSOPHY OF PRICES

INTRODUCTION

WHY did the hunters in the *Wealth of Nations* exchange beavers for deer? In Adam Smith's forest there were no property rights in territory and no specialized skill (for if there were, the exchange value of the game would have been affected by the relative supply of hunters specialized for each quarry). Any man could catch a beaver for himself with the same exertion that it would cost him to catch two deer and exchange them for a beaver. Trade must have occurred only when there were chance discrepancies between an individual's needs and his catch, to be adjusted by swapping, and unless these exchanges were governed by a moral conception that they ought to conform to labour cost, it would have been impossible to detect any normal price in the occasional swaps that took place.

Regular exchanges presuppose specialization. From the earliest times specialized natural resources were used by mankind and specialized skills were developed in working them.

We do not know anything about the social organization surrounding neolithic axe factories,[1] but it seems obvious that there must have been property, in some form or other, in the right to exploit deposits of flints, and that the flint-knappers were highly skilled operatives whose means of subsistence was supplied by exchanging axes for food and other commodities.

We cannot be certain that there was commerce in axes. In some societies the interchange of products is made by ritual gifts, so that, though necessary to the characters concerned for material welfare, it appears to them as a religious duty or a means of emulation, rather than as an economic activity. But the wide diffusion of the flint axes, cutting across tribal boundaries, suggests trade in some form or other. It suggests, indeed, the

[1] J. G. D. Clark, *Prehistoric Europe*, especially chapter 9.

This paper has not previously been published. It covers some of the same ground as 'Some Reflections on the Philosophy of Prices', *Manchester School*, May 1958.

existence of some institution fulfilling the function of a category of merchants, whether as agents of the factories, emissaries from importing tribes or an independent group of middlemen, responsible for buying, selling and transporting both the axes and other wares.

We shall never know what exchange ratios emerged in this commerce, but we can guess with some confidence that the terms of trade between axes and corn varied with the harvest (in a famine year axes would be almost unsaleable and the factory workers in sad straits unless they had had the foresight to accumulate stocks). We can also guess that, taking good years with bad, the normal value of the product of a man-year of work in the factory (whatever share of it the operative received) was much above the value of the product of a man-year in agriculture. Specialized skill combined with limited natural resources must have given axes a scarcity value in terms of corn which would make itself felt under whatever guise exchanges were organized.

There is no need to suppose that any form of money was required for this trade. It is an illusion that barter requires a 'double coincidence'—that I happen to need an axe and have corn to offer when you need corn and have an axe to offer. Any durable commodity in regular demand is a 'store of value', and whenever I have corn to spare I should be pleased to buy an axe whether I wanted one or not, for I could exchange it later for whatever I did want to buy with my corn. The purchaser, again, may be buying it to use, to sell or to hoard for future exchange. The axes themselves could serve as currency as well as being useful tools.

Even if there was no formalized currency, there may well have been credit, for credit arises naturally out of good faith. An offer of axes before the harvest, against a promise to pay later, may have been usual. (Speculation grows fanciful when we inquire whether such promises were transferable, so that a true credit currency was in use.)

I suppose that we shall never know how the flint mines and axe factories were organized. Were the workers serfs of a chieftain? Or were they members of a co-operative, and if so, on what principles were the joint receipts from trade distributed amongst the miners, the flint-knappers and the surveyors who planned the sinking of pits? Or were they employees of capitalists, paid con-

tractual wages? What share of the proceeds did the merchants keep for themselves? The physical evidence shows an elaborate and articulated organization, but cannot reveal what the 'relations of production' were within it. Over the centuries they may have passed through a variety of forms while the physical technique in operation remained unchanged.

The 'natural price' that Adam Smith believed in is a contradiction in terms. The existence of prices entails exchange. Exchange entails specialization. Specialization entails an organized society. Value is a social phenomenon and 'natural' technical costs cannot determine prices independently of the social form in which production is organized.

Two Kinds of Prices

The nature of the price system depends upon what is the basis of specialization. It is possible to distinguish two price systems which are quite different in principle, though they are mixed up and interpenetrate each other in reality and are often confused in theory.

In one type of system the basis of specialization is some natural facility for production of a particular commodity possessed by a particular group of producers—mineral deposits, soil and climate favourable to a particular crop or the inherited lore of a particular manner of manufacture. In the other, the basis of specialization is simply the economies of scale, so that a group of producers can produce any one commodity (or a narrow range of varieties of a commodity) more efficiently if they specialize upon it than if they produce many totally different commodities; any group, given time for adaptation, can produce any commodity, and investible resources can be turned into means of production for any commodity.

In the first case the income of an individual depends upon the price in terms of commodities in general of a day's output of his speciality. This is obviously true where the worker owns the means of production or the exclusive knowledge in which specialization is rooted, as when free peasants, who own their land, are producing a crop for sale or when the secrets of a craft are inherited by a special caste. It is very largely true also in capitalist conditions in the case where a particular district has been deve-

loped as the source of supply of a single commodity. The value of output per man employed, and therefore the level of wages which plantation workers or miners can secure, depends very much upon the price of the crop or the mineral being produced.

In the other sector of the economy there is sufficient mobility between different lines of production to ensure that the level of wages is pretty much the same in occupations which require the same amount of training, while the mobility of investible resources is such (apart from distortions due to monopoly) as to ensure more or less the same rate of profit on capital in all lines. Thus the income of an individual depends upon the grade of labour that he can perform (skill being roughly measured by the time required to acquire it) or the amount of capital that he owns, and is not at all dependent upon what commodity he happens to be producing or drawing profits from. On the contrary, it is the relative prices of commodities which are governed by the levels of the incomes of those who produce them.

The two types of price system cannot be identified exactly with agriculture and industry, or with peasant and capitalist production. Economic facts never fit into perfectly clear-cut categories. In capitalist industry there is not perfect mobility even in a fairly long run, and there are elements of natural aptitude or inherited tradition in the supply of particular kinds of skill. Some very important elements in industrial production, such as coal-mining and hydro-electricity, are closely tied to natural resources. Moreover, industrial equipment once in being is often very highly specialized, so that in respect to short-period changes there may be a strong influence of relative prices upon the rates of profit realized in different lines, and this may react upon the levels of wages also. Thus there are large elements belonging to the first kind of price system mixed up with the operation of the second. At the same time, in the first kind of system the attachment of particular producers to particular specialities may not be absolute, and an element of mobility (including actual migration) may set a limit to the extent to which incomes vary with prices.

Neither system is ever found quite free from elements of the other, but in order to grasp the nature of each one we must try to see how it would operate in a pure form.

An Exchange Economy

To illustrate the operation of the first type of price system, let us imagine an economy, isolated from the rest of the world, composed only of peasants and artisans. Each family has some specialized line of production. One owns a vineyard, one inherits the secret of iron-founding, one has a tradition of weaving in which its children are brought up, and so forth. There are enough families with each speciality to make a competitive supply of each commodity. Once a week they all meet at the market and exchange the goods produced last week for goods to be consumed next week.

In this market it is a matter of indifference whether or not it is customary to quote prices in terms of one of the commodities or in terms of a notional money unit. What matters is the price ratios which are established by exchange. For each commodity there is a price in terms of each other commodity, determined by technical and psychological conditions of demand and supply; that is, the capacity and the desire to produce and to consume each kind of commodity of the families making up the economy. There is a wine-price of horseshoes, a cloth-price of horseshoes, etc., and cross-trading brings them into line with each other, so that when the above two prices have emerged from trading, the wine-price of cloth has also been established. Each family is interested in the price level in terms of its own product and the 'general price level' has no meaning.

In the kind of economy which we are discussing there is one important advantage of the free-market pricing system and four serious drawbacks.

The advantage is that each family, within the limits of the purchasing power provided by its own production, can purchase whatever it pleases and each family is led to specialize upon what it can best produce. No one has to be ordered to do anything and there is no need for any allocation or rationing. Where there are no laws there are no crimes. The system polices itself.

This is a very great merit, and anyone who has had anything to do with an allocation system, whether as an administrator or as a mere recipient, must appreciate the virtues of a free-market system in this respect.

But the drawbacks are very serious. First of all, the distribution of real income between families which comes about in this sort

of system is highly arbitrary and fails to accord with what is generally felt to be natural justice.

Certainly there is no reason to expect that the price ratios between commodities will be such as to make the value of the product of a man-hour of labour equal in all lines, for each kind of labour is different from every other and there is no mechanism in the system to bring the values of, say, a blacksmith-hour, a weaver-hour and a ploughman-hour into equality with each other.

The value of a week's output of any particular worker depends upon the market prices of his commodity in terms of the rest, and that depends upon the relation of the amount of productive capacity for that commodity to the quantity of it that the community requires to consume. A family whose specialized property or inherited lore is scarce relatively to demand has a high income, and a family who can produce only something in relatively plentiful supply has a low income. It is a pure matter of luck, and does not appeal to normal human notions of what is just and reasonable.

The second drawback of the free price system is that the day-to-day equilibrium of the market may require perpetual oscillations in prices. Each group of producers brings to market a quantity of their particular product which is to some extent influenced by the prices in terms of other commodities which they expect to realize. It may happen that one group finds that they have brought to market more than will sell at the expected price. The consequent disappointment causes them to bring less next time, and then the high price realized causes them once more to overshoot the mark. Meanwhile, each change in one set of prices is liable to alter many of the rest. When, say, meat is unusually dear in terms of cloth and horseshoes, something else, say fruit, has experienced a fall in price, because the weavers and blacksmiths who continue to buy meat have economized on it. Where this kind of market situation is combined with production that has a certain gestation period (as in the well-known case of breeding pigs and growing maize), complicated interacting cycles may go on indefinitely without any tendency to find a stable position.

Thirdly, and this is the worst, changes in demand or in technical conditions may suddenly cause the equilibrium level of

prices for a particular commodity to fall below the level at which it is possible to make a living by producing it. There are many historical examples of the dreadful misery that specialist producers are plunged into when their market disappears. Nowadays this situation is admitted to be intolerable, and is often met by a scheme to restrict output, so as to limit supply to a quantity which commands a tolerable price.

Finally, the situation may be reversed and, owing to a sharp fall in the supply of a particular commodity, the fortunate owners of what remains may be suddenly enriched to an extravagant degree by the famine prices which their wares then command.

Wherever the incomes of groups of individuals depend upon the relative prices of commodities, the evils of a free market system much outweigh its advantages. The search for a 'just price' in medieval theory, and in modern capitalism the proliferation of 'commodity schemes' and 'price supports' in times of glut and of food subsidies and rationing in times of scarcity are both evidence that such a system cannot be trusted to produce tolerable results.

Prices and Income in a Planned Economy

The major problem of price policy in a planned economy is to arrive at a fair distribution of income between agricultural and industrial workers. The agricultural workers, grouped in co-operatives, own their principal means of production—the right to exploit a particular area of land—and their money income depends upon the selling price of their produce. Their situation corresponds to that of sellers in the exchange economy. The industrial workers (including all the professions except for a few 'free-lance' journalists, etc.) receive money payments for work done, irrespective of what is produced, and their incomes are even more completely insulated from the prices of the particular commodities that their work contributes to producing than is the case in capitalist industry.

It is easier to make a rapid expansion of outlay on industry than it is to increase output in agriculture. At given rates of payment, the total of money income earned in industry is expanding fast in a rapidly developing economy, and the free market price of food rises as demand expands faster than supply. The money

income of the farmers rises, and the real income of the industrial workers falls. The agricultural workers cannot be allowed to enjoy the full benefit of the demand price for their produce for, if they were, they would be receiving too large a share in the total income of the economy. The problem is not one of government finance; if the farmers spend their money, the government recovers it as additional profits on sales of goods from the industrial sector, and if they save it, the government can print notes for them to hoard or sell them bonds (though, of course, this may be laying up trouble for the future). The difficulty is not concerned with finance, but with the distribution of income. Both from the point of view of satisfying general notions of what is fair and from the point of view of the morale of the industrial sector, the distribution of real income which would come about under a free market system would be intolerable. On the other hand, the methods which have actually been used to correct this tendency in the U.S.S.R. until recently went, it is now admitted, too much to the other extreme, and were grossly unfair to the agricultural sector.

There cannot be any simple criterion to decide what is the 'right' distribution of income between the sectors. The ultimate ideal may be 'equal pay for equal work', but the whole life of an industrial worker is different from that of an agricultural worker, and what constitutes equal pay, taking account of the purchasing power of money over the different kinds of goods and services that each wants to buy, and what constitutes equal work, taking account of the different kinds of jobs that each has to do, can never be obvious and will always leave room for dispute. In any case, the ultimate ideal of justice has to give way meanwhile to expediency, and the distribution of rewards has to be made in the manner most helpful to development. In short, the distribution of income between the two sectors cannot but be a political decision, whether it is made consciously or whether it emerges as the result of expedients adopted from time to time to meet problems as they arise.

Until the supply of foodstuffs is sufficient to saturate demand, it is necessary, in order to establish whatever may be the desired distribution of income between the sectors, to keep the selling prices of foodstuffs on the farm below the demand prices in the consumers' market. This gives rise to very serious problems. In

so far as agricultural output is sold to the government and private sales are illegal, there is a great temptation to develop a black market. In so far as private sales are permitted, there is a temptation to deflect both work-time and the use of land away from government sales into the free market. Either way, administrative means have to be used to keep trade in the required channels and market forces cannot be left to operate freely.

Industrial crops, such as cotton, do not give rise to a black market, since the government is the only buyer who has any use for them, but even they are involved in the general problem, for it is necessary to set a procurement price which will make it worth while for farmers to produce them, taking into account the rival attractions of the black or free prices which other uses of land and labour-time might yield.

There is a way out of these difficulties which is quite simple in principle, though no doubt it would involve all sorts of complications in actual application. The way out is to charge the farmers a land tax, assessed in terms of money instead of in terms of crops, and allow them to sell their produce for what it will fetch. In such a system, the yield of the land tax replaces the profit on sale of foodstuffs as a contribution to government revenue; it is apportioned between farms on the basis of potential earning power of the area, not on the basis of actual receipts. In short, it operates like Ricardian rent. The tax is fixed and it is left to the farmers to earn the money to pay it. The larger the part of government outlay which is covered by the receipts from the land tax, the smaller the part which has to be raised by profits and turn-over tax on industrial output. Therefore, given the prices of industrial commodities, money incomes in industry can be higher the greater the yield of the land tax. Thus the over-all rates of land tax can be adjusted so as to bring about any desired pattern of distribution of income between the two sectors.

Such a system would have three very important advantages. First, those aspects of the relations between government and farmers which are liable to give rise to unpleasantness are all concentrated at a single point, the assessment and collection of the tax. It would still be desirable for the bulk of all produce to be handled by government buyers, and it might be useful for those buyers to enter into long-term contracts with the farmers and to operate buffer stocks so as to avoid casual fluctuations in

prices, but since the buying prices would be in line with market prices there would be no incentive to evade official dealings, and the government agents would appear in the helpful role of assisting the farmers to market their crops, and to improve their earning power to their own advantage. The free price system polices itself.

Secondly, the farmers would have the greatest incentive to produce energetically and efficiently, since the tax is a lump sum, and all additional earnings due to additional effort are kept by the farm. Moreover, the pattern of production would be as fully as possible responsive to demand (including government demand for industrial crops) for each farm wants the most money income (and so the highest value per labour day) that it can get for its members, and the relative demand prices for different kinds of produce would guide the farmers to produce what the consumers require.

The third advantage is that, since the land tax would be assessed according to an estimate of the money-earning power of the particular areas of land—taking account of soil, climate, situation and the prices of the particular crops obtainable in each district—it would tend to mitigate the differences in earnings between one farm and another which are due to pure accidents of nature, independent of the efficiency or industry of the workers concerned.

Since the right to exploit a particular piece of land is a kind of property, there seems to be no justification for wide differences in earning power due to purely natural factors, and presumably they are allowed to persist in socialist economies to-day simply because, under the prevailing price system, it is very difficult to do anything about them.

Whatever advantages it may have, the land-tax system is too far from present practice to be considered seriously, and the need for some kind of legal barrier to preserve the difference between prices on the farm and prices in the consumers' market will persist until the scarcity of agricultural products has been overcome. When that time arrives it will probably be necessary to go into reverse and to direct policy (as in the United States) to keeping up farm prices to a level that will ensure a fair income to the farmers.

A Wage Economy

To see the second type of pricing system in its purest form we may imagine an idealized capitalist economy continually expanding at a steady rate, abstracting, for the sake of argument, from crises and perturbations; abstracting also from monopolistic distortions; and postulating easy and rapid movement both of workers and of investible resources between different lines of production. In such a system, when it is in equilibrium, the level of wages and the rate of profit on capital are uniform throughout the economy, for no one will be content with a lower return in one line than he could get in another.

In such a case there must be a general price level, for wages must be paid in money; that is, generalized purchasing power. The money price of each kind of commodity is governed by its cost of production in money terms, including in costs a proper share of the amortization of plant and of profit at the ruling rate on the capital invested in the productive capacity concerned, for no commodity will continue to be produced unless it yields the same return as the rest.

When these conditions obtain, prices tend to be established at the 'normal long-run level' in Marshall's language, or to correspond to 'prices of production' in Marx's language.

The objections to a profit system are well known—it will not, in fact, be free from crises; it always is distorted by monopoly, and its very basis in the private ownership of means of production is highly irrational—but regarded purely from the point of view of the operation of relative prices, it is free from the objections which we found to the first type of system.

The distribution of income, as between workers and owners of property, is, of course, very arbitrary, but as between producers of different commodities it is perfectly fair. Each unit of work and each unit of capital, in equilibrium, gets just the same return whatever it is applied to producing.

The establishment of equilibrium with a given pattern of demand presents only minor difficulties, for if there has been an over-optimistic estimate of demand in one line, the capital invested in that line will receive less than the expected rate of profit, and will be gradually siphoned off by the oldest plant in the industry not being replaced while its accrued amortization

fund is used to build up productive capacity in some other line. The offer of employment goes with productive capacity, so that labour is also shifted gradually out of the over-expanded industry until equilibrium between supply and demand is established. By the same token, so long as overall demand is buoyant, no one will lose his livelihood by a decline in demand for any particular commodity; and, so long as competition is active, no group of producers can hold society to ransom by maintaining famine prices for a commodity whose demand has increased.

Thus, in the postulated conditions, the free market system can claim great merits, not only in allowing consumers to spend whatever income they have on what they fancy amongst given alternatives, but also in steering production into the lines that meet their tastes.

It is to be observed that the whole virtue of the system arises from the process by which competition exercises its invisible discipline over production. The prices of commodities and the rates of wages are given to each seller, and it is his business to see to it that any given output is produced at the lowest cost, and that the selection of commodities to be produced is that which will yield the largest return.

It is obvious enough that the system is vitiated when monopolists are able to keep up the rate of profit that they obtain by preventing new entry into an expanding market, but in a more subtle way the system is vitiated by the power of sellers to fix their own prices, even if they confine themselves to covering costs of production including a 'fair profit' on the capital invested. When demand has expanded relatively to capacity a policy of 'fair profits' means that prices are kept down, there are shortages and unofficial rationing, and the expansion of capacity which should take place under the influence of super-normal profits is delayed.

When there has been a contraction in the demand for a particular commodity (a general decline in demand—a slump—is, of course, quite another matter), its price may be raised to 'cover the overhead' and defend business from the sub-normal profits which ought to be driving investment out of this line into others.

Equally, if total receipts from sales rise with the expansion of demand for a particular commodity but profit is kept down to the normal level by a rise in the money-wage rate of the particular group of workers concerned, the mechanism of the system is

inhibited. More workers now would like to be employed in this super-normal-wage trade, but the failure of profits to rise prevents productive capacity from being expended and so limits the jobs being offered. (Some rise in wages, it is true, may be required to steer labour into an expanding trade, but the whole point of the kind of system we are considering is that labour is highly mobile between uses, so that a very small differential will enable the industry to attract all the labour it can employ.) It is even more harmful to cut wages in face of a fall in demand so as to 'preserve employment'. There should be unemployment of workers now redundant to this trade, so that they will quickly move into occupations where they are needed, and there is no reason why the workers who remain in the shrunken trade should have permanently lower wages just because there were once too many of them.

In short, the proper operation of the system requires that, as between the production of one commodity and another, wage rates should always remain as nearly as possible uniform, while profits swing up and down with the movements of supply and demand—the differences in profits being always in the course of being ironed out by the flow of new investment which is continually adapting productive capacity to the pattern of demand.

It is by concentrating upon the aspect of a competitive economy which concerns its mode of operation as between one commodity and another, while being rather vague about its operation as between workers and capitalists as a whole, that the generally flattering portrait of the system found in the orthodox text-books has been made to pass for a tolerable likeness.

Prices of Consumers' Goods in a Planned Economy

In a socialist economy there are, strictly speaking, no wages. The means of production are owned in common and everyone works, not for a particular employer, but for his fellow citizens. The payment which individuals receive is his share of the whole proceeds of the economy. But in the present phase of socialism, in which shares are allocated in the main according to work done, the incomes received look and feel exactly like wages, and it is convenient to borrow that term to describe money incomes earned in the industrial sector of the economy.

Given the planned allocation of resources, there is a certain physical volume of consumer goods being produced, and given the level of money wages and money incomes in the agricultural sector, there is a certain volume of money demand for consumer goods. Apart from personal saving (which comes to the government as loans) the whole outlay of all the organs of a socialist economy returns to them collectively as taxes or receipts from sales. The greater the proportion of government outlay which produces no saleable commodities—administration and defence, investment and social services—the higher must be the ratio of taxes and profits to costs of production of saleable commodities. What the over-all price level of commodities must be is therefore decided when the general allocation of resources between the sectors of the economy has been laid down.

The problem of pricing policy is concerned, not with the over-all level, but with the pattern of prices for different commodities. Social considerations are involved in some prices. It may be thought desirable on general grounds to make tobacco dear and books cheap. In some cases there is such a severe shortage of supply relatively to demand (as during war-time) that a system of allocation is to be preferred to 'rationing by the purse', and in some cases when a shortage is seen to be temporary (as when a new consumer durable, such as a television set, first begins to be produced) a system of queuing may be preferable to regulation of demand by prices.

Apart from such exceptions, there is a strong general presumption in favour of a pattern of prices that equates demand to supply for each commodity in each market. The reason is not to be found in the high claims which orthodox economics makes for the 'maximization of satisfaction' or the 'principle of consumer sovereignty', but in the fact, which we have already noticed, that such a system regulates itself. When legal prices are at the level which equates demand to available supplies there can be no black market (apart from sales of stolen goods), no 'under the counter' sales, no bare shelves and unwanted savings due to the lack of anything to buy.

The case for pricing according to market demand is very much stronger in a socialist society than in a capitalist one, for in the capitalist society the distribution of purchasing power between families depends largely on the distribution of property, which

is quite arbitrary from either an economic or an ethical point of view, and the manipulation of prices can be used as a corrective to the maldistribution of income. In the socialist economy every family has the money income (from wages, labour-days earned, pensions, children's allowances, etc.) which it has, on accepted principles, the right to have, so that it seems reasonable to allow money demand to determine prices.

To accept the rule that prices should equate demand to the available supply of each commodity does not settle the question of what the pattern of prices should be. The demand for each commodity of a typical family depends very largely upon how much of the family income has been absorbed by buying other commodities, so that each price depends upon all the rest and there is a great deal of play in the pattern of prices that will establish equality between supply and demand in each market. As between substitutes, say nylon and cotton shirts, it is true that the relative prices that regulate demand are determined by the tastes of the public. When nylon is much less plentiful than cotton, if the public is more or less indifferent between them, nylon must be sold only a little dearer than cotton, whereas if people are very keen on nylon, the price difference will have to be large to get them to take cotton shirts. But as between broad groups of commodities this 'principle of substitution' has much less effect. If clothes as a whole are sold cheaper, people may spend more money on, say, furniture. The same total government revenue could be raised from cheaper clothes and dearer furniture or dearer clothes and cheaper furniture, without any noticeable difference in the fit between supply and demand in each market. There is thus an arbitrary element in the price system at any moment.

The relative prices of different commodities affect the real income of consumers with different tastes, needs and habits. If the pattern of prices happens to be such as to make furniture expensive, the newly married couples find the purchasing power of money correspondingly low. This is certainly arbitrary and may be regarded as unfair, but in a rapidly developing economy it is probably not very important. Groups of consumers who suffer at one time from a pattern of prices unfavourable to them may be the lucky ones a little later.

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In any case, even if there is some sense in which one pattern is the fairest, it would take time to discover it, and meanwhile the situation would have changed. The absolute optimum pattern of prices is a mirage. The proper way of approaching the problem is to take whatever situation past history has produced, as a starting-point, and to see what changes in it can profitably be made.

Taking any system of prices that equates demand to available supplies, it will be found that the value of output per man-hour of labour, including the labour providing materials, power, etc. (which we shall discuss later), varies very much between one enterprise and another, and within enterprises, between one line of production and another. Starting from any arbitrary position that happens to have become established, there may be room for very big improvements by shifting labour from low to high money-value-producing occupations. Of course, it is not desirable to do so when the differences in prices are part of social policy. If tobacco is being deliberately kept scarce, its high price is not an indication for more to be produced. But where differences in relative scarcities are purely accidental, everyone gains by reducing them. For some commodities the conditions of demand are such that a considerable increase in sales could be made (if more of the product was available) with a very small reduction in price, and if it is technically possible to draw labour (including the labour required to produce power and materials) into these lines away from low-money-value production, the total surplus of the selling value of commodities over their total costs is increased. This surplus accrues to the government as profits and taxes, but the sums required to finance government outlay remain the same; the average excess of prices over costs can therefore be reduced, and the purchasing power of the public increased.

In other cases it is not possible to move labour into the high-money-value products because the restriction on supply, which causes the scarcity which causes the high price, is due to some technical cause; for instance, that the plant required is specialized and is limited in capacity. The high price must then remain until capacity can be expanded.

All this concerns prices to final consumers. How are these to be related to factory prices to the enterprises which produce the goods? As we have seen, the whole merit of the ideal competitive

market system springs from the fact that prices are given to the individual producer, so that it is up to him to produce any given output at the lowest possible cost and to produce the selection of commodities that yields the highest return. To reproduce the good features of this system and to avoid the monopolistic elements that vitiate it in the capitalist world, the responsibility for setting prices must remain with the planners, not be delegated to the enterprises. Moreover, the prices set for the enterprises must not be based upon costs of production, for a system under which the value of output is judged by its cost blurs the distinction between socially necessary costs and the results of slackness and inefficiency. The discipline of the market then has to be replaced by administrative checks, and it is the interest of the enterprises to get the greatest amount of costs allowed as legitimate rather than to strive to eliminate all costs that are not strictly necessary. To enjoy the benefits of the self-regulating market system, prices, costs and the pattern of supply must be brought into harmony with each other by the operation of market forces, not wrenched into line by administrative means.

In order to bring the operation of market forces to bear on the pattern of production it is necessary to make factory prices (received by the enterprises) proportional to market prices. Then, in endeavouring to produce the assortment of products that yields the best return, and to use the methods of production that minimize costs, the managers of enterprises will be helping to get supply into line with demand as far as is possible within the existing productive capacity, while the relative profitability (in terms of tax yield) of different lines of production serves as a guide to the planners as to which should be given priority for expansion.

The proportionality of factory to market prices (allowing for transport costs, etc.) can be secured either by a general tax on the wages bill, which raises all prime costs proportionately, or by an *ad valorem* turnover tax, which reduces all receipts proportionately. A very good case can be made out for preferring the wages tax, but since the turnover tax is more in line with present practice it may be better to conduct the argument in terms of it.

After whatever shuffling that can be done immediately, there are bound to remain large differences in the money value of output per man between one enterprise and another which are in no way under the control of the management. We may suppose

that there is enough labour to keep all plant occupied on whatever shift system is in use, and that it is not worth while to try to distinguish between average and marginal cost in the individual enterprise; but, as between one plant and another in the same line, physical output per head varies with the nature of the equipment, and between one line and another money-value (net of material costs, etc.) of the output of a day's working varies with the price of the commodity, which depends upon market conditions.

This variation in the value of output per man in equally well-managed enterprises means that if the whole of the contribution to government funds to be levied on the sale of commodities were raised in a uniform *ad valorem* tax on sales, some enterprises would be making profits and some would have to draw a subsidy to cover part of their wages bill. This is undesirable for a number of reasons. It would be better to fix the rate of tax so that the enterprises with the lowest value of output per man could just cover expenses when working at a reasonable standard of efficiency (exception being made for goods which are intended to be subsidized, or for enterprises which it is desired to keep going in spite of some particular disadvantage; for instance, in respect to geographical position). With such a rate of tax, enterprises where the value of output per man is high (whether because the supply of the commodity being produced is limited and so the demand price high, or because of exceptional advantages in respect to up-to-date plant, etc.) will find themselves earning profits. These must be handed over as a contribution to government funds. Ideally it would be best to assess each enterprise with an annual lump-sum tax, reflecting its special advantages, so that it is equally hard to earn a profit everywhere, and profit reflects only the efficiency of the enterprise. But in practice this assessment would involve precisely the kind of friction which it is the aim of the self-regulating price system to avoid, and a profits tax, leaving the enterprise with whatever share is considered an adequate incentive to efficiency, is probably to be preferred.

Let us now look at the price system which we have outlined. Prices of goods sold to consumers are such as to equate supply to demand in each market (there are no persistent shortages or silting up of stocks). The government is receiving, from taxes and profits, the sums it requires to pay for non-saleable activities.

The factory prices are proportional to selling prices. Where it is impossible (for instance, because of limitation on the supply of plant) to transfer labour to lines where the value of output per man is high and so bring down the price of the commodity concerned, the turnover tax absorbs less than the whole surplus over costs, and profits are being made.

The existence of profits is a useful indication to the planners of points at which demand exceeds supply, and therefore serves to guide plans for future expansion, though they cannot be blindly followed.

It is to be observed that there is no use in the above scheme for a rate of interest or any allowance for the cost of capital in forming prices. Indeed, prices are formed solely in the light of market conditions without reference to costs. Yet, in fact, it will be found that the commodities whose production requires exceptionally heavy investment will be yielding a profit; for the heavy investment required to expand output keeps the commodity in question scarce, so keeps up its price and causes the value of output per man in producing it to exceed expenses per man including the *ad valorem* turnover tax.

The proper place for the rate of interest is not in the determination of prices but in the calculation of the relative yields of different investments. This question cannot be discussed here. We may merely remark that in guiding investment plans it is the expected return on the cost of new plant that matters, and the yield of past investment has no relevance except as a rough indication of what to expect. In any case, investment plans have to be integrated and they involve many other considerations besides yield in revenue terms. The pricing system has only a very limited contribution to make to investment planning. Nevertheless, subject to necessary corrections, the revenue yield of different investments (net of depreciation) may be a useful guide to the planners in trying to get the pattern of production into line with the pattern of demand. In so far as they follow this guide, one bottle-neck after another will be broken as time goes by. Outputs of scarce commodities gradually expand and their demand prices come down. Better plant supersedes the least productive, so that the physical productivity of labour is raised where it was lowest. The system is tending towards an ideal state where the value of output per man (net of depreciation of plant) is the same in all

lines. This position may never be finally reached, but as the system moves towards it the contribution of profits is gradually reduced and a larger and larger part of the total contribution to revenue comes from the *ad valorem* tax. By the same process the pattern of supplies of goods comes ever closer to the pattern of consumers' wants expressed in money demand.

The indications of the market can never be blindly followed and the planners must take many considerations into account besides the revenue yield of investments, but though the price system is a bad master it can be a very useful servant.

PRICES OF MATERIALS

So far we have discussed the problems of production as though the supply of each commodity could be attributed to a particular group of workers. In reality this is not the case; production is split not only vertically into commodities but also horizontally into stages, and a single material produced at one stage enters into the output of many different commodities at the next stage.

In some respects the most important element in pricing policy for a planned economy is to find the correct prices for materials (including power). They concern only transactions between enterprises and so in one sense are mere book-keeping, affecting no one's real income (except in so far as they are sold to farms), but they are very important because it is in their use that the 'principle of substitution' has most scope to operate. Materials, over all, are scarce relatively to demand and most have a wide variety of uses, while most uses (though not all) can be met less or more efficiently by a variety of materials. It must therefore be the object of policy to see to it that each material is put to the uses where it is most important; that is, the uses in which the next-best substitute for it is least eligible.

The allocation of materials is just the kind of job that the pricing system can do best. The manager of an enterprise, in trying to keep his costs as low as possible, will prefer the material, for any job, which is the best bargain; that is, which is cheapest in relation to performance in that particular job. If the prices of materials reflect their relative scarcity, while the prices of final products are fixed, they will automatically be allocated in the most efficient way.

The demand for materials comes partly from high-priority uses, such as defence, partly from investment schemes and partly for export, which are both controlled by the over-all plan, partly from the consumer-good sector and sale to farms, which are both controlled by market demand. It is, therefore, not a simple matter to órganize a simulacrum of a market where each element of demand is given its proper weight in money terms, so that the bids of buyers lead to the establishment of prices that correctly reflect the relative scarcities of different materials. It is probably impossible to escape altogether from the need for direct allocation, at least between the broad categories of uses. But within the consumer-good sector the pricing system could be made to work. The over-all allocation of a material to the consumer sector having been fixed, the authority in charge of it could find out what quantities each enterprise would wish to take at each price, and so arrive at the demand price for the available quantity. These demand prices are derived from the factory prices of commodities which, in turn, are derived from demand in the consumers' market. The factory price has been reduced by the turn-over tax, so that it would not be correct to tax the materials separately, but any profits made on the production of materials must be handed over to the government.

This scheme would be somewhat complicated to apply, but any scheme which makes a rational use of prices takes the weight off direct administration, and the scheme need not be perfect to be a great improvement on allocation as a method of dealing with the distribution of scarce means among a variety of uses.

THE LAW OF VALUE

It is with some hesitation that I suggest an interpretation of the relation of the foregoing argument to the Marxian theory of *value*.

As I understand it, the significance of the Marxian theory of *value* is that, unlike the orthodox neo-classical theory, it stresses the relationship between money prices and the distribution of real income. If this is correct, the law of *value* must appear in a different light in different spheres according to the relationship between prices and incomes in each sphere.

So far as the terms of trade between agricultural and industrial products are concerned, 'prices in accord with *values*' means, I

suggest, that prices are such as to give a fair, or in some sense
'right', relation between incomes of farmers and industrial
workers. In this sphere, then, *value* has a meaning somewhat
akin to the notion of 'the just price'.

In the sphere of consumer-good prices, the over-all relationship
of prices to incomes determines the real purchasing power of
wages over saleable goods. This is dictated (given the efficiency
of production) by the allocation of resources between saleable and
non-saleable output. In this over-all sense, the law of *value* merely
means that prices both will be and ought to be such as to im-
plement that allocation. As between one industrial commodity
and another, prices have no effect on incomes of producers
(though they affect the purchasing power of consumers with
different tastes and needs). Here *value* has not much to say.
Indeed, prices ought not to be in accord with *values*, in the sense
of labour-time required for production, until scarcities have been
overcome and all labour-time produces equal quantities of net
selling value of products. Until that time is reached, the pattern
of prices must reflect the pattern of supply and demand. And
even when prices are, in fact, in accord with *values*, they should
not be directly determined by *values*. Any kind of cost-plus
pricing destroys the merit of the market mechanism. Prices
should always be set, at any moment, in the light of demand;
then when all supplies have become elastic it will be found that
the pattern of demand automatically establishes prices which
reflect *values*. There is no short cut to this world, and to try to
force a way to it by fixing prices according to *values* before the
bottle-necks have been removed is detrimental to efficiency and
only puts off the time for reaching it.

The third type of prices, those for materials, do not seem to
have any connection with *value*, for they do not directly affect
anyone's real income. The market in which they are sold is only
the simulacrum of a market, for all the dealers in it are agents
of the same principal—the socialist economy. Nevertheless, the
simulated operation of a market can be a very useful adjunct to
the administration of the plan.

If I am right, the concept of *value* requires a different definition
in each sphere, and a good deal of confusion seems to be caused
by loading one word with so many different meanings.

THE LABOUR THEORY OF VALUE

DISCUSSION of the labour theory of value is usually conducted in a fog of ideology. Over-anxious to attack or defend, its supporters try to prove too much—for instance, denying that natural scarcities have any influence on prices—or reduce it to a verbal tautology by defining *value* as the product of labour-time; its opponents fabricate misunderstandings or gleefully fasten upon trivial errors, so that there is a great dust raised about peripheral points, and the solid core of the theory never comes to light.

There are two aspects of the theory of value which are, in principle, quite separate. One concerns the ratio of profits to wages—the rate of exploitation—in the economy as a whole. The other concerns the relative prices of particular commodities. The present argument is concerned only with the latter.

RELATIVE VALUES

The theory of value with which we are concerned deals with normal long-run prices (ignoring the passing effects of economic perturbations). It applies to a competitive economy in which there is free mobility of capital between all uses, so that a uniform rate of profit is established throughout the system, and free mobility of labour (of each grade of skill) between all lines of employment, so that a uniform wage rate is established for each grade.

Now, if we abstract from the existence of specialized factors of production in limited supply, the normal price of any commodity is given by the wages cost of the labour required to produce a certain quantity of it, and to make good the wear and tear of any commodities used up in producing it, *plus* a margin sufficient to provide profit at the ruling rate on the capital devoted to its production. This is Marx's theory of 'prices of production'; on its own assumptions it is unexceptionable and, in fact, it is everybody's theory of prices.

This theory seems to have a good right to be called the Labour Theory of Value. The price of a commodity in terms of labour-

time (in a standard unit, differences of skill being evaluated by wage rates) is not the same thing as its labour cost, for the price includes a profit margin; nor are relative prices strictly proportional to relative labour costs, for profit per unit of labour varies with capital per unit of labour; but, by and large, the main determinant of differences in prices, say the difference in price between a packet of pins and a motor car, is obviously differences in labour cost (including the labour cost of producing the capital equipment required for the different lines of production). Moreover, the movement through time of relative prices is predominantly influenced by changes in relative labour costs. For instance, over a period when output per man-hour is rising rapidly in manufactures, but sluggishly or not at all in agriculture and house building, food and dwelling space grow more and more expensive relatively to other consumption goods. Influences of this kind are in general more important than changes in relative profit margins in determining changes in relative prices. By giving up an untenable claim to complete exactness, the labour theory can establish the right to be considered broadly true and highly important.

The main difference between this theory and the supply-and-demand theory of prices to be found in the neo-classical text-books (apart from ideological overtones) is a difference in emphasis. The text-book theory stresses just those elements which the labour theory neglects—that is, differences in the ratio of capital to labour in different types of production and differences in costs due to the existence of specialized factors of production in limited supply, such as particular kinds of soil, mineral deposits and inborn natural aptitudes for particular kinds of work.

When there are differences in the ratio of capital to labour required for the production of different commodities, a difference in the general level of profit in the system as a whole affects relative normal prices, for it has a larger influence where the capital ratio is higher. And where there are permanent bottlenecks in production due to the existence of scarce factors, the normal price of a commodity varies with its rate of output. Thus the pattern of relative prices does not depend solely upon relative labour costs, but is influenced also by the pattern of demand. An analysis of the problems treated in the text-books, therefore, is required to deal with complications which the labour theory

neglects. The text-book theory of normal prices, unfortunately, has never succeeded in getting itself stated coherently, owing to a fatal ambiguity about the treatment of time,[1] but it provides an indispensable supplement to the labour theory for the analysis of the effect of changes in demand in the short period when fixed supplies of specialized factors—machinery and trained labour—dominate the scene.

ABSOLUTE VALUE

There are some other sections of the Marxian analysis which are not so easily digestible.

Ricardo sought to find in labour cost a measure of value which would be invariable in the same manner as a measure of length or of weight, and Marx, though he did not read Ricardo's essay on *Absolute Value and Exchangeable Value*,[2] echoes the same thought when he looks for the 'something' in common between commodities of equal exchange value, which 'cannot be a geometrical, physical, chemical or other natural property of commodities'.[3]

This way of looking at things is essentially pre-Marxist (it takes the author of an original idea a long time to see all its implications—there are many examples of pre-Keynesian thought in the *General Theory*); for one of Marx's greatest contributions to analysis is the distinction between 'the forces of production' and 'the relations of production': that is, between the technical relations of man with his physical environment, and the economic relations of a man with his neighbours in society; and the notion of the Fetishism which attaches itself to exchangeable commodities[4]—qualities arising out of relations between people appearing as relations between things. Weight and length are technical, value is social. Robinson Crusoe provides a touchstone for the distinction; weight and length had the same meaning for him on his island as at home; purchasing power had no meaning at all.

The false analogy between weight and value is connected with the all-too-familiar problem of index numbers. If we are interested in the share of labour in national income (or in the rate of exploitation), we want to be able to measure the total that is to

[1] Cf. Marshall, *Principles*, appendix H.
[2] Published for the first time in Mr. Sraffa's edition of the *Works and Correspondence of David Ricardo*, Volume IV, p. 361.
[3] *Capital* (Everyman edition), Volume I, pp. 5–6.
[4] Op. cit., pp. 43 ff.

be shared; but the quantity to be shared is not physical. The point can be illustrated as follows: I promise to give my gardener one-third of the fruit from my garden; that is, I mean to give him one-third of the apples, one-third of the plums and one-third of the gooseberries. Then he can be said to receive one-third of the fruit (divided at random, so that he gets an average sample) whether they are reckoned by number, weight, volume or money value. But suppose I offer him one-third of the plums, half the apples and a sixth of the gooseberries. Then what proportion of the *fruit* does he get? This in itself is a question for logic chopping, but it is connected with the substantial fact that the gardener's share varies from year to year according as apples or gooseberries are the heavier crop.

Similarly, if the share of labour in proceeds is the same in each line of production taken separately, then the share of labour in total costs is unambiguous; but when the share differs from one industry to another, the share in the total cannot be described unambiguously at any moment, and varies from time to time with the composition of output. Since there is a general tendency for the rate of profit on capital invested to be equal throughout the system, whereas the ratio of capital to labour employed differs, for technical reasons, between one commodity and another, it is impossible for the share of labour to be the same in all industries, and so impossible for the share in output as a whole to have a simple and definite meaning.

Moreover, even when the share of wages in the cost of production has an unambiguous meaning, the share in national income accruing to labour has not. Suppose that the gardener receives one-third of each kind of fruit (so that there is no ambiguity about his physical share) and that the weight of the total is the same from year to year, but that he happens to prefer apples to plums. Then in good apple years he gets more, in an important sense, from a constant share in a constant total weight of fruit than he does in a good plum year. Similarly, when the share of labour in money national income is constant, and the total money value of national income is constant, yet the benefit to labour varies with relative prices—real wages are higher when the things that the workers are interested in consuming are relatively cheap.

These ambiguities are deeply ingrained in the facts of reality, and cannot be smoothed away by giving precise definitions to

words. We have to accept the fact that we do not know *exactly* what we mean by the share of wages either in costs or in proceeds. The index number problem cannot be 'solved', because it is a reflection of one of the characteristics of economic life. But that does not imply that concepts such as the share of wages in national income are meaningless, for a difference between one situation and another can be described unambiguously as lying between certain limits, and differences which are large relatively to the range between the limits are worth talking about.

Marx side-stepped the whole problem by a verbal dodge. He means by the *value* of a commodity, not its price in terms of labour-time, but what its price would be if the share of labour in net output were the same for this commodity as for output as a whole. Thus price is equal to *value* only for those commodities (if there be any) for which the share of wages in costs is equal to the average for all commodities.[1]

In this concept of *value* are concentrated the mystical elements in Marxian thought, which give it a significance quite beyond its definable meaning.

Value without Capital

There is a curious strand of thought in the Marxist doctrine[2]— the notion that in a pre-capitalist economy of peasants and artisans, where each worker owns his own tools, the prices of commodities must be proportional to *values*, so that the money return for an hour's work is the same in all occupations. Actual artisan economies are dominated by caste or guild rules, and their prices are influenced by accepted notions of what is fair or pleasing to the gods. But even if we imagine an artisan economy governed by purely commercial principles, it is hard to see how the labour theory could be applied to it. First of all, in handicraft industry, natural skill and inherited lore are of great importance, so that the notion of a standard unit of labour is an illegitimate simplification. The relative value of different kinds of labour is influenced by supply and demand. If the village blacksmith has one son, and the basket-maker three, blacksmithing becomes more valuable relatively to basketry. We might suppose, however, that there is a free flow of labour between occupations in

[1] *Capital*, Volume III (pub. Kerr), p. 185.
[2] Developed, in particular, by Hilferding in *Böhm-Bawerk's Criticism of Marx*.

the long run. This would tend to equalize earnings over a life-time, but it would not equalize earnings per hour; a type of production in continuous demand would earn less per hour than a type only occasionally required. Moreover, although there would be no source of income recognized as profit, yet the need to provide a relatively heavy investment in equipment (say for the blacksmith compared to the basket-maker) must be supposed to limit entry into certain occupations, and so raise receipts per hour of the type of labour concerned. In short, far from being amenable to analysis on the lines of the labour theory of value, this imaginary artisan economy is just what is needed to give the text-book theory a run for its money.

Money Values

Ricardo, and Marx after him, believed that there was some special significance, for the determination of prices, in the labour cost of mining gold. This is another example of attaching to a technical relation the characteristics which arise out of a social relation. The quality of having purchasing power cannot be tied down to any one physical substance. Any tradable commodity has purchasing power over whatever there is in the trading community to be purchased. Any durable object or paper contract that is exchangeable can be used as a store of value, and consequently as a medium of exchange. Any commodity may serve as a unit of account, and there are as many general price levels as there are separate *numeraires*. An economy in which there is no standardized currency is not a 'non-monetary economy' in the sense that Robinson Crusoe's island was non-monetary; it is merely an economy in which the characteristics of money are diffused and unformulated.

Of all the notional price levels, there is one which has a real importance in a capitalist economy—the price level in terms of the unit in which wage rates are fixed, for it is the price of his own product in terms of this unit which governs the profit margin for each individual producer. If a stocking manufacturer has agreed upon a wage for his workers of so many peanuts per hour, then the stocking-price of peanuts (given the output of stockings per man-hour) determines his profit in terms of stockings. The unit in terms of which wages are fixed has therefore one of the most

important characteristics of money. As a standardized medium of exchange is evolved, all the characteristics of money crystallize around it; wages are both fixed and paid in money,[1] and the money-price level assumes a unique importance.

The physical substance embodying the unit of account and providing a medium of exchange must be chosen from amongst those which are exceptions from the general rule of the labour theory of value. Suppose that a pint of peanuts was the standard unit of account. Then, starting from a position in which all prices are normal, a small rise in the peanut-wage rate would make the production of peanuts relatively unprofitable (for the peanut price of peanuts cannot alter) and a small fall would make it more profitable than anything else. This instability would be excessively inconvenient. The reason why the precious metals have had such a success as a vehicle for money is largely because their supply is not subject to such vagaries. First, being highly durable, the stock in existence at any moment is large relatively to current production; and second, being provided by nature in deposits of varying difficulty, their rate of production alters only moderately with changes in costs (the better gold mines continue working when the worst have been rendered unprofitable by a rise in the gold-wage rate). Thus the cost of mining has only a slow and indirect effect upon the supply of gold, and the supply of gold has only a remote and complicated relationship to the price level in terms of money. The main influence upon the price level in terms of money is the level of wage rates in terms of money.

This proposition was strongly contested by Marx, although it seems to be the only theory of prices which harmonizes naturally with the labour theory of value.[2]

THE WAGE BARGAIN

There would be no point in dabbling in these stagnant controversies if it were not that certain questions of great interest are still debated in terms of the theory of value.

[1] This is not necessarily the case. Wages, for instance, may be paid in money but fixed in terms of a 'basket' of goods. Then the 'basket'-price level is more important than the money-price level.

[2] Since Marx's day this theory was so completely smothered by the Quantity Theory of Money that it appeared as a startling new heresy when Keynes propounded it in his addendum to the Macmillan Report.

One such question is the influence of Trade Unions upon the share of labour in the proceeds of industry. At first sight the proposition that money prices are governed by money-wage rates seems to rule out the possibility of raising wages relatively to prices and so to lead to the conclusion that (taken as a whole) the wage bargain can have no influence upon the level of profits (it was for this reason that the proposition was rejected by Marx). But this line of argument is too facile. It is a long step from *normal* prices in an ideal competitive economy to actual prices in the rough and tumble of short-period situations in which actual wage bargains are made. Costs of production in terms of labour are generally falling as time goes by, with improvements in technique, but prices react only slowly, for even in an economy which is competitive in the broad sense, price competition is often weak. The longer the time lag in the adjustment of prices, the higher at any moment are profit margins (part of which may be devoted to competitive selling costs). A rising tendency in money-wage rates prevents costs in terms of money from falling away below prices and so cuts out the time lag. The viscosity of prices is all the greater where markets are dominated by monopolistic or oligopolistic sellers, for then each one pursues a long-term price policy, and when obliged to concede a rise in wage rates, prefers (within reason) to accept a cut in profit margins rather than disrupt his strategic plans. Large rises in wages, such as occur in periods of strong demand for labour, break through the viscosity of prices. Thus there is no inconsistency in maintaining both that, by and large, over the long run, movements of the general price level are governed by movements in the level of money-wages (relatively to the level of labour costs) and that there is an important, though limited, scope for Trade Union bargaining to squeeze profit margins and so increase the share of labour in output.

Prices in a Planned Economy

Another unsettled question connected with the theory of value concerns the proper principles for price-fixing in a planned economy. Over-all, prices must be such as to create a gap between the total value of the output of consumption goods and expenditure out of the incomes generated by producing them, to provide for the costs of new investment (as well as free social

services, defence, etc.). Apart from private saving and income tax, this gap is created by quasi-profit margins in the prices of consumption goods (which may take the form of a turn-over tax). The total amount of quasi-profit required is governed by the rate of investment which has been decreed. How should its allocation between particular commodities be made? It is often supposed that there is a conflict over this question, the Marxian theory maintaining that prices should not, and the text-book theory that they should, contain an allowance for interest, so that quasi-profit margins should be set relatively high for commodities requiring relatively large investments of capital. This is a mistake (though a common one[1]) for it is a cardinal principle of the text-book theory that bygones are bygones; this is to say that, once an investment has been made in fixed plant, its historical cost should have no influence upon decisions about how it is used. To simulate an ideal competitive system, prices should be such as to ensure that each type of productive equipment is used to capacity. The text-book rule is that the pattern of prices must be such as to equate demands to available supplies. If it should happen that the quasi-profit obtainable from a particular line of output fails to yield an average rate of return on the capital invested, that (according to the text-book point of view) would show that a mal-investment had been made in the past; it would not be a justification for raising the price of the commodity concerned. All that the theory of normal prices has to say is that if past investment has been such as to equalize the rate of profit on capital in all lines, then relative prices are such as to reflect differences in interest cost. In short, if they do they do, and not otherwise.

A socialist administrator may well complain that the text-book formula gives him no practical guidance in his daily problems, and a socialist philosopher may reject the conception (which justifies the text-book principle) that demand price is the best guide to the social usefulness of commodities; but these arguments operate on a different plane. As far as the role of interest in prices is concerned, there is no ground for dispute.

[1] E.g. see P. Wiles, 'Scarcity, Marxism and Gosplan', *Oxford Economic Papers*, Volume V, No. 3, October 1953, p. 298.

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INVESTMENT IN A PLANNED ECONOMY

The rate of profit which plays a role in the theory of value is the *prospective* rate of profit on present investment. The mechanism by which the rate of profit is supposed to be equalized in the ideal competitive economy is that new investment, and the re-investment of funds representing the value of used-up capital goods, are continuously being made in the lines of production where the prospective rate of profit is highest. For the mechanism to work it is necessary that (1) present prices and costs should be a reliable guide to future returns, (2) there should be no obstacles to the entry into any market, (3) the influence of one scheme of investment on the profitability of others should not be large (the decision to open or close a railway line, for instance, has effects far beyond those that are reflected in its own receipts). It is further necessary that wage rates should be uniform throughout the system, for if a rise in wages reduces profitability where demand is strong and a cut in wages mitigates the fall in profits where demand is weak, the equalizing mechanism is impaired.

In the conditions of the ideal competitive economy super-average prospective profits are a symptom either that demand has expanded ahead of supply in the lines of production in question, or that the saving in future costs attributable to the use of more capital is greater per unit of investment in these lines than in others. Thus the profit-equalizing mechanism works in such a way as to lead the flow of investible resources into the most socially useful channels (provided that demand price is accepted as a measure of usefulness).

The failure of the assumptions required by the analysis to be fulfilled in reality means that it provides a very inaccurate picture of how capitalism works and a very feeble guide for investment in a planned economy, but within its own limits there seems nothing to object to about it, either from the right or from the left.

ROSA LUXEMBURG'S *ACCUMULATION OF CAPITAL*

ACADEMIC economists have recently returned from the elaboration of static equilibrium to the classical search for a dynamic model of a developing economy. Rosa Luxemburg, neglected by Marxist and academic economists alike, offers a theory of the dynamic development of capitalism which is of the greatest interest. The book is one of considerable difficulty (apart from the vivid historical chapters), and to those accustomed only to academic analysis the difficulty is rendered wellnigh insurmountable by the Marxist terminology in which it is expressed. The purpose of this preface is to provide a glossary of terms, and to search for the main thread of the argument (leaving the historical illustrations to speak for themselves) and set it out in simpler language.

The result is no doubt too simple. The reader must sample for himself the rich confusion in which the central core of analysis is embedded, and must judge for himself whether the core has been mishandled in the process of digging it out.[1]

Our author takes her departure from the numerical examples for simple reproduction (production with a constant stock of capital) and expanded reproduction (production with capital accumulating) set out in Volume II of Marx's *Capital*. As she points out, Marx completed the model for simple reproduction, but the models for accumulation were left at his death in a chaos of notes, and they are not really fit to bear all the weight she puts on them (Heaven help us if posterity is to pore over all the backs of old envelopes on which economists have jotted down numerical examples in working out a piece of analysis). To follow her line of thought, however, it is necessary to examine her version of Marx's models closely, to see on what assumptions they are based (explicitly or unconsciously) and to search the assumptions for clues to the succeeding analysis.

[1] For a totally different interpretation see Sweezy, *The Theory of Capitalist Development*, chapter 11, section 9.

Introduction to the English edition of *The Accumulation of Capital*, published by Routledge & Kegan Paul, 1951.

To begin at the beginning—gross national income (for a closed economy) for, say, a year, is written $c + v + s$; that is, constant capital, variable capital and surplus. Variable capital, v, is the annual wages bill. Surplus, s, is annual rent, interest and net profit, so that $v + s$ represents net national income. (In this introduction surplus is used interchangeably with rent, interest and net profit.) Constant capital, c, represents at the same time the contribution which materials and capital equipment make to annual output, and the cost of maintaining the stock of physical capital in existence at the beginning of the year. When all commodities are selling at normal prices, these two quantities are equal (normal prices are tacitly assumed always to rule,[1] an assumption which is useful for long-period problems, though treacherous when we have to deal with slumps and crises). Gross receipts equal to $c + v + s$ pass through the hands of the capitalists during the year, of which they use an amount, c, to replace physical capital used up during the year, so that c represents costs of raw materials and wear and tear and amortization of plant. An amount, v, is paid to workers and is consumed by them (saving by workers is regarded as negligible). The surplus, s, remains to the capitalists for their own consumption and for net saving. The professional classes (civil servants, priests, prostitutes, etc.) are treated as hangers-on of the capitalists, and their incomes do not appear, as they are not regarded as producing *value*. Expenditure upon them tends to lessen the saving of capitalists, and their own expenditure and saving are treated as expenditure and saving out of surplus.

In the model set out in chapter 6 there is no technical progress (this is a drastic simplification made deliberately) and the ratio of capital to labour is constant (as the stock of capital increases, employment increases in proportion). Thus real output per worker employed is constant (hours of work per year do not vary) and real wages per man are constant. It follows that real surplus per man is also constant. So long as these assumptions are retained Marxian *value* presents no problem. *Value* is the product of labour-time. *Value* created per man-year is constant because hours of work are constant. Real product per man-year being constant, on the above assumptions, the *value* of a unit of product is constant. For convenience we may assume money

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[1] Cf. the quotation from *Capital*, Volume III, p. 331.

wages per man constant. Then, on these assumptions, both the money price of a unit of output and the *value* of a unit of money are constant. This, of course, merely plasters over all the problems of measurement connected with the use of index numbers, but provided that the technique of production is unchanging, and normal prices are ruling, those problems are not serious, and we can conduct the analysis in terms of money values.[1] (Rosa Luxemburg regards it as a matter of indifference whether we calculate in money or in *value*.)

The assumption of constant real wages presents a difficulty which we may notice in passing. The operation of the capitalist system is presumed to depress the level of wages down to the limit set by the minimum subsistence of the worker and his family. But how large a family? It would be an extraordinary fluke if the average size of family supported by the given wage of a worker were such as to provide for a rate of growth of population exactly adjusted to the rate of accumulation of capital, and she certainly does not hold that this is the case. There is a reserve army of labour standing by, ready to take employment when the capitalists offer it. While they are unemployed the workers have no source of income, but are kept alive by sharing in the consumption of the wages of friends and relations who are in work. When an increase in the stock of capital takes place, more workers begin to earn wages, those formerly employed are relieved of the burden of supporting some unemployed relations, and their own consumption rises. Thus either they were living below the subsistence minimum before, or they are above it now. We may cut this knot by simply postulating that real wages per man are constant,[2] without asking why. The important point for the analysis which we are examining is that when employment increases the total consumption of the workers as a whole increases by the amount of the wages received by the additional workers.

We may now set out the model for simple reproduction, that is, annual national income for an economy in which the stock of capital is kept intact but not increased. All output is divided into two departments: I, producing capital equipment and raw

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[1] Exchanges between industries, however, must take place at 'prices of production', not at *values*.

[2] Later it is assumed that real wages can be depressed by taxation.

materials (producers' goods), and **II**, producing consumption goods. Then we have

$$\text{I}: c_1 + v_1 + s_1 = c_1 + c_2$$
$$\text{II}: c_2 + v_2 + s_2 = v_1 + v_2 + s_1 + s_2$$

Thus

$$c_2 = v_1 + s_1$$

This means that the net output of the producers' goods department is equal to the replacement of capital in the consumers' goods department. The whole surplus, as well as the whole of wages, is currently consumed.

Before proceeding to the model for accumulation there is a difficulty which must be discussed. In the above model the stock of capital exists, so to speak, off stage. Rosa Luxemburg is perfectly well aware of the relationship between annual wear and tear of capital, which is part of c, and the stock of fixed capital, but as soon as she (following Marx) discusses accumulation she equates the addition to the stock of capital made by saving out of surplus in one year to the wear and tear of capital in the next year. To make sense of this we must assume that all capital is consumed and made good once a year. She seems to slip into this assumption inadvertently at first, though later it is made explicit. She also consciously postulates that v represents the amount of capital which is paid out in wages in advance of receipts from sales of the commodities produced. (This, as she says, is the natural assumption to make for agricultural production, where workers this year are paid from the proceeds of last year's harvest.) Thus v represents at the same time the annual wages bill and the amount of capital locked up in the wages fund, while c represents both the annual amortization of capital and the total stock of capital (other than the wages fund). This is a simplification which is tiresome rather than helpful (it arises from Marx's ill-judged habit of writing $s/(c+v)$ for the rate of profit on capital), but it is no more than a simplification and does not invalidate the rest of the analysis.

Another awkward assumption, which causes serious trouble later, is implicit in the argument. Savings out of the surplus accruing in each department (producers' and consumers' goods) are always invested in capital in the same department. There is no reason to imagine that one capitalist is linked to others in his

own department more than to those in the other department, so the conception seems to be that each capitalist invests his savings in his own business. There is no lending by one capitalist to another and no capitalist ever shifts his sphere of operations from one department to another. This is a severe assumption to make even about the era before limited liability was introduced, and becomes absurd afterwards. Moreover, it is incompatible with the postulate that the rate of profit on capital tends to equality throughout the economy, for the mechanism which equalizes profits is the flow of new investment, and the transfer of capital as amortization funds are reinvested, into more profitable lines of production and away from less profitable lines.[1]

The assumption that there is no lending by one capitalist to another puts a limitation upon the model. Not only must the total rate of investment be equal to the total of planned saving, but investment in each department must be equal to saving in that department, and not only must the rate of increase of capital lead to an increase of total output compatible with total demand, but the increase in output of each department, dictated by the increase in capital in that department, must be divided between consumers' and producers' goods in proportions compatible with the demand for each, dictated by the consumption and the investment plans in each department.

There is no difficulty, however, in choosing numbers which satisfy the requirements of the model. The numerical examples derived from Marx's jottings are cumbersome and confusing, but a clear and simple model can be constructed on the basis of the assumptions set out in chapter 7. In each department, constant capital is four times variable capital. (Constant capital is the stock of raw materials which is turned over once a year; variable capital is the wages bill, which is equal to the capital

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[1] In the numerical example quoted in chapter 6, p. 117, the rate of profit is much higher in Department II than in I. Marx has made the rate of exploitation equal in the two departments, and the ratio of constant to variable capital higher in Department I. This is evidently an oversight. The two departments must trade with each other at market prices, not in terms of *value*. Therefore s_1 must represent the profits accruing to Department I, not a proportion (half in the example) of the *value* generated in Department I. s_1/v_1 should exceed s_2/v_2 to an extent corresponding to the higher organic composition of capital in Department I. The point is interesting, as it shows that when off guard Marx forgot that he could make prices proportional to *values* only when the organic composition of capital is the same in all industries.

represented by the wages fund.) Surplus is equal to variable capital (net income is divided equally between wages and surplus) and half of surplus is saved. Savings are allotted between constant and variable capital in such a way as to preserve the 4 to 1 ratio. Thus four-fifths of savings represents a demand for producers' goods, and is added to constant capital each year, and one-fifth represents a demand for consumers' goods, and is added to the wages fund (variable capital). These ratios dictate the relationship between Department I (producers' goods) and Department II (consumers' goods).[1] It can easily be seen that the basic assumptions require that the output of Department I must stand in the ratio of 11 to 4 to the output of Department II.[2] We can now construct a much simpler model than those provided in the text.

	c	v	s	Gross Output
Department I	44	11	11	66
Department II	16	4	4	24
			Total	90

In Department I, 5·5 units are saved (half of s) of which 4·4 are invested in constant capital and 1·1 in variable capital. In Department II, 2 units are saved, 1·6 being added to constant and 0·4 to variable capital. The 66 units of producers' goods provide 44 + 4·4 constant capital for Department I and 16 + 1·6 constant capital for Department II and the 24 units of consumers' goods provide 11 + 4 wages of labour already employed, 5·5 + 2 for consumption out of surplus and 1·1 + 0·4 addition to variable capital, which provide for an addition to employment.

After the investment has been made, and the labour force increased in proportion to the wages bill, we have

	c	v	s	Gross Output
Department I	48·4	12·1	12·1	72·6
Department II	17·6	4·4	4·4	26·4
			Total	99

[1] Since, in this model, the organic composition of capital is the same in the two departments, prices correspond to *values*.

[2] Of total gross output, $\frac{2}{3}$ is replacement of constant capital; surplus is $\frac{1}{6}$ of gross output, and of surplus half is saved; thus savings are $\frac{1}{12}$ of gross output; of saving $\frac{4}{5}$ is added to constant capital; thus $\frac{1}{15}$ of gross output is added to constant capital. The output of Department I is therefore $\frac{2}{3} + \frac{1}{15}$ or $\frac{11}{15}$ of total gross output. Similarly, the output of Department II is $\frac{4}{15}$ of total gross output.

The two departments are now equipped to carry out another round of investment at the prescribed rate, and the process of accumulation continues. The ratios happen to have been chosen so that the total labour force, and total gross output, increase by 10 per cent per annum.[1]

But all this, as Rosa Luxemburg remarks, is just arithmetic. The only point of substance which she deduces from Marx's numerical examples is that it is always Department I which takes the initiative. She maintains that the capitalists in Department I decide how much producers' goods to produce, and that Department II has to arrange its affairs so as to absorb an amount of producers' goods which will fit in with their plans. On the face of it, this is obviously absurd. The arithmetic is perfectly neutral between the two departments, and, as she herself shows, will serve equally well for the imagined case of a socialist society where investment is planned with a view to consumption.

But behind all this rigmarole lies the real problem which she is trying to formulate. Where does the demand come from which keeps accumulation going?

She is not concerned with the problem, nowadays so familiar, of the balance between saving and investment. Marx himself was aware of that problem, as is seen in his analysis of disequilibrium under conditions of simple reproduction (zero net investment). When new fixed capital comes into existence, part of gross receipts are set aside in amortization funds without any actual outlay being made on renewals. Then total demand falls short of equilibrium output, and the system runs into a slump. Contrariwise, when a burst of renewals falls due, in excess of the current rate of amortization, a boom sets in. For equilibrium it is necessary for the age composition of the stock of capital to be such that current renewals just absorb current amortization funds. Similarly, when accumulation is taking place, current investment must absorb current net saving.

It is in connection with the problem of effective demand, in this sense, that Marx brings gold-mining into the analysis. When real output expands at constant money prices, the increasing total of money value of output requires an increase in the stock of money

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[1] This model bears a strong family resemblance to Mr. Harrod's 'Warranted rate of growth', *Towards a Dynamic Economics*, lecture III.

in circulation (unless the velocity of circulation rises appropriately). The capitalists therefore have to devote part of their savings to increasing their holdings of cash (for there is no borrowing). This causes a deficiency of effective demand. But the increase in the quantity of money in circulation comes from newly mined gold, and the expenditure of the gold-mining industry upon the other departments just makes up the deficiency in demand.[1]

Rosa Luxemburg garbles this argument considerably, and brushes it away as beside the point. And it *is* beside the point that she is concerned with. She does not admit the savings and investment problem, for she takes it for granted that each individual act of saving out of surplus is accompanied by a corresponding amount of real investment, and that every piece of investment is financed by saving out of surplus of the same capitalist who makes it.[2] What she appears to be concerned with is rather the inducement to invest. What motive have the capitalists for enlarging their stock of real capital? How do they know that there will be demand for the increased output of goods which the new capital will produce, so that they can 'capitalize' their surplus in a profitable form? (On the purely analytical plane her affinity seems to be with Hobson rather than Keynes.)

Needless to say, our author does not formulate the problem of the inducement to invest in modern terminology, and the ambiguities and contradictions in her exposition have left ample scope for her critics to represent her theory as irredeemable nonsense.[3] But the most natural way to read it is also the clearest. Investment can take place in an ever-accumulating stock of capital only if the capitalists are assured of an ever-expanding market for the goods which the capital will produce. On this reading, the statement of the problem leads straightforwardly to the solution propounded in the third Section of her book.

Marx has his own answer to the problem of inducement to invest, which she refers to in the first chapter. The pressure of competition forces each individual capitalist to increase his

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[1] The phrase '*zahlungsfähige Nachfrage*', translated 'effective demand', is not the effective demand of Keynes (roughly, current expenditure) but appears often to mean demand for new capital, or, perhaps, prospective future demand for goods to be produced by new capital.

[2] This assumption is made explicit later.

[3] See Sweezy, loc. cit.

capital in order to take advantage of economies of large-scale production, for if he does not his rivals will, and he will be undersold. Rosa Luxemburg does not discuss whether this mechanism provides an adequate drive to keep accumulation going, but looks for some prospective demand outside the circle of production. Here the numerical examples, as she shows, fail to help. And this is in the nature of the case, for (in modern jargon) the examples deal with *ex post* quantities, while she is looking for *ex ante* prospects of increased demand for commodities. If accumulation does take place, demand will absorb output, as the model shows, but what is it that makes accumulation take place?

In Section II our author sets out to find what answers have been given to her problem. The analysis she has in mind is now broader than the strict confines of the arithmetical model. Technical progress is going on, and the output of an hour's labour rises as time goes by. (The concept of *value* now becomes treacherous, for the *value* of commodities is continuously falling.) Real wages tend to be constant in terms of commodities, thus the *value* of labour power is falling, and the share of surplus in net income is rising (s/v, the rate of exploitation, is rising). The amount of saving in real terms is therefore rising (she suggests later that the proportion of surplus saved rises with surplus, in which case real savings increase all the more). The problem is thus more formidable than appears in the model, for the equilibrium rate of accumulation of capital, in real terms, is greater than in the model, where the rate of exploitation is constant. At the same time the proportion of constant to variable capital is rising. She regards this not as something which is likely to happen for technical reasons, but as being necessarily bound up with the very nature of technical progress. As productivity increases, the amount of producers' goods handled per man-hour of labour increases; therefore, she says, the proportion of c to v must increase. This is an error. It arises from thinking of constant capital in terms of goods, and contrasting it with variable capital in terms of *value*, that is, hours of labour. She forgets Marx's warning that, as progress takes place, the *value* of the commodities making up constant capital also falls.[1] It is perfectly possible for productivity to increase without any increase in the *value* of capital per man employed.

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[1] This point is, however, later admitted.

This would occur if improvements in the productivity of labour in making producers' goods kept pace with the productivity of labour in using producers' goods to make consumers' goods (capital-saving inventions balance labour-saving inventions, so that technical progress is 'neutral'). However, we can easily get out of this difficulty by postulating that as a matter of fact technical progress is mainly labour-saving, or, a better term, capital-using, so that capital per man employed is rising through time.

Rosa Luxemburg treats the authors whom she examines in Section II with a good deal of sarcasm, and dismisses them all as useless. To some of the points raised her answers seem scarcely adequate. For instance, Rodbertus sees the source of all the troubles of capitalism in the falling proportion of wages in national income. He can be interpreted to refer to the proportion of wages in gross income. In that case, she is right (on the assumption of capital-using inventions) in arguing that a fall in the proportion of wages is bound up with technical progress, and that the proportion could be held constant only by stopping progress. He can also be taken to refer to the share of wages in net output, and this is the more natural reading. On this reading she argues that the fall in share of wages (or rise in rate of exploitation) is necessary to prevent a fall in the rate of profit on capital[1] (as capital per man employed rises, profit per man employed must rise if profit per unit of capital is constant). But she does not follow up the argument and inquire what rise in the rate of exploitation is necessary to keep capitalism going (actually, the statisticians tell us, the share of wages in net income has been fairly constant in modern industrial economies[2]). It is obvious that the less the rate of exploitation rises, the smaller is the rise in the rate of saving which the system has to digest, while the rise in real consumption by workers, which takes place when the rate of exploitation rises more slowly than productivity in the consumption good industries, creates an outlet for investment in productive capacity in those industries. The horrors of capitalism, and the difficulties which it creates for itself, are both exaggerated by the assumption of constant real-wage rates and, although it would be impossible to defend Rodbertus' position that a constant

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[1] Marx himself failed to get this point clear. Cf. my *Essay on Marxian Economics,* chapter 5.

[2] Cf. Kalecki, *Essays in the Theory of Economic Fluctuations,* pp. 14 *et seq.*

rate of exploitation is all that is needed to put everything right, he certainly makes a contribution to the argument which ought to be taken into account.

Tugan-Baranovski also seems to be treated too lightly. His conception is that the rising proportion of constant capital in both departments (machines to make machines as well as machines to make consumers' goods) provides an outlet for accumulation, and that competition is the driving force which keeps capitalists accumulating. Rosa Luxemburg is no doubt correct in saying that his argument does not carry the analysis beyond the stage at which Marx left it, but he certainly elaborates a point which she seems perversely to overlook. Her real objection to Tugan-Baranovski is that he shows how, in certain conditions, capitalist accumulation might be self-perpetuating, while she wishes to establish that the coming disintegration of the capitalist system is not merely probable on the evidence, but is a logical necessity.[1]

The authors such as Sismondi, Malthus and Vorontsov, who are groping after the problem of equilibrium between saving and investment, are treated with even less sympathy (though she has a kindly feeling for Sismondi, to whom she considers that Marx gave too little recognition) for she is either oblivious that there is such a problem, or regards it as trivial.[2] We leave the discussion, at the end of Section II, at the same point where we entered it, with the clue to the inducement to invest still to find.

Section III is broader, more vigorous and in general more rewarding than the two preceding parts. It opens with a return to Marx's model for a capitalist system with accumulation going on. Our author then sets out a fresh model allowing for technical progress. The rate of exploitation (the ratio of surplus to wages) is rising, for real wages remain constant while output per man increases. In the model the proportion of surplus saved is assumed constant for simplicity, though in reality, she holds, it would tend to rise with the real income of the capitalists. The ratio of constant to variable capital is rising for technical reasons. (The

[1] Marx did not find himself in this dilemma because he held that there is a fundamental 'contradiction' in capitalism which shows itself in a strong tendency for the rate of profit on capital to fall as technical progress takes place. But Rosa Luxemburg sees that the tendency to a falling rate of profit is automatically checked and may even be reversed if real-wage rates are constant.

[2] One passage suggests that she sees the problem, but thinks it irrelevant to the real issue.

convention by which the annual wear and tear of capital is identified with the stock of capital now becomes a great impediment to clear thinking.) The arithmetical model shows the system running into an impasse because the output of Department I falls short of the requirements of constant capital in the two departments taken together, while the output of Department II exceeds consumption. The method of argument is by no means rigorous. Nothing follows from the fact that one particular numerical example fails to give a solution, and the example is troublesome to interpret as it is necessary to distinguish between discrepancies due to rounding off the figures and those which are intended to illustrate a point of principle.[1] But there is no need to paddle in the arithmetic to find where the difficulty lies. The model is over-determined because of the rule that the increment of capital within each department at the end of a year must equal the saving made within the same department during the year. If capitalists from Department II were permitted to lend part of their savings to Department I to be invested in its capital, a breakdown would no longer be inevitable. Suppose that total real wages are constant and that real consumption by capitalists increases slowly, so that the real output of Department II rises at a slower rate than productivity, then the amount of labour employed in it is shrinking. The ratio of capital to labour, however, is rising as a consequence of capital-using technical progress. The output of Department I, and its productive capacity, is growing through time. Capital invested in Department I is accumulating faster than the saving of the capitalists in Department I, and capitalists of Department II, who have no profitable outlet in their own industries for their savings, acquire titles to part of the capital in Department I by supplying the difference between investment in Department I and its own saving.[2] For any increase in the stock of capital of both departments taken together, required by technical progress and demand conditions, there is an appropriate amount of saving, and so long as the total accumulation required and total saving fit, there is no breakdown.

[1] In this model the rate of exploitation is different in the two departments. This means that the numbers represent money value, not *value*.

[2] Rosa Luxemburg seems to regard this process as impossible, but for what reason is by no means clear.

But here we find the clue to the real contradiction. These quantities might conceivably fit, but there is no guarantee that they will. If the ratio of saving which the capitalists (taken together) choose to make exceeds the rate of accumulation dictated by technical progress, the excess savings can only be 'capitalized' if there is an outlet for investment outside the system. (The opposite case of deficient savings is also possible. Progress would then be slowed down below the technically possible maximum; but this case is not contemplated by our author, and it would be irrelevant to elaborate upon it.)

Once more we can substitute for a supposed logical necessity a plausible hypothesis about the nature of the real case, and so rescue the succeeding argument. If in reality the distribution of income between workers and capitalists, and the propensity to save of capitalists, are such as to require a rate of accumulation which exceeds the rate of increase in the stock of capital appropriate to technical conditions, then there is a chronic excess of the potential supply of real capital over the demand for it and the system must fall into chronic depression. (This is the 'stagnation thesis' thrown out by Keynes and elaborated by modern American economists, notably Alvin Hansen.) How, then, is it that capitalist expansion had not yet (in 1912) shown any sign of slackening?

In chapter 26 Rosa Luxemburg advances her central thesis —that it is the invasion of primitive economies by capitalism which keeps the system alive. There follows a scorching account of the manner in which the capitalist system, by trade, conquest and theft, swallowed up the pre-capitalist economies—some reduced to colonies of capitalist nations, some remaining nominally independent—and fed itself upon their ruins. The thread of analysis running through the historical illustrations is not easy to pick up, but the main argument seems to be as follows: As soon as a primitive closed economy has been broken into, by force or guile, cheap mass-produced consumption goods displace the old hand production of the family or village communities, so that a market is provided for ever-increasing outputs from the industries of Department II in the old centres of capitalism, without the standard of life of the workers who consume these commodities being raised. The ever-growing capacity of the export industries requires the products of Department I, thus maintaining invest-

ment at home. At the same time great capital works, such as railways, are undertaken in the new territories. This investment is matched partly by savings from surplus extracted on the spot, but mainly by loans from the old capitalist countries. There is no difficulty here in accounting for the inducement to invest, for the new territories yield commodities unobtainable at home. We might set out the essence of the argument as follows: Cloth from Lancashire pays for labour in America, which is used to produce wheat and cotton. These provide wages and raw materials to the Lancashire mills, while the profits acquired both on the plantations and in the mills are invested in steel rails and rolling stock, which open up fresh territories, so that the whole process is continuously expanding. Moreover, apart from profits earned on capital actually invested in the new territories, great capital gains are made simply by acquiring possession of land and other natural resources. Labour to work the resources may be provided by the local dispossessed peasantry or by immigration from the centres of capitalism. Investment in equipment for it to use is more profitable than in that operated by home labour, partly because the wretched condition of the colonial workers makes the rate of exploitation higher, but mainly just because they are on the spot, and can turn the natural resources seized by the capitalists into means of production. No amount of investment in equipment for British labour would produce soil bearing cotton, rubber or copper. Thus investment is deflected abroad and the promise of profit represented by the natural resources calls into existence, by fair means or foul, the labour and capital to make it come true. The process of building up this capital provides an outlet for the old industries and rescues them from the contradictions inherent in deficiency of demand.

The analysis of militarism in the last chapter overreaches itself by trying to prove too much. The argument is that armaments are built up out of taxes which fall entirely on wages. This can be regarded as a kind of 'forced saving' imposed on the workers. These savings are extra to the saving out of surplus. They are invested in armaments, and that ends the story. On this basis the armaments, in themselves, cannot be held to provide an outlet for the investment of surplus (though the use of the armaments, as in the Opium War, to break up primitive economies is

a necessary condition for the colonial investment already described) and capital equipment to produce armaments is merely substituted for capital formerly producing consumers' goods. The analysis which best fits Rosa Luxemburg's own argument, and the facts, is that armaments provide an outlet for the investment of surplus (over and above any contribution there may be from forced saving out of wages), which, unlike other kinds of investment, creates no further problem by increasing productive capacity (not to mention the huge new investment opportunities created by reconstruction after the capitalist nations have turned their weapons against each other).

All this is perhaps too neat an account of what our author is saying. The argument streams along bearing a welter of historical examples in its flood, and ideas emerge and disappear again bewilderingly. But something like the above seems to be intended. And something like it is now widely accepted as being true. Rosa Luxemburg, as we have seen, neglects the rise in real wages which takes place as capitalism develops, and denies the internal inducement to invest provided by technical progress, two factors which help to rescue capitalism from the difficulties which it creates for itself. She is left with only one influence (economic imperialism) to account for continuous capital accumulation, so that her analysis is incomplete. All the same, few would deny that the extension of capitalism into new territories was the mainspring of what an academic economist has called the 'vast secular boom' of the last two hundred years,[1] and many academic economists account for the uneasy condition of capitalism in the twentieth century largely by the 'closing of the frontier' all over the world.[2] But the academic economists are being wise after the event. For all its confusions and exaggerations, this book shows more prescience than any orthodox contemporary could claim.

[1] Hicks, *Value and Capital*, p. 302, note. Mr. Hicks himself, however, regards the increase in population as the mainspring.

[2] Cf. *A Survey of Contemporary Economics* (ed. Ellis), p. 63.

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THE MODEL OF AN EXPANDING ECONOMY

THE various models of a continuously expanding capitalist economy, set up, for instance, by Marx, by Cassel and, in recent times, by Mr. Harrod and Professor Domar,[1] all have their origin in a simple piece of arithmetic. When a constant proportion of income is added to capital every year and capital bears a constant ratio to income, then income expands continuously at a constant proportional rate. Thus, when 10 per cent of net income is invested every year, and the stock of capital is 5 years' purchase of net income, then the stock of capital, the rate of investment per annum, consumption per annum and net income per annum all expand cumulatively at 2 per cent per annum.

The various models which have been set up are based on widely different assumptions, and are arrived at by widely different arguments, but it is no accident that they all yield the same result, for the various assumptions and arguments are merely various ways of giving an economic application to the same piece of arithmetic.

To what use can the model be put? The meaning of a proposition depends very much upon what it denies. In this respect the model is two-sided. On the one hand, it shows that there is no inherent logical impossibility in conceiving of a capitalist system enjoying continuous expansion—it contradicts the view that there is an inescapable necessity for capitalism to run down. On the other hand, the model shows that certain special conditions are required for continuous expansion, and so it contradicts the view that there is, in general, an automatic tendency for capitalism to keep going.

Cassel lays the main emphasis upon the first aspect; the rest upon the second.

[1] Karl Marx, *Capital*, Volume II, Part III. (References are made to the English edition of Volume II, published by Swan Sonnenschein, and of Volume III, published by Kerr.) Gustav Cassel, *Theory of Social Economy*, chapter 1, § 6. R. F. Harrod, *Towards a Dynamic Economics*. E. D. Domar, 'Expansion and Employment', *American Economic Review*, March 1947. A summary of some recent literature is provided by Harrod, 'Notes on the Trade Cycle', *Economic Journal*, June 1951.

To see the use to which the model is put we must examine the various superstructures of assumptions and arguments that have been based on the arithmetic. First, how are the quantities concerned measured?

The arithmetic makes sense if we apply it to output in real terms. Marx reckons in *value*; that is, labour-time.[1] To arrive at real output it is necessary to multiply *value* by output per man-hour, which is rising through time when technical progress is taking place.

Cassel assumes that output per head is constant (there is no technical progress) so that he has no difficulty in reckoning in terms of real output. Harrod assumes constant prices, and reckons in terms of money. In effect, he takes the money value of output, corrected for changes in prices.

Whatever measure we choose we cannot avoid an index-number problem when relative wage rates and relative prices alter. The arithmetic represents income simply as a number, and it can be applied only when it is a reasonable abstraction to treat output as though it were homogeneous, that is, with constant relative prices of commodities. When changes in relative prices and relative wages are important, a more complicated analysis has to be developed.

None of our authors gives a very perspicuous account of how capital is measured, but it seems clear that the quantity of capital, at a moment of time, means all the goods in existence at that moment, valued at their prices in terms of a unit of final output. for this is the quantity which is increasing at a constant proportional rate when the conditions of the model are fulfilled.

What about employment? It is an essential characteristic of the model that output increases in proportion to the stock of

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[1] So long as the rate of exploitation (the ratio of profits to wages) is uniform throughout the economy (wages and profits being the only categories of income) and is constant through time, this comes to the same thing as using the money wage per man-hour as the unit of account. When the organic composition of capital is different in different lines of production, the ratio of capital to labour is different, and if the rate of profit on capital tends to be the same in all lines (as Marx assumes) the rate of exploitation cannot be uniform. This gives rise to the 'problem of transforming *values* into prices'—the *pons asinorum* of Marxian theory, similar to the 'adding-up problem' in marginal-productivity theory. Cf. Sweezy, *Theory of Capitalist Development*, chapter 7. See also his preface to the edition published by Kelley (New York) of Böhm-Bawerk, *Karl Marx and the Close of his System*.

capital. Therefore, if output per man-hour is rising (with technical progress) at a faster rate than the stock of capital, the number of hours work done in a year is falling through time. This (unless the available supply of labour is shrinking) entails either growing unemployment or a falling number of hours worked per man-year. If output per man-hour is rising in a smaller proportion than the stock of capital, employment is growing, which entails either that population is growing or that there is an indefinitely large reserve army of labour, in open or disguised unemployment, to be taken into service. (Alternatively, hours worked per man-year may be increasing, but this has obvious limits.)

Cassel assumes no rise in output per man-hour and full employment; therefore he requires population to be growing at the same rate as the stock of capital.[1]

Domar assumes full employment, although he allows for rising output per head. This involves him in contradictions or in assumptions about hours of work and the rate of growth of population which he does not in fact specify. Either his model is intended to be radically different from the others or the introduction of full employment into it was simply a mistake.

Harrod is rather vague about employment, while for Marx the existence of a reserve army is one of the central features of the model.

Employment, as such, does not appear in the arithmetic. The conditions of the model concern only the accumulation of capital. The basic condition, that the ratio of output to capital is constant, is satisfied if (1) technical progress is *neutral* in Harrod's sense; this means that, when capital is reckoned in terms of the cost in wage-units of the stock of capital goods, capital per unit of labour is constant, and capital per physical unit of output is falling at the rate at which output per man-hour is rising[2]; and (2) the rate of profit (interest *plus* net profit) on capital reckoned in terms of value is constant. These two conditions entail that prices in terms of wage-units fall at the pace at which output per man-hour rises (if money prices are constant, the money wage per

[1] Rather, he looks at it the other way round. He assumes that population is increasing at a steady rate, and he postulates that the community carries out investment at a sufficient rate to maintain capital per head at a constant level.

[2] Though capital in terms of wage-units is constant, physical capital is increasing; thus horse-power per man-hour is likely to be rising as technical progress goes on.

hour rises with output per hour). The ratio of output to capital, measured in terms of product, is constant. The wage per hour in terms of product rises with output per hour. The relative shares in proceeds of wages and profits (which are taken to be the only categories of income) are constant. (In Marx's language, the rate of exploitation is constant.)

Marx makes great use (and the rest no doubt would concur) of the division of the stock of capital between the two main sectors of industry—that producing investment goods and that producing consumption goods. The model requires that the division between these sectors, both of the stock of capital existing at any moment and of the investment currently going on, corresponds to the division of output between investment and consumption. Productive capacity in each sector is expanding at the same proportional rate as the total stock of capital, and therefore at the same rate as income, investment and consumption.

Next, to satisfy the conditions of the model, the proportion of saving in net income must correspond, at any moment, to the division of total productive capacity between investment and consumption goods, and must remain constant through time. This provides that effective demand expands at the same pace as total output. (The condition that saving is a constant proportion of income is consistent with the condition that the relative share of profit in net income is constant, since it is then not unplausible to postulate a given long-run propensity to save in the economy as a whole.)

Two further conditions are necessary. The stock of capital in each sector must be continuously maintained and adapted to new techniques as it grows. This condition is fulfilled if annual renewals bear a constant proportion to the stock of capital, and amortization funds, providing at the required rate for wear and tear and obsolescence, taken as a whole, are continuously reinvested as they accrue.

Finally, the gestation period of capital goods must be constant, so that a given rate per annum of investment entails a given growth per annum in the stock of capital available for use.

No doubt it is possible to construct models in which a failure in one of these conditions is compensated by a variation in another—for instance, in which a growth through time of capital per unit of output is offset by an appropriate rate of rise in the

proportion of income saved—but this involves complicated rela-
tionships between the quantities involved, and the present
argument is confined to the simple model in which all the condi-
tions are fulfilled.

In the following numerical example, the stock of capital is
equal to 5 years' purchase of net income; annual renewals are
10 per cent of the stock of capital in each sector. Investment is
10 per cent of net income. Capital is divided between the sectors
in the ratio of consumption to net investment *plus* renewals. The

	Stock of Capital			Annual Output				
	Investment Industries	*Consumption Industries*	*Total*	*Renewals*	*Consumption*	*Investment*	*Net Income*	*Gross Income*
Year 1 . . .	200	300	500	50	90	10	100	150
Year 2 . . .	204	306	510	51	91·8	10·2	102	153
Year 10 (approx.) .	240	360	600	60	108	12	120	180

'year' is an arbitrary length of calendar time. It must be long
enough relatively to the gestation period of capital goods to make
it a reasonable approximation to take the investment made in one
'year' equal to the addition to capital available for use in the next.[1]

[1] The example has to be slightly altered in order to be set out in the form which
Marx used. His terminology obliges him to make the stock of capital (pre-existing
capital, *c*, *plus* the wages fund, *v*) equal to the cost of production of a year's output
(annual replacement of capital, *c*, and the year's wages bill, *v*). He usually takes the
rate of exploitation to be unity (*v*, wages, equal to *s*, profits) so that, in our example,
v would be 50. We must therefore put *c* at 450, and consequently gross income at
550. The other quantities are the same as those set out above. (On this basis, organic
composition of capital is equal to 9, and the rate of profit on capital 10 per cent per
annum.) The gross output of Department I, renewals *plus* net investment, is 460;
while the gross output of Department II, consumption goods, is 90. To avoid tiresome
fractions, multiply all the quantities in the example by 11.
Then we have, in the first year:

	c	*v*	*s*	*Total*
Department I . .	4140	460	460	5060
Department II .	810	90	90	990
Total . .	4950	550	550	6050

Each quantity increases at the rate of 2 per cent per annum. Marx left his own
numerical examples in a state of confusion (*Capital*, Volume II, pp. 591–610). They
were reconstructed by Rosa Luxemburg in better shape, but they are still rather
awkward in the form in which she set them out; *Accumulation of Capital*, chapter 6,
pp. 115 *et seq.**

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* Cf. above, p. 64.

The specified conditions ensure that output expands continuously provided that investment is maintained at the required continuously expanding rate. This is as far as arithmetic can take us. We must now inquire what motive force may be conceived to keep the economy running along the rails which the conditions have laid out.

In Marx's scheme capitalists are subject to a strong pressure to accumulate. Saving is made only for the purpose of investment, and (apart from crises) all savings are invested as they are made. For Cassel saving *is* investment. But for those who have revived the model under the influence of Keynes the existence of thriftiness by no means guarantees that investment will be carried out.[1] They must therefore pose the question: How can perpetual accumulation be conceived to occur?

Domar regards continuous investment as requiring a kind of collective faith. Each capitalist finds it worth while to invest at the appropriate rate provided that all the others do so, and so long as each believes that the others will continue, he continues himself.

Harrod relies upon the 'acceleration principle'. The increase in the rate of output which is taking place 'induces' the increase in stock of capital which makes it possible. This is backed up by the view that so long as capitalists collectively keep the stock of capital expanding at the required rate, they are 'satisfied', and continue to do so. (Neither argument is at all clearly explained.[2])

Since he is tied up in the 'acceleration principle', Harrod has to regard his system as chronically unstable. Any chance increase in output above the rate appropriate to the conditions of the model 'induces' a higher rate of investment, and causes a boom which cannot last, and so precipitates a slump.

Another solution of the problem is to graft Marshall's analysis of long- and short-period supply price on to the model. When an economy is expanding at the rate appropriate to the given conditions, all prices are equal to long-period average costs (including in cost, profit on capital at the given rate) and all

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[1] Nor does the existence of human needs. One of the confusing points in Mr. Harrod's scheme of ideas is that he seems to identify needs with prospective profits, so that a growth in population automatically induces profit-seeking capitalists to make investment (Southern Italy?).

[2] Mr. Harrod has elaborated his view in the article referred to above, but still leaves it somewhat mysterious.

capital equipment is working at its designed capacity. In each sector conditions of rising short-period supply price obtain, so that any increase in output relatively to capacity would be accompanied by a rise in price above long-period average cost. The capitalists expect the rate of profit to continue in the future to rule at the present level.

Now, if we postulate that the capitalists' expectations of future profits have great inertia and do not react to passing events, the system can be regarded as being in equilibrium from the short-period point of view. A chance increase in consumption would cause the output of consumption goods to rise above designed capacity, prices to rise above normal costs and so profits to rise above their long-run level. But since this state of affairs is not expected to last, investment is not stepped up, and no 'acceleration' occurs. Similarly, a chance increase in investment does not raise expected future receipts (in spite of a rise at the moment, due to the operation of the short-period multiplier). But the prices of capital goods have risen above the normal long-run level, the rate of profit to be expected on funds invested at these prices is less than the accustomed rate, and so, we may suppose, investment is checked. If investment chanced to fall, the price of capital goods would fall, the rate of profit to be expected on funds invested at those prices would rise, and investment would pick up again. Thus, the postulate that expectations do not vary with current events may be considered to endow the system with short-period stability, and (combined with faith in future profitability of capital) to provide a presumption that the rate of investment tends to be maintained at a level which continuously corresponds to the gradually growing capacity of the investment-good industries.

The foregoing argument is intended to show that perpetual steady accumulation is not inherently impossible. We now turn to the arguments intended to show that the conditions required by the model are unlikely to be found in reality. First, consider the assumption, so frequently made, consciously or tacitly, in economic theory, that the economy must always be tending towards a position of static equilibrium.

An economy with constant population and unchanging technique, with capital equipment working at capacity, which has settled down to consuming the whole of its net income, fulfils the

specified conditions. It is a limiting case of the model, with the rate of accumulation at zero.[1]

But an economy in which accumulation has been taking place up to the present, and which now finds itself with a stationary population and a fixed body of technical knowledge, is in a very different pickle. Investment cannot continue for long at a constant rate of profit; accumulation is tending to come to an end, and as it falls off, a slump will occur.

This is the setting of the vision of the Day of Judgment which Pigou attributed to Keynes,[2] and of the argument as to whether a falling rate of interest and a rising value of money can maintain a given level of employment in stationary conditions.[3] However, the notion of a static state is not more realistic than the notion of

[1] This—simple reproduction—was the only example of the model which Marx worked out satisfactorily. (His examples of expanded reproduction are full of inconsistences).*

[2] 'Mr. J. M. Keynes' *General Theory of Employment, Interest and Money*', *Economica*, May 1936. It is true that some passages in the *General Theory*, especially chapter 17, can be taken to suggest that this was Keynes' view. But it is doubtful if he had anything that can properly be called a view on this question. He was impatient of the notion of long-period equilibrium and never brought his mind to bear upon it.

[3] This argument is illustrated in the following diagram. The axes measure saving, S, and income, Y, both in real terms. At each point on the L curve, which represents the long-period relation between saving and income, the stock of capital is appropriate to income. Thus at the point A the stock of capital, say a, is that of which A represents the capacity output; the point B represents capacity output of capital β; and so forth. At the point F net saving is zero.
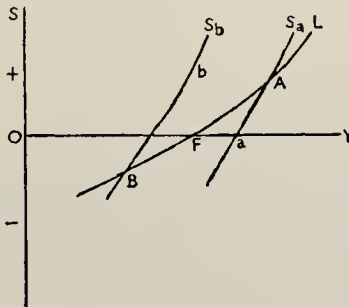
Now, if the economy exists in a stationary environment, with given, unchanging techniques, population, tastes and rate of interest, positive net investment cannot continue for any length of time, for, if it did, capital, after a while, would become redundant. Thus the only possible position of full stationary equilibrium is at F. (If the L curve does not cut the Y axis, that is, if saving is positive at all levels of income, there is no point of equilibrium short of universal extinction.)

The model of a 'pure' trade cycle in a trendless economy (Kalecki, *Essays in Economic*

* See above, p. 63, note.

continuous expansion, and this objection to the model may be
dismissed as a case of the pot calling the kettle black.

Next, consider Marx's point of view. His general picture of
the process of capitalist development throws up three main
objections to the conditions of the model. The first is that in an
unplanned private-enterprise economy there is no reason to
expect the capitalists to hit off the right proportions of investment
in various sectors of the economy.[1] The capital stock is always
getting out of gear with the main division of demand between
consumption and capital goods,[2] and with subdivisions of demand

continued from p. 81]

Fluctuations) exhibits income cycling round the point F, disinvestment in each slump
wiping out the increment of capital created in each preceding boom.

Each point on the L curve is cut by an S curve showing the short-period relation
between saving and income with given capital equipment. The S curves are steeper
than the L curve, since a rise in income above the normal capacity output of a given
stock of capital is accompanied by a rise in prices above long-period costs, an increase
in profits and consequently a rise in the ratio of saving to income. In the diagram
S_a represents incomes produced with capital α and S_b incomes produced with capital β.

Take a ease where income happens to be at the point b. The economy is now
facing the Day of Judgment. Positive investment is going on at the moment, but this
will not last, and the economy cannot make the transition from b to F without passing
through a cataclysmic slump. The problem, then, is whether, by lowering the rate of
interest and raising the real value of the stock of money, it is possible to move the
point F to the right, and flatten the S curves, in such a way as to make a smooth
transition from b to F possible.

Now suppose that the stock of capital happens to be a. This is even worse than
the Day of Judgment conceived by Pigou. Any income greater than that shown by
the point a entails positive net investment, and cannot be sustained for long. But at
the point a where savings are zero, output is below the capacity of the stock of capital;
therefore disinvestment must be taking place, income must be below a, and the stock
of capital must be dwindling towards that appropriate to F. If the economy is subject
to a trade cycle, it pursues a spiral course, the net disinvestment in each slump
exceeding the net investment in the preceding boom.

When the environment is not stationary, but technical progress combined with
population growth make steady accumulation possible, then if the conditions of the
model of steady expansion are fulfilled at A and if capitalists are willing to make
continuous investment at the appropriate rate, expansion is taking place through
time. A line rises from the page through the dimension of time, with its root at A,
set at a north-easterly angle to the plane of the diagram indicating the proportional
rate of expansion per annum in income and in saving.

[1] E.g. *Capital*, Volume III, p. 141.

[2] Rosa Luxemburg pushed this argument further than it will go. She believed
that saving out of profits can be invested only in the sector of the economy where
the profits were made, so that, unless the ratio of savings in each sector is just right
to begin with, the system will immediately jam, with a surplus of production in one
sector and a deficiency in the other.*

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* Cf. above, p. 62.

for particular commodities, so that gluts and scarcities of particular goods frequently occur. This makes smooth development impossible.

The second objection is rather vaguely sketched by Marx;[1] it is more clearly set out by Sismondi,[2] Rosa Luxemburg[3] and Hobson.[4] In their view, real-wage rates fail to rise in proportion to productivity, while profits are largely saved, so that the demand for consumption goods fails to expand as fast as the stock of capital, and accumulation cannot continue to be profitable.

The third objection to be found in Marx's analysis is based on the opinion that technical progress normally takes forms which raise the ratio of capital to output. This violates a basic condition of the model. Marx assumes that the rate of exploitation (which governs the share of profit in proceeds) cannot rise sufficiently to compensate for the increase in capital per unit of output, so that the rate of profit tends to fall over the long run, and the capitalist system is caught in a 'contradiction' which sooner or later will bring it to destruction.[5] This is a weak point in Marx's argument, for it is hard to understand how the share of labour in national income can remain constant in face of a rising ratio of capital to output.

If we assume that there is a normal rate of profit on capital (obtainable when effective demand is such as to keep output just at the level corresponding to capacity) which tends to remain constant through time, then a rising ratio of capital to output entails a rising share of profits in total income. A rising capital ratio then has two contrary effects. On the one hand, it means that as time goes by an ever-larger amount of investment is required to create a given increase in capacity; on the other hand, it means that the proportion of saving in income is rising. These two effects might balance, so that accumulation could continue smoothly.* This leads us back to the unexplored field of compensated models, in which a deviation from one of the basic conditions of the simple model is offset by an appropriate deviation from another.

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[1] E.g. *Capital*, Volume III, p. 293.   [2] *Nouveaux Principes d'Economie Politique*.
[3] *Accumulation of Capital*.   [4] *Economics of Unemployment*.
[5] *Capital*, Volume III, chapter 13.

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* This is the case of what I have called a quasi-golden age.

When the increase in required investment is greater than corresponds to the rise in thriftiness, then (provided that capitalists do want to make a continuous increase in capacity) the economy undergoes a secular boom. In the reverse case it dwells in a chronic slump.

However, if in fact technical progress on the whole is more or less *neutral*, this problem is not important either way.

In Domar's view the main objection to the conditions required by the model concerns the motive power which keeps accumulation going. A failure of confidence, or a mere tendency for capitalists each to wait and see what the others will do, brings investment to a halt.

Harrod's bugbear is a modified form of the Day of Judgment. He conceives of the maximum physically possible rate of increase in output, given by the rate of increase of employable population and the rate of increase in output per head due to technical progress (this he calls the *natural* rate of growth—an unnatural use of language). He expects that in the future this maximum possible rate of growth will fall short of the rate corresponding to the rate of accumulation which has been going on in the past, so that chronic slump conditions will set in unless policies are devised either to reduce thriftiness or to keep the ratio of capital to output rising.

All these views point to circumstances (which may or may not be realized) in which the model would break down.

Even when there is no systematic failure in any of the conditions required by the model, an overriding objection remains. History and geography present a developing economy with all sorts of chances and changes—some favourable, some unfavourable to accumulation—so that development cannot follow a steady course for long, even if all the conditions are present to start with.[1] And the very fact that actual development is erratic destroys the basic conditions for smooth development.

First, the stocks of specific equipment of various kinds and the supplies of particular types of labour, in existence at any moment, have been moulded by the past history of demand and are usually out of gear with current demand. This destroys the basic condition of the model that productive capacity in the various sectors

[1] This point of view is supported by T. C. Schelling, 'Capital Growth and Equilibrium', *American Economic Review*, December 1947.

of industry is adjusted to the division of demand between their products.

Second, when the capitalists know that unpredictable disturbances are liable to occur, the inertia of the economy is destroyed. When the present state of affairs alone is certain, it has an undue influence upon behaviour. Thus, when output expands, for any reason, relatively to capacity, capitalists have a tendency to behave as though they expected the consequent high level of profit to be maintained in the future, and to plan investment accordingly.[1] While investment is going on, profits rule all the higher; but the increase in capacity which is being created is doomed to bring the rate of profit below the level which caused it to be planned. Thus accumulation can take place only in a series of booms interrupted by slumps. If the economy has not developed smoothly in the past, it is incapable of doing so in the future.[2]

From this it seems to follow that it is a mistake to look for a theory of the trade cycle conceived in terms of oscillations around a trend of steady growth, for an economy in which steady growth is possible differs in its internal structure from one which is subject to oscillations. The connection between the cycle and the trend is both more intimate and more complicated than any that has yet been set out in a systematic theory.

POSTSCRIPT

I had forgotten, when I wrote the above, that the first use, in its modern form, of the rate of growth of capital derived from the ratio of saving to income and the ratio of income to capital, was made by Keynes in his Galton Lecture.[3]

Meanwhile, many more models have been set up. My own differs from most in that I do not rely on any fixed relationship, for the long run, between the inducement to invest and the rate of profit. 'Lower stakes will serve the purpose equally well, once

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[1] R. M. Goodwin makes an illuminating comparison between expectations that have this characteristic and the operation of a thermostat. (Chapter 22 of Alvin Hansen's *Business Cycles and National Income*, p. 437.)

[2] Mr. Harrod conceives the 'warranted rate of growth' which fulfils the conditions of the arithmetical model as a path which the economy is constantly crossing and re-crossing as it advances. But if the above argument is correct, unless the economy is actually on the path, the path does not exist.

[3] *Eugenics Review*, Volume XXIX, 1, 1937.

the players are accustomed to them.' Thus it is quite natural, in my scheme, to postulate that two economies are enjoying steady growth at the same rate though one has a lower rate of profit than the other. This would occur if one or both of the income classes taken separately was more thrifty in one economy than the other, the share of wages being correspondingly higher, so that the ratio of over-all saving to income was the same in both.[1] The low-profit economy will be using a more mechanized technique of production at each phase of technical progress.

I should say that when the 'natural' conditions are such as to make steady growth possible, it will be near enough realized if the propensity to accumulate capital that arises out of the competitive struggle of capitalist firms each to grow faster than others is sufficiently high. There is no danger of it being 'too high'. A high propensity to invest tends to speed up the 'natural' rate of growth by making firms more eager to adopt technical improvements. If there is not enough neutral technical progress to absorb the desired rate of investment, firms may be prepared to accept innovations with a capital-using bias, and when this has gone on for long enough the capital/output ratio will have been raised sufficiently for a steady rate of growth from then on to absorb the desired rate of investment. If this is not enough, there is still the possibility of 'deepening' investment to raise the degree of mechanization at any one phase of technical progress, which, again, may be conceived to go on until the capital/output ratio has been raised to the required extent.

To some extent the reverse adjustment—slower progress and a lower capital/output ratio—operates when the propensity to accumulate is low, but, where a low urge to invest is combined with a high rate of growth of population, the 'natural' rate of growth fails to be realized.

Though I maintain that there is no point in postulating a long-run inducement to invest function in terms of the over-all rate of profit, yet I find it natural to assume that a rise in prospective profits above what they have been in the recent past stimulates investment and postpones scrapping of plant, while a fall in prospective profits checks investment and speeds up scrapping. Thus I do not see any difficulty in introducing fluctuations of the multiplier-accelerator type into the story of

[1] Cf. p. 95 below.

long-run development. A loose-jointed model of this kind seems to me to be a more useful instrument for interpreting economic history than those in which a particular set of equations is expected to hold water for centuries on end.

NOTES ON THE THEORY OF ECONOMIC DEVELOPMENT

STUDENTS of economic theory at the present time have a peculiarly difficult task, for the subject changes faster than one can learn it. This is not, as in the highly developed sciences, that new branches are sprouting from an old and solid trunk. Rather it is the trunk itself which changes. The most difficult and advanced part of the subject is its 'elements' and the newest theories deal with the oldest problems.

When I was a student myself, thirty years ago, this was not so. There seemed then to be an accepted and well-established body of 'economic principles' to learn. But I think mine was the last generation for whom this was true. Very soon all the seeming-solid ground began to quake and change.

This transition is very neatly illustrated by Keynes' Introduction to the *Cambridge Economic Handbooks*. The first to appear, in 1922, carried an Introduction in which Keynes wrote of the economists' 'apparatus of thought'. 'It is not complete yet, but important improvements in its elements are becoming rare. The main task of the professional economist now consists, either in obtaining a wide knowledge of *relevant* facts and exercising skill in the application of economic principles to them, or in expounding the elements of his method in a lucid, accurate and illuminating way, so that, through his instruction, the number of those who can think for themselves may be increased.' Only a few years later Keynes altered that passage and put in its place: 'Even on matters of principle there is not yet a complete unanimity of opinion amongst professional students of the subject. Immediately after the war daily economic events were of such a startling character as to divert attention from theoretical complexities. But to-day economic science has recovered its wind. Traditional treatments and traditional solutions are being questioned, improved and revised. In the end this activity of research should clear up controversy. But for the moment controversy and doubt are increased.'

It was Keynes' own work which overthrew the complacent orthodoxy that is reflected in the first Introduction. Now, after the dust of the great controversy which raged around the General Theory has settled, we see that Keynes' victory in that argument has raised fresh questions to which the General Theory does not provide answers.

This does not mean that we should go back to the old theory. Ideas develop by a process of action and reaction, but the movement should be in a spiral, not in a circle.

After Keynes

The central point of difference between the General Theory and the neo-classical theory which it displaced concerned capital accumulation and the relations between saving and investment. According to the neo-clasiscal theory, the rate of accumulation of capital is determined by willingness to forgo consumption. 'Saving', 'waiting', 'abstinence', are the sources of growing national wealth. Just as for an individual, so for a whole economy, refraining from consumption is a means to amass wealth. This point of view provided more than an economic theory; it provided an ideology. It gave a moral justification for income from property, for the rentier had the right to be rewarded for the noble self-sacrifice of not consuming all his wealth. Moreover, the belief that thrift and prudence, the virtues of the good family man, contribute to the welfare of society was morally satisfactory. For this reason Keynes' argument that saving is a cause of unemployment was deeply shocking. Keynes himself was not above deriving some amusement from being shocking and he took pleasure in pointing out the analogy between his argument and the satirical Manderville's dictum that private vices are public virtues.

Keynes shifted the emphasis from the rentier aspect of capital as the product of thrift to the entrepreneur aspect of capital as the product of enterprise. According to him the development of wealth depends not upon prudence but upon energy:

> Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative

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probabilities. Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus, however candid and sincere. Only a little more than an expedition to the South Pole, is it based on an exact calculation of benefits to come. Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die;—though fears of loss may have a basis no more reasonable than hopes of profit had before.[1]

If human nature felt no temptation to take a chance, no satisfaction (profit apart) in constructing a factory, a railway, a mine or a farm, there might not be much investment merely as a result of cold calculation.[2]

The enemy of accumulation is not lack of thriftiness but lack of energy. If the 'animal spirits' flag, the economy will fall into stagnation, and thriftiness, far from helping to revive them, makes matters still worse by reducing the profitable market for production. It then becomes the duty of governments to substitute public investment for the failing activity of the private entrepreneur.

In such a case society is not faced with the choice between consuming and saving. An increase in the rate of investment would be accompanied by an increase in consumption. An economy which is suffering from a deficiency of effective demand is unable to use the productive equipment and the labour force which is already in existence, and eager to work if only it is given the chance. Investment and consumption therefore are not alternatives. It is not a question of sacrificing present consumption to add to future wealth. The very process of adding faster to wealth (by speeding up investment) will lead to more consumption being enjoyed, whereas to refrain from consumption would not promote investment but only increase unemployment.

Nowadays these ideas appear sufficiently obvious; it would now seem quite nonsensical to suggest an economy campaign as a remedy for slump conditions. Keynes' one-time paradoxes have become accepted orthodoxy.

There was another paradox in Keynes' argument. In his theory the relevant point about investment is that it generates effective demand. It is the process of investment, not its fruits, that matters. Even if investment is merely 'digging holes in the ground and filling them up again', it will generate demand and

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[1] *General Theory*, p. 161.   [2] Ibid., p. 150.

lead to an increase in real income. The increase in real income does not come from the holes, but from the process of digging them, which causes money to be spent and idle resources already in existence to be brought into useful activity.

So far as Keynes' main point is concerned it is nowadays only too painfully obvious that he was right. War and armaments production have taught us that useless investment can create employment and bring about a high level of production of useful goods as well, within the bounds of given short-period productive capacity.

But as soon as this lesson has been learned it ceases to be true. Keynes was fond of calling himself Cassandra—the prophetess whom no one believed. Only the predictions of Cassandra can be correct, for if the prophet is believed some avoiding action is taken and so the prediction is falsified or comes true in some unexpected sense.

As soon as Keynes' views ceased to be regarded as the ravings of a maniac and became orthodox doctrine, a large part of them ceased to be relevant. Once it is accepted policy that full employment is to be maintained in any case the whole problem appears in a different light. First, the fruit of investment becomes more important than the process of investment and 'digging holes' or building battleships is seen in its true light as an onerous burden on the community, not as a source of wealth. If resources were not being used for these dismal purposes, they could be used for something useful or pleasant. Secondly, the place of saving in the scheme of things is completely altered. The choice between present consumption and accumulation for the future becomes a real one. Investment involves a present sacrifice instead of being the vehicle for a present benefit. Public and private virtue once more come together, and refraining from consumption individually means increasing wealth collectively.

Thirdly, the problem of distribution of the product of industry comes back into the centre of the argument. In a stagnant economy which is not using all its resources because of a deficiency of effective demand, anything which increases output increases both wages and profits. When full employment is guaranteed, then, given the rate of investment, the output of consumption goods is determined. Consumption output is the difference between total output and investment. Then the division between

wages and profits is subject to the rule 'the less there is of yours, the more there is of mine'. The consumption of workers is more or less closely limited by their earnings, for they have very narrow scope for borrowing to spend more than they receive, and in general they are not sufficiently well off to have a margin for saving. The owners of property are free to save or to exceed their incomes just as they please, and the smaller the slice of cake that they choose to consume (given the total output of consumption goods) the more is available for the workers. Thus, given the level of wages, the more thrifty are the capitalists the faster is the rate of accumulation; or, given the rate of investment, the more thrifty are the capitalists the higher is the level of wages. Thus, from either point of view, saving appears as a virtuous activity.

All this sounds much like pre-Keynesian doctrine. But we cannot return to the pre-Keynesian view that saving governs investment. The essential point of Keynes' teaching remains. It is decisions about how much real investment is to be made that governs the rate at which wealth will accumulate, not decisions about saving.

The Accumulation of Capital

Keynes' theory was worked out (apart from a few rather vague general remarks) in terms of short-period situations. He considers the process of investment with a given stock of capital in existence and does not look over the edge of the short period to see what effect the addition to the stock of capital has after it has been made. Since Keynes said very little about the long period, in that department the old theory still seems to hold sway, and it is only quite recently that we have begun to reconsider it in the light of what we have learned from Keynes' analysis of the short period. The long-period theory in the text-books is mainly confined to working out static analysis, and has very much elaborated questions connected with the allocation of given resources between different uses. Economics has even been defined as the analysis of the distribution of given means between competing ends. Keynes was concerned with situations in which, though means are given, their use is not, and he was concerned with seeing how they could be used; in particular, with how full employment of a given labour force can be achieved. As soon as we see that full employment requires investment, we see that means are not

given; the investment is continually increasing the stock of capital, and if there is continuous full employment both of labour and capital the economy is continually expanding.

Let us begin by considering the simplest possible case of an expanding economy with continuous full employment. This is described by Marshall:

> But nearly all the distinctive features [of a stationary economy] may be exhibited in a place where population and wealth are both growing, provided they are growing at about the same rate, and there is no scarcity of land: and provided also the methods of production and the conditions of trade change but little; and above all, where the character of man himself is a constant quantity. For in such a state by far the most important conditions of production and consumption, of exchange and distribution will remain of the same quality, and in the same general relations to one another, though they are all increasing in volume.[1]

In this case a certain part of the labour force is continuously occupied in producing capital equipment for the growing number of workers to operate, and in building up the corresponding working capital. The output of the economy consists of consumption goods and capital goods, and income must be correspondingly divided between consumption expenditure and saving. Who is doing the saving? Let us first suppose that the capitalists are as virtuous as it is possible to be—the consumption of their families is negligible and the whole of profits are saved, while the whole of wages is currently consumed. Then, given the technique of production, which determines output per man employed, the level of real wages is determined by the rate of accumulation. It is obvious that this must be so, for the division of the labour force between the two departments—consumption goods and capital goods—determines the rate of output of consumption goods which are available to the workers to consume. With a labour force of 100, if 80 are engaged in the consumption sector (including in that sector replacement of the equipment which it requires) and 20 in net investment, then the average wage is 0·8 of the output per man in the consumption sector. If 10 are engaged in net investment, the wage is 0·9.

It is obvious that this must be so, but how does it come about through the operation of the market? Since we are assuming that only workers buy consumption goods, the total selling value of a

[1] *Principles*, p. 368.

year's output of consumption goods is equal to a year's wages bill.
The excess of the receipts for the sale of consumption goods over
their wages cost is the wages bill of the investment sector. The
profit margin on the sale of consumption goods prevents the
workers in the consumption sector from consuming the whole of
their own output, and makes it possible for the workers in the
investment sector to share in consumption. The larger the
investment sector, the higher the profits margins and the lower the
real wage rate.

The profit on each year's operation is equal to the value of the
addition to capital made during the year, but since the economy
is continuously expanding, each year's investment is greater than
the last. The investment made this year exceeds the profit
realized last year. Thus, the entrepreneurs must be continually
investing finance over and above their profits. There must
therefore be a continuous expansion of credit. So long as they
continue to invest, they continue to realize profits, and each year's
operations enables them to repay the loans which financed it.
Thus the economy can continue to expand.

The notion that (given technique) the level of real wages is
determined by the rate of accumulation becomes quite obvious
when we consider it in terms of a planned economy. In the
U.S.S.R. there is no unearned income and private saving is
negligible. Profit belongs to the nation and is devoted entirely
to administration, social services, defence and investment. The
division of output between consumption goods and investment is
fixed in the production plan, and the level of money wages and
prices is related in such a way that the whole output of consump-
tion goods is sold. Prices of consumption goods exceed the wages bill
for producing them in such a way as to provide for all the other
expenses of the economy, including investment. The gap between
wages and prices is arranged partly by profit within each enter-
prise, but mainly by means of a turnover tax. This turnover tax
(given wage rates) has to be higher the smaller the proportion of
consumption to total output. Thus the turnover tax fulfils the
same function as profit margins in the capitalist economy. The
function both of the turnover tax and the profit margins is to
prevent the consumption-sector workers from buying the whole
of their own product, so that the rest of the workers also can
consume.

Now let us consider the role of consumption out of profits. So far we have assumed that the capitalists live up to the morality of thrift a hundred per cent. They save all they receive, and act merely as an organ in the body politic to promote investment just like the planning authorities in a socialist economy.

But, in fact, they are not merely an organ of society but human beings, and human beings are addicted to consumption. The capitalists consume a part of what they receive as profits. Their expenditure raises the selling value of the output of consumption goods. Thus profit margins have to be correspondingly greater and receipts of profits are swollen. Taken as a whole, the more the capitalists spend, the more they receive.

The relation between public and private virtue now appears in a more complicated form. For the private family-man it is a virtue to be prudent and to save. For the capitalists considered as a class it is spending that is meritorious, for it is spending that generates profits. Indeed, we know very well with what assiduity capitalists are continually urging everyone to spend. In the U.S.A., where capitalism flourishes best, salesmanship is most urgent, and virtuous businessmen slip into each other's houses while they are at work and entice each other's wives and children with advertisements on the television screen.

It is sometimes supposed that the capitalists depend upon saving to supply them with funds for investment. But that is not the case. If saving is going on, receipts fall short of outlays for the entrepreneurs and they are obliged to borrow to finance investment. But if there is no outside saving, their profits are so much the greater and they can finance investment from their own undistributed profits, without having to borrow. Thus, spending by the public suits them much better than saving.

For the capitalists as a class spending is meritorious and saving is a vice. But there is another level to the argument. The economy as a whole cannot be identified with the capitalists, and what is a virtue from the point of view of the capitalists may not be so from the point of view of the economy as a whole. There are two ways of stating the fundamental proposition: Given the level of investment, real wages are lower and profits higher the less thrifty is the community. But we can state the same thing another way. Given the level of real wages, the less thrifty is the community, the lower the rate of accumulation that it can undertake.

This is extremely important in the case of the countries such as India where the standard of life of the mass of the people is very low. To recruit an industrial labour force it is probably necessary to increase the workers' consumption. Certainly there is no room to depress wages to make way for investment, for the workers are already at the subsistence minimum. Therefore willingness on the part of the wealthy classes to save is a necessary condition for getting investment started.

Equally in a developed capitalist economy which has accepted Keynes' teaching and is maintaining full employment, it is impossible to depress wages to make way for investment. With full employment and high profits, the workers are able to demand a rise in money wages to offset any rise in prices that occurs. Employers have little objection to granting their demands, for, in a strong market, prices can be raised to cover a rise in costs. So the attempt to increase investment at the expense of wages is frustrated by the vicious spiral. Then saving is seen in its true light as a means to make investment possible.

UNDERDEVELOPED ECONOMIES

This way of looking at things throws light on one of the most important problems of the present day—the problem of the underdeveloped economies.

What do we mean by underdeveloped economies? In one sense all economies are underdeveloped. Certainly the United States can be regarded as an underdeveloped peasant economy. The American farmer is a peasant in his economic relations, though in habits and mentality he does not correspond to what we usually mean by that term. The existence of agricultural overproduction in the U.S.A. indicates that there is an excess population on the land, and that there is a reserve of disguised unemployment that could be drawn upon if industry were expanding even faster than it is. This is the typical situation of an underdeveloped economy.

But I do not wish to include the United States in that category for the purposes of our present discussion. I prefer a subjective definition. The underdeveloped economies are those which are dissatisfied with their present economic condition and want to develop. To do so, it is necessary for them to increase their

present rate of accumulation, and this is what, in one way or another, they are struggling to do, or are at least talking about planning to do.

Amongst them we see all sorts of economies, including some which are operating a fully planned socialist system, some part-way to capitalism and some still predominantly feudal. The most outstanding fact in the present situation of the world is that those countries which are carrying out development after going through a socialist revolution are developing faster than the rest. From the point of view of the old theory this seems to be an anomaly. It is capitalism which is favourable to accumulation. The justification of profit is that it promotes saving. How then can it be that socialist economies are proving themselves more effective precisely at the point at which capitalism was supposed to excel? Keynes' analysis of the relation between saving and investment enables us to understand how this can be.

First of all, in the socialist economies, power is in the hands of those who are determined to carry through the process of development at the fastest possible pace. There is no question of hesitation or ambivalence or flagging 'animal spirits'. Indeed, it has now* become evident that some of them have been over-doing it, and have pressed their level of real wages below the tolerable minimum. Secondly, the very fact that the new system is set up after a socialist revolution makes a great contribution to solving the problem of saving. There is no income from property; the surplus of production over the necessary subsistence of the workers that was formerly supporting a wealthy class becomes available for investment.

The pre-existing surplus in such economies, however, is not very great. The rate of accumulation that can be achieved by using the whole surplus for investment and cutting out all con-sumption above the necessary minimum would lead to a certain rate of growth of industry, which may be less than the rate of growth of population so that unemployment in open or disguised form would still continue to grow. Even if it would be sufficient to keep up with population, the problem of absorbing the dis-guised unemployment from agriculture and low-level industry would remain. To achieve the desired rate of development it is

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necessary to have a higher rate of investment, and to make a high
rate of investment possible it is necessary to increase the surplus,
and to use the increased surplus for further investment. This
also is much easier to do in the socialist economy. As develop-
ment proceeds, productivity increases and output per head rises.
A small part of the additional output can be allocated to addi-
tional consumption and the rest used to increase the rate of
investment. By this means a gradual acceleration in the rate of
investment can be achieved and the pace of development speeded
up. Trouble arises when not enough rise in consumption is
permitted, but in principle it should be possible to hit it off right.
The high profits generated by a high rate of investment automa-
tically come back to the government without any leakage, and
the only problem is to decide how great the total should be.

In a market economy, also, a high rate of investment entails a
high level of profits, but a rise in profits leads to a rise in con-
sumption out of profits. No capitalist class has ever fulfilled the
conditions of perfect virtue which we discussed just now and saved
the whole of its receipts to finance investment. Some leakage
there must be. When consumption out of profits is increasing,
it becomes morally and politically impossible to object to allow-
ing wages also to increase. Thus investment is retarded and the
private enterprise economies limp behind the socialist economies
on the road to development.

Compared to a purely feudal system, capitalism was a great
invention for promoting accumulation. It shifted the balance of
power from property to enterprise and got going the process of
accumulation. Compared to capitalism, socialism makes the
transfer in a still more thoroughgoing way. Property ceases to
exist and the 'animal spirits' of enterprise drive the whole economy
to undertake unprecedented feats.

Thus, so far as the underdeveloped economies are concerned, it
seems that socialism is going to beat capitalism at its own game,
and the reason that it will do so is that it is a far more powerful
instrument than capitalism for extracting the investible surplus
from an economy.

As Kalecki remarked in a similar context: 'Doubtless many
people will consider this theory paradoxical. But it is not the
theory which is paradoxical but its subject.'

CONTINUOUS DEVELOPMENT

So far we have been considering the problem of saving and investment in the underdeveloped economies. Let us now consider the position in economies which are already developed. As I just said, all economies, objectively considered, are underdeveloped. Even in the United States a faster rate of development would be possible. The physical standard of life is rising fast but not at the maximum possible rate.

The difference between developed and underdeveloped economies must be defined in terms of policy—those economies are underdeveloped where it is considered necessary to speed up the rate of development, and this involves increasing the ratio of investment to consumption. In the developed economies the existing rate of accumulation is considered adequate and there is no particular pressure to increase it. Every economy was underdeveloped once, and those which are now regarded as developed passed through a period at some time in their history when the strenuous and painful process of accelerating accumulation had to be undertaken. Now they are in a relatively easy position and have only to maintain a level already achieved.

Let us return for a moment to the expanding economy described by Marshall.

Population is increasing at a steady rate. Natural resources are available in unlimited supply, so that there is no diminishing returns and capital is accumulating at just the right rate to equip all the labour force with means of production. Then the level of real wages and the rate of profit on capital remain constant as the economy expands. The distribution of the product between wages and profits remains constant. It is only necessary to suppose that each class maintains constant habits in respect to saving, so that the proportion of wages saved and the proportion of profits saved remain constant through time. Then, since the division of national income between wages and profits is constant, the division between saving and consumption is constant.

So long as the capitalists continue to invest every year a constant proportion of the growing total stock of capital, there will be sufficient demand to absorb the product of the growing stock of capital, and the growing labour force will be continually employed. If prices also are to remain stable the money-wage rate

must be constant. Then everything continues in the expanding economy without any internal change while the size of the whole system steadily grows.

Accumulation need not be confined to the rate of growth of population. Output expands faster than population grows when there is technical progress. Technical progress does in fact take place when the 'animal spirits' of the capitalists urges them to accumulate at a faster rate than the labour force is growing, for then it becomes necessary for them to raise output per man (and output per acre, if land is limited).

In Marshall's scheme the technique of production does not alter and we can reckon capital simply by counting up the items of equipment. But when technique is changing there is no physical measure of capital. When we say that the ratio of capital to labour is constant we mean simply that the relative numbers of machines of each type and men employed on them does not alter, and when we say that the ratio of capital to output (at full-capacity working) is constant we mean that the flow of goods produced by each machine is constant. But when technical progress is going on, machines are altering in form, methods of production are changing and there is no physical measure of capital to relate either to employment or to output. What, then, is the condition for stability which corresponds to Marshall's constant ratio of capital to labour?

The essential point is that a given proportion of income saved leads to a given rate of growth of income; that is, that the ratio of the value of capital to income shall be constant. This requires a double condition to be fulfilled. First, the division of resources between consumption and investment must remain constant. The division of the labour force between the two departments of the economy producing consumption goods and capital goods remains constant, and productivity increases in each of them at the same rate. The stable conditions would be upset if this were not so. If technical progress goes on faster in the capital goods sector, so that there is a capital-saving bias in progress, consumption would have to increase in a faster proportion than investment to maintain full employment. Or if technical progress were less in the capital-goods sector, consumption would have to increase less fast than investment.

Technical progress has to be without bias, between the sectors—output per head must rise as fast in producing productive capacity as in using productive capacity to produce output.

This is what is usually called 'neutrality of technical progress'.

But neutrality of technical progress is not sufficient by itself to establish stability. The second requirement is that the share of wages in the value of output should be constant, for if the distribution of the product between wages and profits alters, the proportion of saving to income alters and the conditions of stability are upset.

With technical progress output per man is rising. A constant share of wages therefore means that real wages must rise at the same rate as output. Provided that these conditions are satisfied, a constant ratio of investment to income will ensure a constant rate of growth of the economy. With neutral technical progress and wages rising with output per man, the share of profit in income remains constant. The value of capital per unit of output is constant. Total profit rises in the same proportion as output, consequently the rate of profit on capital is constant. Thus the balance of the economy is maintained, and just as in Marshall's simple case, everything goes on without internal change as the total of output steadily expands.

In short, these are the conditions of stability:

Technical progress must be neutral, so that output per head rises at the same rate in both departments, investment must be a constant proportion of income and the real wage rate must rise at the same rate as output per head.

A rise in real wages may come about by prices falling while money-wage rates remain constant, or by prices rising with money wages in a smaller proportion. In either case some disturbances are set up, and the situation most favourable to preserving stability is that money-wage rates should rise at just the same rate as productivity increases, so that the general level of prices remains constant while real wages rise.

The rise in the real-wage rate is an essential part of the mechanism which keeps the system running, for it is rising real wages which provide the market for the ever-growing product of the ever-growing stock of productive capital.

It used to be a dogma of socialist theory that the capitalist system is doomed to destroy itself through its own internal con-

tradictions. There were three branches of this theory, all of which turned upon the failure of real wages to rise with productivity.

The first is the under-consumption theory. Capitalism is continually increasing productivity and needs an ever-expanding market, but the capitalists are always too strong for the workers and keep forcing wages down to the subsistence level, so that there is not enough purchasing power to buy the goods that they produce and a crisis of over-production becomes a chronic state.

According to the second branch of the socialist theory, the ratio of capital to output must continually grow, for wages are constant, and profit is used mainly for investment. The system can keep running so long as the capitalists continue to increase the ratio of investment to consumption, but they cannot increase capital per head without lowering the rate of profit, and after a certain point the rate of profit falls too low to make investment worth while.

According to both these views the system tends to fall into a state of stagnation with investment coming to an end.

According to the third view, the end is a violent explosion. Real wages remain constant, capital accumulates and more employment is offered to the workers, until unemployment disappears. The workers organize themselves and demand higher wages, but they are always frustrated, for every rise of wages is countered by the capitalists introducing labour-saving devices and re-creating unemployment, so that the capitalists always win in the struggle, until the workers finally rise up in wrath to expropriate them.

All these theories have been proved inadequate by experience. Over the long run it seems to be the case that the share of wages, not the level of wages, remains fairly constant in developing capitalist systems. Real-wage rates are therefore rising, and it is necessary to keep up only a constant ratio of investment to maintain employment. Technical progress may be sufficient to provide an outlet for accumulation without any fall in the rate of profit.

Above all, in the highly developed capitalist economies labour organizations do not disrupt the system but are an essential element in its functioning. If organized labour were not strong enough to keep real wages rising with productivity, effective demand would fail and the capitalist economy would sink into stagnation. Each individual capitalist must resist a claim for

wages and try to keep up the share of profit, but the continued existence of the capitalists as a class depends upon their not winning too decisively—the class war has been reduced to a game which provides exercise necessary for health.

A statement of the conditions for steady progress suggests that there is no necessary and inevitable collapse of capitalism in prospect. At the same time, it shows how hard it is for the conditions for stability to be satisfied and how many weak points there are in the mechanism that keeps the system running.

Let me repeat the conditions required:

1. The balance of forces between workers and employers must be such as to keep real wages rising with output per head. This is essential. It is also desirable, though less important, that prices should be stable; that is to say, that the rise of real wages comes about by a rise of money wages step by step with productivity.

2. Technical progress must be neutral, so that the shares of wages and of profit remain constant.

3. Accumulation must be sufficient to keep the stock of capital expanding as fast as output per man rises. The animal spirits of the entrepreneurs must never flag, so that the system is kept continually at stretch, and technical progress must be sufficient to enable it to be so.

4. Thriftiness must be maintained so that saving bears a constant proportion to income.

5. The monetary system must operate in such a way as to permit investment to proceed at the required rate.

6. Limitation of natural resources must be overcome by technical progress which makes it possible to substitute capital for those resources which are growing scarce.

The last proviso may turn out to be the most difficult to satisfy. With a continuously rising standard of life for a continuously growing population, the rate of mining of the wealth of the earth's crust grows ever greater. It may be that we are living now in a fool's paradise, and in the long run it may be that the citizens of the underdeveloped economies, who are content to build their houses of mud and travel in ox carts, will have to teach us how to live without steel and oil. But that is a large question that I cannot embark upon here.

What of the remaining provisos for steady progress? First, the balance of forces between workers and employers must be such

as to keep real wages rising at the right rate. If the balance of forces is upset in either direction, the economy runs into trouble.

The business of capitalists is to make profits, and when costs fall as a result of increasing productivity, they have no reason to reduce prices unless they are compelled to do so by competition. If competition fails, the power of trade unions may act as a substitute for it by raising money-wage rates. If both fail, so that real-wage rates do not rise with productivity, profit per unit of output rises and each individual capitalist may congratulate himself on an increase in the profitability of his business. But for the capitalists as a whole the result is by no means favourable. If real wages fail to rise, demand fails to expand; profit per unit of output may be higher, but less output is sold. Profits as a whole do not increase sufficiently to keep the system running, and stagnation sets in. If the workers grow too strong they insist on raising wages faster than productivity is increasing. Then either consumption increases at the expense of investment and the necessary level of accumulation cannot be maintained, or the vicious spiral develops so fast as to disorganize the whole system.

Secondly, technical progress must go on at the right rate. Technical progress is not reliable. At times it may be too sluggish, so that accumulation can be kept up only if capitalists are willing to invest at a falling rate of profit. At other times technical progress may make strides too rapid for the economy to keep up with. We seem to be on the threshold of such a period now with the introduction of 'automation'. According to the engineers, automation has not a capital-using bias—it is neutral or even capital saving; but it raises output per man employed enormously, for the labour required to produce a given rate of output in an automatic plant is reduced to vanishing-point. How can a capitalist economy digest technical progress in this form? It requires a large rise in wage rates just at a time when the demand for labour is reduced. Such an upheaval is something which an unplanned private enterprise economy is ill adapted to meeting.

Thirdly, the basic condition for expansion is that investment should be maintained. The animal spirits of the capitalists must not flag. In fact, even at the best of times progress in capitalist countries has always gone by fits and starts. The problem of the trade cycle has always been present; the greatest enemy of accumulation has been the instability of the system, which makes

investment risky, and apart from the actual losses and waste of resources that occur in periodical slumps, it slows down the whole process of accumulation by discouraging the spirit of enterprise.

Fourthly, thrift must be maintained. If the capitalists grow too fond of consumption while the workers are strong enough to maintain their share of the product, investment has to give way and the rate of accumulation falls off. On the other hand, thriftiness must not increase, for if it does the market fails to expand with productivity and profitability falls off.

Fifthly, the monetary mechanism must function successfully so that investment is not held up by lack of finance.

When any of these conditions fail to be fulfilled, so that the pace of accumulation slackens and stagnation sets in, the pace of technical progress also slows up.

The chief driving force behind technical progress is the scarcity of labour in relation to capital which is produced by a rate of accumulation in excess of the rate of growth of population. The chief reason for the superior performance of capitalism in the United States is that the American economy grew up in conditions of scarcity of labour, and the American capitalists have always been more concerned to raise output per head than those who had a reserve of labour to call upon.

Once stagnation has set in, there is no reason for seeking out labour-saving methods; defensive monopolies are set up in a vain attempt to preserve the level of profits, but by their very action they limit the market and make profits fall all the more.

All these problems beset the development of a market economy, but when they are understood they can be dealt with, and the capitalist nations are gradually learning to deal with them.

The socialist critics of Keynes often accuse him of naïvety. They say that he thinks in terms of a benevolent government which will concern itself with maintaining employment for the benefit of the workers and the general good of society, whereas a government in a capitalist country is not benevolent or concerned with the general good, but is the organ of the capitalist class and is concerned only with the good of the capitalists. It seems to me that it is not Keynes but his critics who are being naïve. Under capitalist conditions full employment can be maintained only by maintaining prosperity also for the capitalists. The preservation of full employment has become accepted orthodoxy, and is now

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the central ideology of the Conservative party in England and the Republicans in the U.S.A. The socialists are certainly naïve if they expect capitalism to cut its own throat to oblige them.

Many difficulties, it is true, remain to be overcome. The problems of employment policy can be dealt with once they are understood. But the only organs available for dealing with them are national governments, and for each country separately the most difficult problems are those which arise in its relations with others. Any one can often help itself at the expense of the rest, but then it suffers in turn from the efforts of the others to help themselves. No reasonable solutions can be found without a much greater and more sincere effort at international collaboration than any that has yet been achieved. The socialist thesis that the capitalist system is inevitably bound to destroy itself is much too simple, but it is also too simple to suppose that it can be relied upon to maintain a constant state of prosperity.

'The price of liberty is eternal vigilance.' It is equally true that the price of prosperity is eternal vigilance.

First I argued that the socialist system is well suited to the needs of developing economies. Now I am maintaining that capitalism, if it is managed with intelligence and goodwill, may continue to flourish in economies that are already developed. If my argument is correct, we have to look forward to a long period of co-existence of different economic systems. For this reason I believe that a study of economic theory can make a small but useful contribution to peace and good neighbourliness.

I began by saying that the students of to-day are to be pitied because economic theory is growing faster than it is possible to learn it, but at least they have the consolation that nowadays it is concerned with interesting subjects.

POPULATION AND DEVELOPMENT

IT is impossible to draw any generalizations about the relationship between growth of population and growth of economic wealth merely from history. We know that sometimes a rapid rate of growth of population has been associated with a rapid rise in real income per head, as in England in the late nineteenth century, Japan in the early twentieth century or the U.S.A. at the present day. Sometimes a rapid rate of population growth is associated with a moderate rate of rise of income per head, as in Holland at the present time. Sometimes it is associated with a falling level of income per head, as was probably the case in India before the last war. Sometimes a stationary population is associated with a rapid rise of income per head, as in Sweden in recent times. It is obviously impossible to say, as a general rule, that growth of wealth stimulates growth of population, for in many cases this clearly does not happen. Nor can we say that growth of population stimulates growth of wealth, for in many cases, such as India, it has rather increased poverty. The reason, of course, is that the growth of wealth depends mainly upon the means of production at the disposal of workers, the organization of the economy and the level of education. An increase of numbers at a more rapid rate than increase of means of production must reduce average productivity and so reduce average real income. A growth of means of production relatively to numbers, or improvements in organization, increase average real income.

To find out the relationships involved we cannot rely on any simple observations, but must approach the question analytically.

First of all, it is necessary to distinguish clearly between the effects of *differences* in the size of population from the effects of *changes*.

It is also necessary to be clear as to what exactly is the population we are concerned with. If we think in terms of political nations, they may change their size by changing their boundaries.

There are very important economic advantages from having a large area under one national control. (There may be some

drawbacks also.) To take the simplest case, suppose that in a primitive economy two village communities live out of touch with each other, each supplying all its own needs for grain, wool and so forth. One has good grass land, but must cultivate part of it to grow grain to eat. The other has good grain land but has to use some to pasture sheep. If a road were built between them and they were thrown into one economy, the two together would experience a rise in real income. At this level of the argument it does not make any difference whether they organize themselves co-operatively or merely trade with each other. In either case each can specialize. All the grain is raised on the good arable land and all the sheep on the good grass land. Output per head for the average worker is higher in the larger two-village economy than it was in each of the smaller one-village economies.

In an ideal world of peace, stability and universal free trade the advantages of specialization of natural resources can be got by international exchange. But as things are nowadays, international trade is far from free and stable, and I doubt whether it ever was so outside the imagination of the writers of English economic text-books. It is far better to have a wide range of different natural resources under one political control. This gives a very great advantage at present to the U.S.S.R. and the U.S.A. over smaller nations, and will do, when they are more fully developed, to China and India.

This is nothing whatever to do with the population question. The population question is concerned with the relations of people to space; that is to say, the density of population in a particular area, not the political grouping of areas.

There are well-known economies to be obtained from a large output, particularly of manufactures, from a given economy. A large total output makes it possible to have highly specialized production, giving economies of scale; and it means that the cost of what we may call the 'overhead' of the economy—administration, the transport system, etc.,—is spread over a larger volume of output.

To some extent these economies can be got simply by concentrating a given output—a high degree of specialization between plants gives economies of long runs. Under capitalist conditions concentration carries the menace of increased monopoly. One of the important advantages of a socialist economy, in principle, is

that it can enjoy all the technical benefits of monopoly without the political drawbacks.

In some cases the benefits of high density can be got simply by concentrating the population and leaving some territory empty. But (apart from any military and political considerations involved) this is often out of the question simply because of the scatter of natural resources. When iron mines are in one corner of the map, natural harbours in another and the best farm land in a third, the population must be scattered over the whole area, and if the population is sparse, transport costs are heavy and each local market is too small to permit of all the economies of scale in manufacture. In such a case a larger output costs less per unit in real terms than a smaller output.

It is to be observed that the economies depend more upon the scale of output than the number of people. It is the total real income that is the main determinant, not the population. Take the example of a local theatre. One theatre might be supported by a large population who can only afford to go once a month, or a much smaller population with higher income and more leisure who can go once a week. The cost of the overhead would be much the same, though the small, wealthy population would demand a larger repertory.

The same principle applies in manufacturing industry. A wealthy, small population offers the same economies of scale on the general overhead as a larger and correspondingly poorer population, but requires a greater variety of output.

There are also factors which tend to make a large output more costly per unit, in real terms. Of these the most important is the limitation upon natural resources. A small output of coal can be cut from the largest seams; a small amount of timber can be got from the forests on the river banks. Larger outputs involve going deeper and farther afield, so that more labour is required per unit of output. The same principle applies to food production. This, of course, is the classic ground of the population problem—the nightmare of land per head falling so low that it becomes impossible to support life beyond the most miserable level of mere subsistence. The classical view was based on ignoring the possibilities of technical progress. A low ratio of land per head does not necessarily mean low output per head when scientific methods of cultivation are applied. It is wrong, however, to dismiss the

classical view as merely erroneous, for it serves to remind us of a very important point—the distinction between labour-saving and land-saving improvements. Up till the present, labour-saving—for instance, combine-harvesters in place of teams of men with scythes—has proved easier and may be even at the expense of reducing output per acre. Land-saving inventions, such as improved seeds, fertilizers, etc., are what is required to fend off classical 'diminishing returns from land'.

In any case, there are very great and obvious advantages in having a high ratio of land per family. It is partly, once more, a question of international trade, but certainly those nations are in the most fortunate position who can feed at home.

Land is also a very important consumption good. Perhaps it is hard for someone who grew up in the U.S.S.R. to realize this, for here space is only too plentiful; but visualize the difference between, say, Norway and Holland. Statistically, the standard of life is about the same, or perhaps higher in Holland, but in reality the urban population of Norway has an immense advantage in free or cheap pleasures—gardens, holiday resorts, wild country. When the standard of life here has risen to the point where every family in Moscow has a datcha, you will begin to see what I mean.

All this concerns the question of the advantages and disadvantages of *being* a large population. It is now time to turn to the question of the rate of growth.

Let us leave aside questions of defence, of power and prestige, and assume that the object of economic activity is 'the securing of the maximum satisfaction of the constantly rising material and cultural requirements of the whole of society'.

To secure a rising standard of life requires investment in means of production and in education. Investment has to be provided for out of the surplus of current production. This is a technical fact which is independent of the form of organization of society. The engineer building a steelworks and the student in the technical school have to eat and have to wear boots. To provide for them there must be an excess of production of bread and boots over the consumption of farmers and bootmakers. The higher the rate of investment, the larger the proportionate surplus must be, which is the same thing as saying the lower must be the ratio of consumption per head to the output of the consumption-good sector of the economy. Under capitalist conditions the surplus is

provided mainly out of profits, and a large part of it, so to say, leaks into consumption by capitalists. This casts an extra burden upon the workers. But even when this is eliminated altogether, as in a socialist economy, investment remains a burden.

Now, when the population is increasing, an appropriate part of investment has to be devoted to equipping the new arrivals with the same level of means of production, education, houseroom, etc., that is enjoyed already, and only what remains can be devoted to raising the average standard.

If the population is stationary, all investment can be devoted to improving standards.

Let us suppose, to reduce the problem to its simplest terms, that at the existing standard it takes the work of five man-years to equip one worker (including the provision for keeping the stock of newly created equipment in being in the future). Then if the labour force is growing at the rate of, say, 2 per cent per annum, ten men in every hundred have to be engaged in providing for the new entry just to keep the standard of life from falling. Only the net investment over and above 10 per cent of current output begins to contribute to improvement. With a stationary labour force, the whole of current net investment can go into improvements, or the rate of investment can be reduced and a higher proportion of current income can be consumed in meeting the material and cultural requirements of society.

So far as capitalist countries are concerned, a rise in capital per head with given techniques must lead to a fall in the rate of profit. This is an old threat that has been held over capitalism since the time of Ricardo, but in fact it has turned out that technical progress and the speeding up in the rate of diffusion of technical knowledge accompany accumulation, so that the tendency to a falling rate of profit is not realized in fact.

In any case, this is a problem only for pure capitalist nations. In a planned economy, or even in a very imperfectly regulated mixed type of economy such as we see in, say, England or Sweden, this is no problem but a great advantage.

The above argument applies with full force to a country which has behind it the main work of building up the basis of a modern economy. When the basic structure has to be created—railways laid out, land irrigated, towns established, mines opened and heavy industry equipped—the situation is somewhat different, for

the great works that have to be done do not depend very much on the numbers that will use them. It is not possible to build a railway line for so much per head. You either build it or you do not build it. This is the same point as 'spreading the overhead' which we discussed earlier.

The great works that have to be created can be made more quickly the larger the total labour force available. So long as a worker in the consumption sector can produce any surplus at all, the larger the total labour force is, the larger the amount of labour available for investment; and the larger the amount of labour available, the quicker the job can be done.

Even when we grant full force to this consideration, it does not mean that a high rate of growth of population is likely to be advantageous to a developing country. The argument applies to the employed labour force, not to the numbers of the population. In many countries there is by no means full employment of the existing labour force and, over and above the actual unemployed, almost every country in the world has a very large potential reserve army of labour in its agriculture. Even in the United States, which is not generally considered as an 'underdeveloped economy', it is possible to draw labour out of agriculture continuously, while agricultural output continues to rise. In all other countries, where the existing standard is lower, investment in mechanizing agriculture can release labour for industry. Where there are plentiful natural resources to be brought into use and where the existing population is so sparse that important economies of scale remain to be realized, a larger population may be no drawback but actually a positive advantage in terms of the average standard of life. The leading examples no doubt are Canada and the U.S.S.R. For most countries, however, the existing numbers are already too large.

Even when there is an advantage to be gained from *having* a larger population, the process of growth is likely to be onerous, and where (as in India and China) the existing population already provides a very large potential labour force that requires to be equipped for production, a growth in numbers is a very serious disadvantage.

What moral is to be drawn from these remarks? Perhaps you think that I wish to lead up to an argument in favour of family planning. I do not think that that ought to be necessary, for the

case for family planning on grounds of health, human relations and, indeed, the very basis of civilized life, is strong enough without any support from purely economic arguments.

Nor do I think that purely economic argument can ever finally settle any question, for political and human considerations are always involved in every question and are usually decisive.

But I do intend to argue that if anyone wishes to maintain that an increasing population is helpful to development, the onus of proof is on him and that he will have a very difficult case to make out.

PART II

THE PRODUCTION FUNCTION AND THE THEORY OF CAPITAL

INTRODUCTION

THE dominance in neo-classical economic teaching of the concept of a production function, in which the relative prices of the factors of production are exhibited as a function of the ratio in which they are employed in a given state of technical knowledge, has had an enervating effect upon the development of the subject, for by concentrating upon the question of the proportions of factors it has distracted attention from the more difficult but more rewarding questions of the influences governing the supplies of the factors and of the causes and consequences of changes in technical knowledge.

Moreover, the production function has been a powerful instrument of miseducation. The student of economic theory is taught to write $O = f(L, C)$ where L is a quantity of labour, C a quantity of capital and O a rate of output of commodities.[1] He is instructed to assume all workers alike, and to measure L in man-hours of labour; he is told something about the index-number problem involved in choosing a unit of output; and then he is hurried on to the next question, in the hope that he will forget to ask in what units C is measured. Before ever he does ask, he has become a professor, and so sloppy habits of thought are handed on from one generation to the next.

The question is certainly not an easy one to answer. The capital in existence at any moment may be treated simply as 'part of the environment in which labour works'.[2] We then have a production function in terms of labour alone. This is the right procedure for the short period within which the supply of concrete

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[1] Throughout this essay we shall be abstracting from land as a factor of production, so we will not bother the student with it.

[2] Keynes, *General Theory*, p. 214.

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capital goods does not alter, but outside the short period it is a very weak line to take, for it means that we cannot distinguish a change in the stock of capital (which can be made over the long run by accumulation) from a change in the weather (an act of God).

We may look upon a stock of capital as the specific list of all the goods in existence at any moment (including work-in-progress in the pipe-lines of production). But this again is of no use outside the strict bounds of the short period, for any change in the ratio of capital to labour involves a reorganization of methods of production and requires a change in the shapes, sizes and specifications of many or all the goods appearing in the original list.[1]

As soon as we leave the short period, however, a host of difficulties appear. Should capital be valued according to its future earning power or its past costs?

When we know the future expected rate of output associated with a certain capital good, and expected future prices and costs, then, if we are given a rate of interest, we can value the capital good as a discounted stream of future profit which it will earn. But to do so, we have to begin by taking the rate of interest as given, whereas the main purpose of the production function is to show how wages and the rate of interest (regarded as the wages of capital) are determined by technical conditions and the factor ratio.

Are we then to value capital goods by their cost of production? Clearly money cost of production is neither here nor there unless we can specify the purchasing power of money, but we may cost the capital goods in terms of wage units; that is, in effect, to measure their cost in terms of a unit of standard labour.

To treat capital as a quantity of labour-time expended in the past is congenial to the production-function point of view, for it corresponds to the essential nature of capital regarded as a factor of production. Investment consists, in essence, in employing labour now in a way which will yield its fruits in the future while saving is making current products available for the workers to consume in the meantime; and the productiveness of capital consists in the fact that a unit of labour that was expended at a

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[1] In Professor Robertson's example, when a tenth man joins nine who are digging a hole, nine more expensive spades are turned into nine cheaper spades and a bucket to fetch beer. (*Economic Fragments*, p. 47.)

certain time in the past is more valuable to-day than a unit expended to-day, because its fruits are already ripe.

But here we encounter a fundamental difficulty which lies at the root of the whole problem of capital. A unit of labour is never expended in a pure form. All work is done with the assistance of goods of some kind or another. When Adam delved and Eve span there were evidently a spade and a spindle already in existence. The cost of capital includes the cost of capital goods, and since they must be constructed before they can be used, part of the cost of capital is interest over the period of time between the moment when work was done in constructing capital goods and the time when they are producing a stream of output. This is not just a consequence of capitalism, for equally in a socialist society a unit of labour, expended to-day, which will yield a product in five years' time, is not the same thing as a unit which will yield a product to-morrow.

Finally, even if it were possible to measure capital simply in terms of labour-time, we still should not have answered the question: Of what units is C composed? When we are discussing accumulation, it is natural to think of capital as measured in terms of product. The process of accumulation consists in refraining from consuming current output in order to add to the stock of wealth. But when we consider what addition to productive resources a given amount of accumulation makes, we must measure capital in labour units, for the addition to the stock of productive equipment made by adding an increment of capital depends upon how much work is done in constructing it, not upon the cost, in terms of final product, of an hour's labour. Thus, as we move from one point on a production function to another, measuring capital in terms of product, we have to know the product-wage rate in order to see the effect upon production of changing the ratio of capital to labour. Or if we measure in labour units, we have to know the product-wage in order to see how much accumulation would be required to produce a given increment of capital. But the wage rate alters with the ratio of the factors: one symbol, C, cannot stand both for a quantity of product and a quantity of labour-time.

All the same, the problem which the production function professes to analyse, although it has been too much puffed up by the attention paid to it, is a genuine problem. To-day, in country

Alpha, a length of roadway is being cleared by a few men with bulldozers; in Beta a road (of near enough the same quality) is being made by some hundreds of men with picks and ox-carts. In Gamma thousands of men are working with wooden shovels and little baskets to remove the soil. When all possible allowances have been made for differences in national character and climate, and for differences in the state of knowledge, it seems pretty clear that the main reason for this state of affairs is that capital in some sense is more plentiful in Alpha than in Gamma. Looked at from the point of view of an individual capitalist, it would not pay to use Alpha methods in Gamma (even if unlimited finance were available) at the rate of interest which is ruling, and looked at from the point of view of society, it would need a prodigious effort of accumulation to raise all the labour available in Gamma even to the Beta level of technique. The problem is a real one. We cannot abandon the production function without an effort to rescue the element of common sense that has been entangled in it.

The Quantity of Capital

'Capital' is not what capital is called, it is what its name is called. The capital goods in existence at a moment of time are all the goods in existence at that moment. It is not all the things in existence. It includes neither a rubbish heap nor Mont Blanc. The characteristic by which 'goods' are specified is that they have value; that is, purchasing power over each other. Thus, in country Alpha an empty petrol tin is not a 'good', whereas in Gamma, where old tins are a source of valuable industrial raw material, it is.

The list of goods is quite specific. It is so many actual particular objects, called blast furnaces, overcoats, etc., etc. Goods grouped under the same name differ from each other in the details of their physical specifications and these must not be overlooked. Differences in their ages are also important. A blast furnace twenty years old is not equivalent to a brand new one of the same specification in other respects, nor is an egg twenty days old equivalent to a brand new one. There is another relevant characteristic of the goods. An overcoat requires one body to wear it, and an egg one mouth to eat it. Without one body, or one mouth, they are useless, and two bodies or mouths (at a given

moment of time) cannot share in using them. But a blast furnace can be used by a certain range of numbers of bodies to turn iron ore into iron. Therefore the description of a blast furnace includes an account of its rate of output as a function of the number of bodies operating it. (When long-period equilibrium prevails, the number of bodies actually working each piece of equipment is the number which is technically most appropriate to it.)

There is another aspect of the goods which is quite different. Of two overcoats, completely similar in all the above respects, one is on the body of Mrs. Jones, who is purring with inward delight at her fine appearance. Another is on the body of Mrs. Snooks, who is grizzling because, her husband's income being what it is, she is obliged to buy mass-produced clothes. In what follows we shall not discuss this aspect of goods at all. We take it that an overcoat (Mark IV) is an overcoat (Mark IV), and no nonsense.

Now, this enormous who's who of individual goods is not a thing that we can handle at all easily. To express it as a *quantity* of goods we have to evaluate the items of which it is composed. We can evaluate the goods in terms of the real cost of producing them—that is, the work and the formerly existing goods required to make them, or in terms of their value expressed in some unit of purchasing power; or we can evaluate them according to their productivity—that is, what the stock of goods will become in the future if work is done in conjunction with it.

In a position of equilibrium all three evaluations yield equivalent results; there is a quantity which can be translated from one number to another by changing the unit. This is the definition of equilibrium. It entails that there have been no events over the relevant period of past time which have disturbed the relation between the various valuations of a given stock of goods, and that the human beings in the situation are expecting the future to be just like the past—entirely devoid of such disturbing events. Then the rate of profit ruling to-day is the rate which was expected to rule to-day when the decision to invest in any capital good now extant was made, and the expected future receipts, capitalized at the current rate of profit, are equal to the cost of the capital goods which are expected to produce them.

When an unexpected event occurs, the three ways of evaluating the stock of goods part company and no amount of juggling with units will bring them together again.

We are accustomed to talk of the rate of profit on capital earned by a business as though profits and capital were both sums of money. Capital when it consists of as yet uninvested finance is a sum of money, and the net receipts of a business are sums of money. But the two never co-exist in time. While the capital is a sum of money, the profits are not yet being earned. When the profits (quasi-rents) are being earned, the capital has ceased to be money and become a plant. All sorts of things may happen which cause the value of the plant to diverge from its original cost. When an event has occurred, say a fall in prices, which was not foreseen when investment in the plant was made, how do we regard the capital represented by the plant?

The man of deeds, who has decisions to make, is considering how future prospects have altered. He is concerned with new finance or accrued amortization funds, which he must decide how to use. He cannot do anything about the plant (unless the situation is so desperate that he decides to scrap it). He is not particularly interested (except when he has to make out a case before a Royal Commission) in how the man of words, who is measuring capital, chooses to value the plant.[1]

The man of words has a wide choice of possible methods of evaluation, but none of them is very satisfactory. First, capital may be conceived of as consisting either in the cost or in the value of the plant. If cost is the measure, should money cost actually incurred be reckoned? It is only of historical interest, for the purchasing power of money has since changed. Is the money cost to be deflated? Then by what index? Or is capital to be measured at current replacement cost? The situation may be such that no one in his senses would build a plant like this one if he were to build now. Replacement cost may be purely academic. But even if the plant is, in fact, due to be replaced by a replica of itself at some future date, we still have to ask what proportion of the value of a brand new plant is represented by this elderly plant? And the answer to that question involves future earnings, not cost alone.

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[1] 'A man of words but not of deeds
Is like a garden full of weeds.'
This is sadly true of the theory of capital.

If the capital is to be measured by value, how decide what the present value of the plant is? The price at which it could be sold as an integral whole has not much significance, as the market for such transactions is narrow. To take its price on the Stock Exchange (if it is quoted) is to go before a tribunal whose credentials are dubious. If the capital-measurer makes his own judgment, he takes what he regards as likely to be the future earnings of the plant and discounts them at what he regards as the right rate of interest for the purpose, thus triumphantly showing that the most probable rate of profit on the capital invested in the plant is equal to the most appropriate rate of interest.

All these puzzles arise because there is a gap in time between investing money capital and receiving money profits, and in that gap events may occur which alter the value of money.

To abstract from uncertainty means to postulate that no such events occur, so that the *ex ante* expectations which govern the actions of the man of deeds are never out of gear with the *ex post* experience which governs the pronouncements of the man of words, and to say that equilibrium obtains is to say that no such events have occurred for some time, or are thought liable to occur in the future.

The ambiguity of the conception of a quantity of capital is connected with a profound methodological error, which makes the major part of neo-classical doctrine spurious.

The neo-classical economist thinks of a position of equilibrium as a position towards which an economy is tending to move as time goes by. But it is impossible for a system to *get into* a position of equilibrium, for the very nature of equilibrium is that the system is already in it, and has been in it for a certain length of past time.

Time is unlike space in two very striking respects. In space, bodies moving from *A* to *B* may pass bodies moving from *B* to *A*, but in time the strictest possible rule of one-way traffic is always in force. And in space the distance from *A* to *B* is of the same order of magnitude (whatever allowance you like to make for the Trade Winds) as the distance from *B* to *A*; but in time the distance from to-day to to-morrow is twenty-four hours, while the distance from to-day to yesterday is infinite, as the poets have often remarked. Therefore a space metaphor applied to time is a very tricky knife

to handle, and the concept of equilibrium often cuts the arm that wields it.

When an event has occurred we are thrown back upon the who's who of goods in existence, and the 'quantity of capital' ceases to have any other meaning. Then only that part of the theory of value which treats of the short period, in which the physical stock of capital equipment is given, has any application.

LONG-PERIOD EQUILIBRIUM

One notion of equilibrium is that it is reached (with a constant labour force) when the stock of capital and the rate of profit are such that there is no motive for further accumulation. This is associated with the idea of an ultimate thorough-going stationary state,[1] in which the rate of profit is equal to the 'supply price of waiting'. In this situation an accidental increase in the stock of capital above the equilibrium quantity would depress the rate of profit below this supply price, and cause the additional capital to be consumed; while any reduction would raise the rate of profit, and cause the deficiency to be made good. Equilibrium prevails when the stock of capital is such that the rate of profit is equal to the supply price of that quantity of capital.

But this notion is a very treacherous one. Why should the supply price of waiting be assumed positive? In Adam Smith's forest there was no property in capital and no profit (the means of production, wild deer and beavers, were plentiful and un-appropriated). But there might still be waiting and interest. Suppose that some hunters wish to consume more than their kill, and others wish to carry consuming power into the future. Then the latter could lend to the former to-day, out of to-day's catch, against a promise of repayment in the future. The rate of interest (excess of repayment over original loan) would settle at the level which equated supply and demand for loans.* Whether it was positive or negative would depend upon whether spendthrifts or prudent family men happened to predominate in the community. There is no *a priori* presumption in favour of a positive rate. Thus, the rate of interest cannot be accounted for as the 'cost of waiting'.

[1] Pigou, *The Economics of Stationary States.*

* This point is discussed below; see 'Saving without Investment', p. 191.

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The reason why there is always a demand for loans at a positive rate of interest, in an economy where there is property in the means of production and means of production are scarce, is that finance expended now can be used to employ labour in productive processes which will yield a surplus in the future over costs of production. Interest is positive because profits are positive (though at the same time the cost and difficulty of obtaining finance play a part in keeping productive equipment scarce, and so contribute to maintaining the level of profits).

Where the 'supply price of waiting' is very low or negative, the ultimate stationary equilibrium cannot be reached until the rate of profit has fallen equally low, capital has ceased to be scarce and capitalism has ceased to be capitalism. Therefore this type of equilibrium is not worth discussing.

The other way of approaching the question is simply to postulate that the stock of capital in existence at any moment is the amount that has been accumulated up to date, and that the reason why it is not larger is that it takes time to grow. At any moment, on this view, there is a certain stock of capital in existence. If the rate of profit and the desire to own more wealth are such as to induce accumulation, the stock of capital is growing and, provided that labour is available or population growing, the system may be in process of expanding without any disturbance to the conditions of equilibrium. (If two snapshots were taken of the economy at two different dates, the stock of capital, the amount of employment and the rate of output would all be larger, in the second photograph, by a certain percentage, but there would be no other difference.) If the stock of capital is being kept constant over time, that is merely a special case in which the rate of accumulation happens to be zero. (The two snapshots would then be indistinguishable.)

In the internal structure of the economy conditions of long-period equilibrium may then be assumed to prevail. Each type of product sells at its normal long-run supply price. For any one type of commodity, profit, at the rate ruling in the system as a whole, on the cost of capital equipment engaged in producing it, is part of the long-run supply price of the commodity, for no commodity will continue to be produced unless capital invested for the purpose of producing it yields at least the same rate of profit as the rest. (It is assumed that capitalists are free to move

from one line of production to another.) Thus the 'costs of production' which determine supply price consist of wages and profits. In this context the notion of a quantity of capital presents no difficulty, for, to any one capitalist, capital is a quantity of value, or generalized purchasing power, and, in a given equilibrium situation, a unit of any commodity can be used as a measure of purchasing power.

Since the system is in equilibrium in all its parts, the ruling rate of profit is being obtained on capital which is being used to produce capital goods, and enters into their 'cost of production'. Profit on that part of the cost of capital represented by this profit is then a component of the 'cost of production' of final output. A capitalist who buys a machine ready made pays a price for it which includes profit to the capitalist who sells it. The profit a capitalist who has the machine built in his own workshops will expect to receive, from sales of the final output, includes profit on the interest (at a notional rate equal to the ruling rate of profit) on the cost of having the machine built reckoned over the period of construction. For when he builds the machine himself he has a longer waiting period between starting to invest and receiving the first profit. If he could not earn profit on the notional interest cost, he would prefer to make an investment where there was a shorter waiting period, so that he could receive actual profit earlier. The actual profit he could plough into investment; thus acquiring (over the same waiting period) the same quantity of capital as in the case where he builds the machine for himself. (He would also have the advantage that he could change his mind and consume the profit, whereas in the first case he is committed to the whole scheme of investment once he begins.) Thus, investments with a long gestation period will not be made unless they are expected to yield a profit on the element of capital cost represented by compound interest over the gestation period (if there were uncertainty, they would have to be expected to yield more, to compensate for the greater rigidity of the investment plan).

We need not go back to Adam to search for the first pure unit of labour that contributed to the construction of existing equipment. The capital goods in being to-day have mutually contributed to producing each other, and each is assumed to have received the appropriate amount of profit for doing so.

So much for the supply price of an item of new equipment.
How are we to reckon the supply price of part-worn equipment?
Investment in new equipment is not made unless its gross earnings
(excess of output over wages bill in terms of output) are expected
to be sufficient to amortize the investment over its working life,
allowing for interest at the ruling rate on accrued amortization
funds, as well as providing profit at the ruling rate. The supply
price of an equipment which has been working for a certain time
may be regarded as its initial cost accumulated up to date at
compound interest, *minus* its gross earnings also accumulated from
the dates at which they accrued up to the present, for this corre-
sponds to the expectations which induced capitalists in the past
to make the investment concerned.

Since initial cost is incurred at the beginning, and earnings
accrue over time, the element of interest on cost in the above
calculation exceeds the element of interest on earnings. Thus
when an equipment has yielded a quarter of its expected total
earnings, its supply price, in this sense, is somewhat more than
three-quarters of its initial cost; half-way through, somewhat more
than half its initial cost, and so forth, the difference at any
moment being larger the higher the rate of interest. Over its life
the accumulated interest on its earnings, so to say, catches up
upon the accumulated interest on its cost, so that at the end of its
life it is fully paid off and its supply price (abstracting from scrap
value) has fallen to zero.

The value of an equipment depends upon its expected future
earnings. It may be regarded as future earnings discounted back
to the present at a rate corresponding to the ruling rate of interest.
In equilibrium conditions the supply price (in the above sense)
and the value of an equipment are equal at all stages of its life.[1]

Equilibrium requires that the stock of items of equipment
operated by all the capitalists producing a particular commodity
is continuously being maintained. This entails that the age
composition of the stock of equipment is such that the amortiza-

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[1] The equalization of the value of two annuities at any point of time entails their
equalization at any other point of time. If the cost of a new machine is equal, at the
moment when it is brand new, to the discounted value of its expected gross earnings,
it follows that, at any later point of time, the accumulated value of the original cost
and gross earnings up to date will, if expectations have been proved correct up to
date and are unaffected for the future, be equal to the present value of the remaining
gross earnings expected over the future. Cf. Wicksell, 'Real Capital and Interest',
Lectures (English edition), Volume I, p. 276.

tion funds provided by the stock as a whole are being continuously spent on replacements. When the stock of equipment is in balance there is no need to inquire whether a particular worker is occupied in producing final output or in replacing plant. The whole of a given labour force is producing a stream of final output and at the same time maintaining the stock of equipment for future production. Nor is it necessary to inquire what book-keeping methods are used in reckoning amortization quotas. These affect the relations between individual capitalists, but cancel out for the group as a whole.

In equilibrium the age composition of the stock of equipment is stable, but the total stock may be in course of expanding. The average age of the plants making up a balanced stock of stable age composition varies with the length of life of individual plants. If the total stock is remaining constant over time, the average age is equal to half the length of life. If the stock has been growing, the proportion of younger plants is greater and average age is less than half the life span. (There is an exact analogy with the age composition of a stable population.)

The amount of capital embodied in a stock of equipment is the sum of the supply prices (reckoned as above) of the plants of which it is composed, and the ratio of the amount of capital to the sum of the costs of the plants when each was brand new is higher the greater the rate of interest.[1]

[1] The order of magnitude of the influence of the rate of interest is shown by the formula provided in the Mathematical Addendum by D. G. Champernowne and R. F. Kahn.* For this formula it is necessary to assume (a) that the total stock of capital is constant over time, (b) that earnings are at an even rate over the life of the plant. C is the capital value of an investment, K the initial outlay, r the rate of interest and T the period over which the asset earns. For values of rT less than 2 we use the approximation $C/K = \frac{1}{2}(1 + \frac{1}{6}rT)$.

On this basis, when the rate of interest is, for example, 6 per cent, a machine of ten years' life costing £100 when new must earn £13.3 per annum surplus over the current outlay on working it (including current repairs). The yield will then be 6 per cent on a capital value of £55.

A group of ten such machines of ages zero to nine years have a pattern of values, at any moment, which corresponds to the pattern over time of a single machine. It requires an annual outlay on renewals of £100 permanently to maintain the stock of machines. They represent a capital value of £550 and yield a return of £33 per annum.

If the rate of interest were 10 per cent, rT would be equal to 1 and the capital value (abstracting from a higher initial cost of machines due to the higher interest rate) would be £583; the earnings of each machine would then have to be £15.8 to yield the required rate of profit.

If the length of life of machines was twenty years, and the rate of interest 5 per cent, capital value would again be £583, and each machine would have to yield £7.9 per annum (£5 for amortization and £2.9 for interest); at 10 per cent, rT would be equal to 2; the capital value would then be £666, and each machine would have to yield £11.7 per annum.

* This appears as an appendix to my *Accumulation of Capital*.

Equilibrium requires that the rate of profit ruling to-day was expected to be ruling to-day when investment in any plant now extant was made, and the expectation of future profits obtaining to-day was expected to obtain to-day. Thus the value of capital in existence to-day is equal to its supply price calculated in this manner. The heavy weight which this method of valuing capital puts upon the assumptions of equilibrium emphasizes the impossibility of valuing capital in an uncertain world. In a world where unexpected events occur which alter values, the points of view of the man of deeds, making investment decisions about the future, and of the man of words making observations about the past, are irreconcilable, and all we can do is botch up some conventional method of measuring capital that will satisfy neither of them.

Wages and Profits

The neo-classical system is based on the postulate that, in the long run, the rate of real wages tends to be such that all available labour is employed. In spite of the atrocities that have been committed in its name there is obviously a solid core of sense in this proposition. To return to our road builders, employment per unit of output is much higher in Gamma than in Alpha, and it seems obvious that this is connected with the fact that real wages there are much lower—that the plethora of labour keeps real wages down, and so helps to get itself employed. Let us try to see what this means.

The basic data of the system are: the labour force, the amount of capital and the state of technical knowledge, expressed as the hierarchy, ranged according to degrees of mechanization, of the possible techniques of production. In order to satisfy the neo-classical postulate of full employment, the given amount of capital must employ the given amount of labour.

At any given wage rate, the interplay of competition between capitalists, each seeking to maximize his own profits, is assumed to ensure that the technique will be chosen that maximizes the rate of profit. Thus, the technique is a function of the wage rate. The outfit of productive equipment in existence is determined by the technique and the total amount of capital. A given outfit of equipment offers a given amount of employment. Thus, we have the amount of employment as a function of the wage rate. We can then state the neo-classical postulate: the wage rate is assumed

to be such that the technique of production is such that the given quantity of capital employs the given labour force. It is necessary to postulate that the amount of real wages (which is not the same thing as the wage bill but is governed by it) in relation to the cost of subsistence is at least sufficient to maintain the given labour force in being.

The condition that the given amount of capital employs the given amount of labour thus entails a particular rate of profit. But the value of the stock of concrete capital goods is affected by this rate of profit and the amount of 'capital' that we started with cannot be defined independently of it.

What becomes of the neo-classical doctrine if we read it the other way round: that the rate of profit tends to be such as to permit all the capital that comes into existence to be employed? Suppose that the wage rate has been established at a level which yields some conventional minimum real wage, and that, the technique having been chosen which maximizes the rate of profit, the quantity of capital in existence does not employ all available labour, so that there is a reserve of unemployment. Accumulation can then proceed at a constant factor ratio and constant rate of profit until all available labour is employed. If population is increasing at least as fast as capital is accumulating, full employment is never attained, and the expansion of the economy can continue indefinitely (we have postulated that there is no scarcity of land, including all non-produced means of production).

So far the argument is dismally simple. What are we supposed to imagine to happen when there is full employment in the long-period sense, that is, when there is sufficient plant in existence to employ all available labour? One line of argument is to suppose that the capitalists who are accumulating act in a blindly individualistic manner, so that a scramble for labour sets in; the money-wage rate is bid up, and prices rise in an indefinite spiral. (It is of no use to bring the financial mechanism into the argument, for if the supply of the medium of exchange is limited, the interest rate is driven up; but what the situation requires is a fall in the rate of interest, to encourage the use of more mechanized techniques.)

Or we may postulate that the capitalists, while fully competitive in selling, observe a convention against bidding for labour—each confines himself to employing a certain share of the constant

labour force. Then anyone who wishes to increase the amount of capital that he operates shifts to a more mechanized technique. Those who first make the change may be supposed to compete for wider markets and so to reduce prices relatively to money wages. A higher degree of mechanization then becomes eligible, and the switch to more mechanized techniques proceeds at a sufficient rate to absorb new capital as it accrues. Alternatively, we might imagine that an excessive number of plants of the less mechanized type are actually built, and that their redundancy, relatively to labour to man them, reduces profit margins, so that the wage rate rises and induces mechanization. (Whichever line we follow the argument is necessarily highly artificial, for in reality the state of trade is the dominant influence on investment. The situation which promotes the mechanization of production is full employment and full order books, that is to say, a scarcity of labour relatively to effective demand, but the equilibrium assumptions do not permit us to say anything about effective demand.)

Somehow or other, accumulation may be conceived to push down the rate of profit, and raise the factor ratio.

But the very notion of accumulation proceeding under equilibrium conditions at changing factor ratios bristles with difficulties. The rate at which the factor ratio rises is not governed in any simple way by the pace at which accumulation goes on—it depends upon the extent to which the rising wage rate causes capital to be absorbed by the Wicksell effect.* Moreover, the effect of a given change in the factor ratio depends upon the speed at which it is made, relatively to the length of life of plant. If capital per man is rising rapidly some capitalists' plants appropriate to a variety of degrees of mechanization will be operating side by side.

Even if we can find a way through these complications, there remains the formidable problem of how to treat expectations when the rate of profit is altering. An unforeseen fall in the rate of profit ruptures the conditions of equilibrium. Capitalists who are operating on borrowed funds can no longer earn the interest they have contracted to pay, and those operating their own capital find themselves in possession of a type of plant that they would

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* This is discussed below; see 'The Real Wicksell Effect', p. 185.

not have built if they had known what the rate of profit was going to be.

On the other hand, if we postulate that accumulation goes on in the expectation of a gradually falling rate of profit, the whole basis of the analysis becomes immensely complicated. We can no longer argue in terms of a single interest rate. There is a complex of rates for loans of different lengths, the rates for shorter terms standing above the rates for longer terms. Moreover, the pace at which the rate of profit falls as the factor ratio rises is dictated by technical conditions. Over its early reaches the factor-ratio curve may be supposed to be steep, with the rate of profit falling slowly. Then it passes over a hump, with a rapid fall in the rate of profit, and flattens out again with a lower but more slowly falling rate of profit. To be correct, the expectations of the capitalists cannot merely be based on past experience but require a highly sophisticated degree of foresight.

Thus, the assumptions of equilibrium become entangled in self-contradictions if they are applied to the problem of accumulation going on through time with a changing factor ratio. To discuss accumulation we must look through the eyes of the man of deeds, taking decisions about the future, while to account for what has been accumulated we must look back over the accidents of past history. The two points of view meet only in the who's who of goods in existence to-day, which is never in an equilibrium relationship with the situation that obtains to-day.

In short, the comparison between equilibrium positions with different factor ratios cannot be used to analyse changes in the factor ratio taking place through time, and it is impossible to discuss changes (as opposed to differences) in neo-classical terms.

The production function, it seems, has a very limited relevance to actual problems, and after all these labours we can add little to the platitudes with which we began: in country Gamma, where the road builders use wooden shovels, if more capital had been accumulated in the past, relatively to labour available for employment, the level of real wages would probably have been higher and the technique of production more mechanized, and, given the amount of capital accumulated, the more mechanized the technique of production, the smaller the amount of employment would have been.

POSTSCRIPT

I have included here only the negative part of this article as the constructive parts are better done in my book, *The Accumulation of Capital*. The trouble which I was trying to expose arose from burdening the concept of a production function with inappropriate tasks. The notion of a range of possible techniques, co-existing in time in the form of blue prints, amongst which choices are made by firms or investment planners when new productive capacity is being set up, is useful and has a genuine operational meaning (though it is very difficult to apply in the complicated situations that arise in reality). In that context, it is appropriate to measure the investible resources about to be committed in terms of value. The difficulties that present themselves arise out of the uncertainty of the future and can be imagined to disappear in conditions of perfect tranquillity.

When presented with the task of determining the distribution of the product of industry between labour and capital, the neo-classical production function comes to grief (even in the most perfect tranquillity) on the failure to distinguish between 'capital' in the sense of means of production with particular technical characteristics and 'capital' in the sense of a command over finance.

When presented with the task of analysing a process of accumulation, the production function comes to grief on the failure to distinguish between comparisons of equilibrium positions and movements from one to another.

The remarks about equilibrium on page 120 above seemed very queer to Sir Dennis Robertson,[1] and, indeed, they are not well worded. My point was this: a state of equilibrium is one in which each individual is satisfied that he could not do better for himself by changing his behaviour. Applied to long-lived capital equipment, this means that the stock in existence to-day is in all respects what it would have been if those concerned had known, at relevant dates in the past, what expectations about the future they would be holding to-day. But periods affected by different decisions overlap and the relevant past stretches back indefinitely. Thus, an economy can be following an equilibrium path to-day

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[1] *Lectures on Economic Principles*, Volume I, p. 95.

only if it has been following it for some time already. A thorough-going stationary state is a limiting case in which nothing changes except the date as the economy moves along its equilibrium path.

In the article which follows I have tried to show how the neo-classical production function can be rescued if we bring the Keynesian conditions to its aid. The equilibrium path of accumu-lation and distribution of income can then be traced out. But there is still lacking any plausible account of a mechanism to keep the economy in equilibrium.

ACCUMULATION AND THE PRODUCTION FUNCTION

THE present-day interest in capital accumulation and economic development has given a new lease of life to the neo-classical problem of accumulation in an economy where the labour force and the state of knowledge are constant, with the rate of profit falling and the real-wage rate rising as time goes by.

Various recent attempts to synthesize the concept of a neo-classical production function with a Keynesian treatment of saving and investment have not been very successful. My own version, though not, I believe, erroneous, is clumsy and un-convincing.[1] Mr. Kaldor[2] throws away the neo-classical half of the problem. In his model there is a mysterious force that keeps the capital/output ratio constant, but if it did ever alter, on his assumptions, it would alter through a bias in technical progress, not through a movement along a production function. Mr. Little[3] throws away the Keynesian half and makes saving govern investment. The brilliance of Professor Solow[4] dazzles more than it enlightens. Professor Champernowne[5] asks us to ascend a towering structure of argument without adequate assurance that all the rungs are firmly fixed. Mr. Ara[6] takes refuge in 'K is a quantity of capital' and Mr. Swan in sets of Meccano.[7]

The difficulty of the problem arises, I think, from attempting to rig up assumptions to make it seem plausible that a private-enterprise economy would continuously accumulate, under long-period equilibrium conditions, with continuous full employment of a constant labour force, without any cyclical disturbances, in

[1] *The Accumulation of Capital*, chapter 14.
[2] 'A Model of Economic Growth', *Economic Journal*, December 1957.
[3] 'Classical Growth', *Oxford Economic Papers*, June 1957. The elegance of this article is marred by a supply curve of labour which is left flapping about unattached to the rest of the argument.
[4] 'A Contribution to the Theory of Economic Growth', *Quarterly Journal of Economics*, February 1956, and 'The Production Function and the Theory of Capital', *Review of Economic Studies*, 1955-6, Volume XXIII, 2, No. 61.
[5] 'Capital Accumulation and the Maintenance of Full Employment', *Economic Journal*, June 1958.
[6] 'Capital Theory and Economic Growth', *Economic Journal*, September 1958.
[7] 'Economic Growth and Capital Accumulation', *Economic Record*, November 1956.

face of a continuously falling rate of profit. But why try to make it seem plausible, when we know that in real life nothing like it ever happens? Let us take it simply as an exercise, and postulate that accumulation does take place in this way for no other reason than that that is what we choose to postulate.

I

The conditions which have to be fulfilled are:

1. There is constant employment, without excess or deficient demand for labour at the ruling wage rate.

2. The ratio of income to investment satisfies the propensity to consume, without undesigned saving or dis-saving. Prices and supply and demand for individual commodities are in competitive equilibrium.

3. All possible technical relations between labour, capital goods and output are known and do not change through time. They are subject to conditions of diminishing returns in the sense that a rise in the value of capital per man, capital goods being reckoned at constant prices, leads to a smaller proportionate rise in output.

4. Those in charge of the investment plans of firms believe with perfect confidence that they know all relevant future prices and wage rates, and, in the light of these and the technical relations, always choose the physical form of investment in such a way as to maximize their profits. (This is excessively fanciful, for they have to operate with a complex of profit rates, applying to each investment the rate appropriate to the length of life of the capital goods concerned, but it is part of the neo-classical equilibrium conditions that we accept for the sake of the exercise.)

We take it that it is possible to measure a quantity of consumption goods in an unambiguous manner. All values are reckoned in terms of money of a constant purchasing power over consumption goods.

In one set of technical relations and conditions governing the propensity to consume (thriftiness conditions for short) there is one path that the process of accumulation must follow. With any given value of the stock of capital in existence (the fruit of past accumulation) the rate of investment (in conjunction with the thriftiness conditions) determines the current rate of profit and influences expected rates, in a Keynesian manner. The complex

of expected profit rates (in conjunction with technical relations) determines the form in which capital is invested (the choice of technique) and the amount of employment it offers, in a neo-classical manner. There is one set of expectations that will be compatible with continuing equilibrium. At any particular moment the past course of the rate of accumulation (the ratio of net investment to the stock of capital) has been such as to make the course of profits such that (being foreseen) they have caused the capital to be embodied in forms that offer employment to just the amount of labour that is available. And they must continue to be such as to fulfil this requirement.

The Keynesian freedom of entrepreneurs to invest as they please has not been sacrificed to the neo-classical conditions, but to the postulate that equilibrium is never ruptured. If, at any moment, the rate of investment rose above the level required by the prescribed path of accumulation, there would be a rise in the share of profits and a failure of real wages to reach the prescribed level. There would then be an excess demand for labour and an inflationary situation would develop. If the rate of investment fell below the prescribed level, a slump would set in. Nothing prevents this from happening except the postulate that equilibrium is maintained. The Keynesian forces are being asked, for the sake of the exercise, to dance to a neo-classical tune.

Granted that at any moment the *rate* of gross investment is such as to give full employment and full-capacity working of the existing stock of capital, it must be of a *form* which is such that full-capacity working will be compatible with full employment when the equipment now being built is in use. The allocation between investment and consumption, and the techniques chosen, must be such as to keep the supply of goods in equilibrium with demand, and demand for labour in equilibrium with supply. If, say, too much were being put into enlarging capacity in the investment sector, then a scarcity of plant and inflationary profits would develop in the consumption-good markets. Or if too capital-using a technique were being installed, current gross investment would be replacing old machines by a quantity of new machines which required less labour to operate, and full employment would become impossible.

There is one pattern of physical investment that will preserve equilibrium, and one pattern of expectations that will induce

investment to take that physical form; it is just these expectations that are confidently held by the firms carrying out investment. The expectations being compatible with equilibrium, the plans based on them will maintain equilibrium and cause the expectations to be realized.

Since this is true at every moment, the history of accumulation is prescribed and the evolution of the stock of capital through time is determined by it. At any moment there is a particular assemblage of concrete capital goods, including stocks and work in progress, that can be listed in a who's who, specifying their technical properties, age and prospective life. And there is a particular pattern of prices, such that the value of the stock of capital, of the rate of investment and real income, and the division of income between wages and profits, are compatible both with the technical relations and the thriftiness conditions at that moment. The who's who and the values for all past and future dates are implicit in the situation at that moment, and the whole history, backwards and forwards, can be seen at any moment in it. Looking back, the value of the stock of capital dwindles till it is vanishingly small, and the rate of accumulation indefinitely great. Looking forward, the value of the stock of capital is growing and the rate of accumulation sinking towards zero. The stationary state appropriate to the given conditions is the asymptote which the system is approaching at a predestinate pace along its predestinate path.

We let ourselves in for this when we accepted the neo-classical postulate of continuous equilibrium with full employment.

II

The thriftiness conditions are stated in terms of the ratio of net saving to net income. The provision which capitalists make for amortizing investments over the life of the capital goods concerned are not counted as net saving. Our second equilibrium condition, therefore, must be stated in terms of net investment. It is net investment that net saving has to be equal to. What exactly do we mean by the value of a year's net investment, and how is the net investment related to the growth in the value of the capital stock over that year?

We have no need to worry about any pseudo-Wicksell effects*— revaluations of existing capital goods when changes occur in the rates of interest. The complex of interest rates for different terms correctly reflects the complex of prospective rates of profit. Our capitalists never make a mistake and are never surprised by the fall in interest rates that occurs as time goes by. The difference in value of a capital good made by expected changes in interest rates over its life is already in its price to-day, and no revaluation will be called for when the expected happens.

On the other hand, we do have to take account of real Wicksell effects. As time goes by the real-wage rate and the complex of interest rates are altering. The reproduction cost (in terms of money of a constant purchasing power over consumption goods) of any fairly long-lived capital good is equal to its historic cost only by a fluke. It may be greater or smaller, according as the effects of higher wage rates more or less than offset the effects of lower interest rates. Generally a piece of equipment will not be replaced by a replica of itself, for during its lifetime different techniques have become eligible, but the issue can be stated without supposing that it is.

Let us suppose that we calculate what the latest type of equipment would cost on the basis of the wage rate and the relevant interest rates that were ruling when the equipment now being replaced was new. A physical quantity of the new plant that, at the old prices, would have a cost equal to the historic cost of the old plant may be regarded as the 'equivalent' of the old plant. In terms of consumption goods to-day, a sum equal to the initial cost of the old plant may purchase more or less than its 'equivalent', according as the effect on the cost of plant of the new type of lower interest more or less than outweighs the effect of higher wages. By this means we can detect whether money of a given purchasing power over commodities now has a higher or lower purchasing power over capital goods, and so separate out the part of the change in value of capital per head which is due to changes in factor prices from that which is due to the change in the physical quantity of capital.[1]

[1] Cf. T. Swan, loc. cit.

* See p. 190.

In the case where an amortization fund equal to the historic cost of a plant will purchase more than its 'equivalent' when the old one comes to be replaced, the additional physical capital is not counted as part of net investment. It is just thrown in. It means that the physical and technical counterpart of a given value of capital has become bigger and better without any net saving having been required. On the other hand, when the cost of its 'equivalent' has risen over the lifetime of the old plant the finance which has to be added to its amortization fund in order to recreate an 'equivalent' amount of plant is included in net investment.

Our capitalists need not be conscious of all this. It is only necessary that they (and the economists observing them) follow the rule of calculating net profit after providing for the maintenance of the value of any finance invested in the past. So long as this rule has always been followed (without mistakes in foresight), the total value of the capital in existence to-day is the sum of all the net investments that have been made in the past. But it means that there is no simple relation between a sum of value of capital and any kind of index of physical capital. The relation between output per unit of labour and the value of capital per head is not a purely technical one. It combines the effects (in various proportions in different situations) of technical relations with the effects of differences in factor prices.[1]

The neo-classicals hanker after a simple one-dimensional index of physical capital. Formerly they tried (as Wicksell with his grove of trees) to reduce physical capital to terms of a simple time-dimension. Nowadays the fashion is rather to try to reduce the time-dimension to technical terms by postulating that capital goods are one-hoss shays that work with perfect efficiency for a technically determined time and then fall to pieces. Bigger and better one-hoss shays are somehow to be expressed in units of a standard shay. But even if a reasonably satisfactory physical unit can be devised, it is no help.

At any particular moment, with given wage rates and prices and a given complex of interest rates, the technical choices open to investors can be set out in terms of value of capital per unit of labour, and a physical unit is not necessary. If we had one, we

[1] I have been much complained of for this, like the messenger in an old play who brings bad news.

K

could reckon the quantity of gross investment in terms of it, but it would not help us to detect how much of the gross investment was net, for depreciation allowances are designed to maintain the value of capital, not its quantity in terms of any particular physical unit.

Thus the interplay between the thriftiness conditions (which run in net value terms) and the technical relations (which run in gross physical terms) is extremely complicated. All the same, under the rules governing our exercise, it is perfectly determinate. At each point on the prescribed path there is a certain value of capital, a certain concrete stock of capital goods, a certain flow of physical outputs of consumption and capital goods and certain levels of wages and prices. The technical and the value relationships are always fitted together to fulfil the equilibrium conditions in terms of which the exercise is conducted.

III

As accumulation goes on, the value of capital per unit of labour is continuously rising. How does this affect the relative share of wages and profits in total net income?

To discuss this question we must specify the thriftiness conditions. Let us make them simple. We postulate a two-class economy in which the workers' consumption is equal to their wages, while capitalists spend a lump sum, say b per annum, which is independent of income, plus a proportion $(1 - s)$ of what they properly regard as net profit. Then, when designed savings are equal to investment, net profits per annum are $(b + I)/s$, where I is a year's net investment. The constant, b, is not of any importance in the present context (it will come in handy later); we may assume it to be negligibly small in relation to I. The share of profit in income then rises or falls in proportion to the ratio of investment to income.

Now, as time goes by, the ratios of income and of investment to the over-all value of the stock of capital are changing (in general, both are falling). There is no presumption as to how the ratio of investment to income will change.

Its behaviour at each phase of accumulation depends upon the relation between real wages and output per head. Generally speaking, as capital accumulates real-wage rates rise, and are

expected to rise further; the degree of mechanization of each new lot of capital goods installed (exception made for cranky cases) is greater than that of the last, and output per head is tending to rise. When the rise in real wages, over a certain period, has been accompanied by a more than proportionate increase in the value of output per head, gross profits per man employed have risen, and there must have been an increase in the ratio of investment to income to absorb the increase in savings per unit of value of output that this entails. Otherwise a deficiency of demand would have developed and the increase in mechanization would have thrown men out of work. Conversely, when a rise in real wages has been accompanied by a smaller increase in output per head, the ratio of investment to income must have fallen sufficiently to permit the consequent increase in consumption to take place without an inflationary excess of demand.

When the rise in output per head happens to be exactly proportional to the rise in wages associated with it, the ratio of investment to income is constant and consumption is increasing at the same rate as total net income. This is the case of constant relative shares.

How does this agree with the neo-classical doctrine that the behaviour of relative shares depends upon the 'elasticity of substitution' between labour and 'capital'? It is usually far from clear what this elasticity is intended to mean. The neo-classicals are in a dilemma. If they state their doctrine in terms of an index of physical capital they find themselves discussing net profit per unit of physical capital, when what they need is the rate of profit on capital, which governs the choice of technique. On the other hand, if they state it in terms of the value of capital, the definition of the elasticity of substitution becomes circular— the elasticity is greater or less than unity according as the relative share of profit in income rises or falls when the value of capital per man increases.

But however confusedly the doctrine is stated, it contains a substantial point. A situation in which a small rise in real wages causes a large switch to more mechanized technique is one of high substitutability of capital for labour, and where a great rise in real wages can occur with only a small rise in output per head

substitution is weak.[1] The level of wages which affects the choice of technique is not only the level ruling when a choice is made. The future levels expected over the lifetime of any equipment set up to-day affect its prospective profitability and play a part in the choice.[2] Thus, the relationship between wages and the choice of technique is immensely complicated at any moment and is liable to shift as time goes by. It is not adequately expressed by a two-dimensional elasticity. But taking it broadly, when the technical relations are favourable to substitution, the ratio of investment to income has to be rising to prevent unemployment. Thus, broadly speaking, easy substitutability causes the share of profits to rise as capital accumulates, and sticky technical relations cause the share of wages to rise.

When it comes to specifying precisely the condition for relative shares to be constant, however, we can only say that it is such that the rise in the value of output per head (over the economy as a whole) which accumulation is bringing about is exactly proportionate to the rise in real wages that is consonant with the physical form that gross investment is taking.

In short, when equilibrium conditions require constant relative shares, constant relative shares is what equilibrium conditions require.

<div align="center">IV</div>

In spite of the stringent requirements of equilibrium, the course of the prescribed path may be very varied.

For instance, it is in general true that, as the value of capital grows, the ratio of income to capital falls, but this need not be the case all the time. When the price of 'equivalent' capital goods has recently fallen sharply, the equipment for a more mechanized technique may cost less now, per unit of output, than that for a less-mechanized technique did earlier (of course, with the prices and interest rates prevailing at any one time, the more mechanized technique has the higher capital cost per unit of output). Moreover, the capital/output ratio may vary very much between one sector of the economy and another, so that the change in the

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[1] In my *Accumulation of Capital*, chapter 14, I rigged up assumptions to make substitutability zero and infinite in alternating phases.

[2] In the analysis referred to in the above note I assumed very short-lived capital goods to evade this problem.

over-all ratio depends upon the allocation of investment between sectors.

Again, the rate of accumulation (the ratio of net investment to value of capital) is, in general, decelerating, but it is not impossible that it might speed up for a time. At a particular stage it might become appropriate to invest in productive capacity for investment to such an extent that the productive capacity for consumption goods actually declines—reinvestment of amortization funds siphons capital from one sector to the other. The share of profit must then rise so much that real wages actually fall. The current rate of profit on capital rises. For the moment less-mechanized techniques become eligible, but this applies only to short-lived capital goods, for the very fact that the current rate of profit is exceptionally high means that the longer-term rates fan out more steeply. The very fact that the rate of accumulation has risen means that the economy is moving faster than before towards a period of lower profits.

The prescribed path may contain many such sinuosities, but diminishing returns will prevail in the end. Over the long sweep, income per unit of capital, the rate of accumulation and the current rate of profit must all be falling. The system is moving towards the stationary state which is the asymptote of its prescribed path.

Each set of thriftiness conditions has its appropriate stationary state. In the conditions that we have postulated, when net investment is zero net profit per annum is equal to b/s; that is, to the annual value of capitalists' consumption. The value of the stock of capital and the rate of profit (which in a stationary state closes the fan and becomes a single, constant rate) have to be such as to yield that net profit, while keeping the capital intact, and this requirement, with the technical relations, determines the physical composition of the stock of capital and the level of wages.

In the stationary state the neo-classical conditions have to dance to the Keynesian tune.

V

The requirement that there is in existence, whenever we break into the story, an equilibrium stock of capital (because there have been correct expectations in the past) deprives our exercise of application and reduces it to a mere pastime.

What has led us astray is the bad habit (which Marshall tried to resist, but Wicksell freely indulged) of conducting an analysis of movements through time as though they occurred in stationary equilibrium.

The neo-classical argument starts at the point where an economy is already in a stationary state. Compare two economies of which one, Alpha, relatively to the other, Beta, is more thrifty or is performing more 'waiting', or what you will. Alpha, in any case, has a lower rate of interest than Beta when there is zero net saving in each. The stationary state implies that any past aberrations due to mistakes of foresight have long ago been digested and the future is expected to be simply a continuation of the present. In each economy the who's who of capital goods and all prices and wage rates are determined. The rate of profit on capital is equal to the zero-saving rate of interest. The degree of mechanization of technique is higher in Alpha, where the rate of profit is lower. If we had some reasonable physical measure of capital, physical capital per head could be said to be higher in Alpha. It would be only in a rather peculiar case that the value of capital would not also be higher. Thus, it seems fairly safe to say that Alpha has 'more capital' without bothering about how capital is measured.

Now, having established that the economy with 'more capital' has a lower rate of profit, the neo-classicals jump into motion and argue that an *increase* in the stock of capital *lowers* the rate of profit. But that jump shatters the equilibrium and deprives them of the right to apply what they have deduced from equilibrium relations to what will happen next.

VI

To escape from the requirement of an equilibrium past, let us descend into a short-period situation, and postulate that there is a specific stock of capital goods, that just happens to be whatever it is.

We can rig up full-employment assumptions as follows. There is a more or less definite capacity output of the equipment in the consumption sector (given habits about shift-working, etc.) and the price policy of firms is such that they work to capacity. A higher or lower level of demand is then reflected in higher or

lower gross profit margins, not in more or less output and employment. The number of men employed on the consumption-good equipment being given, skilfully operated financial controls work in such a way as to induce enough investment to employ the rest of the labour (we may suppose either that there happens to be enough equipment to offer the requisite employment, or that there are some navvying jobs, where the ratio of labour to physical equipment is very high, which can take up any slack).

We now have full employment guaranteed whatever the past and future state of expectations may be. Profits yielded by the various capital goods are all over the place, for the various stocks in existence are quite arbitrary relatively to the pattern of demand. The techniques in use are not in equilibrium with the level of wages and profits.

The amount of investment is regulated, but its form is left to profit-seeking firms to decide. The capital goods being produced are designed to increase capacity in what appear to promise to be the most paying lines, and the techniques being chosen are influenced by expectations of current and future wages and prices. A pale ghost of a tendency towards equilibrium is floating around the planning of investment. But expectations in the past have not proved correct (for the stock of capital we started from was not in equilibrium) and there is no warrant for postulating that the expectations to-day guiding investment plans will turn out to be correct in their turn. Indeed, there is no reason why all the various expectations being held independently should be consistent with each other. It is not possible for each firm to know what all the others have planned to do, and to deduce from this knowledge how its own position will be affected. Since the expectations being held are not self-consistent, they are not capable of being justified by the event. The investment now being done is going to create another out-of-equilibrium stock of capital goods. So the system will lurch from one short-period position to another.

Nevertheless, if the full-employment level of investment is maintained and capacity for producing consumer goods is being enlarged, real wages are rising, for the full-capacity level of prices is falling relatively to money-wage rates as capacity grows. Consequently (in the absence of technical progress), the techniques being chosen at each moment are influenced by expecta-

tions of a higher cost of labour in terms of product than were those chosen earlier. Therefore, the degree of mechanization of technique is, in general, rising as time goes by and the current rate of profit on capital falling. This is all we can offer to appease the neo-classical ghost.

In all this technical progress has been ruled out. When technical progress is going on, the poor ghost may have very little to play with, for then there will often be one obviously best technique to choose at each round of investment, which though it requires a higher value of capital per man employed than others, also offers a higher output per unit of capital. Only when accumulation is so rapid that it cannot find an outlet in installing superior techniques (or giving innovations a capital-using bias) does it spill over into raising the degree of mechanization on a given production function.

Very rapid accumulation is characteristic, nowadays, of socialist economies; it is there, if they would have it, that the neo-classical ghost could find a congenial home.

Postscript

This paper was written six years after the preceding one. In that time there was a great deal of controversy, partly aroused by the first article. I hope the present one shows an improvement in perspicuity.

THE THEORY OF DISTRIBUTION

THE theory of the distribution of the product of industry between wages and profits which is knocking about in current economic teaching consists of a number of propositions, each of which seems quite unexceptionable in itself, but none of which bears any relation to the rest. We cannot be satisfied with this state of affairs, and we must try to fit the pieces together into a coherent whole.[1]

I am confining the present discussion to a closed economy (without international trade) abstracting from government operations and from scarce factors of production. There is a two-class society, in which wages and profits account for the national income.

The first proposition is ancient and respectable. It is that the relative shares of wages and profits are governed by the supplies of factors and the elasticity of substitution between them. A high ratio of capital to labour is associated with a low rate of profit, high real wages and a high degree of mechanization of methods of production.

The second proposition was derived by Michal Kalecki from the analysis of imperfect competition.[2] It is that, because in manufacturing industry under-capacity working is normal and competition is never perfect, gross profit margins (the excess of prices over prime costs) are governed by the price-policy of firms. The relation of prices to money-wage rates determines real-wage rates. Thus, grouping all the influences that play on gross margins (when there is surplus capacity) under the title of the degree of monopoly, the share of wages in product is determined by how great the degree of monopoly is.

[1] This paper covers some of the same ground as N. Kaldor, 'Alternative Theories of Distribution', *Review of Economic Studies*, Volume XXIII, 2, No. 61, 1955–6.

[2] *Essays in the Theory of Economic Fluctuations*, Part I, section 1. See also *The Theory of Economic Dynamics*.

The third proposition, again, is due to Kalecki[1] and is to be found less sharply stated also in Keynes.[2] It is that the relative shares are governed by the rate of investment and the propensity to consume of each class. The share of wages tends to be greater the greater the proportion of saving out of profits and of saving out of wages. Given the propensity to consume of each class, the share of wages is lower the greater the ratio of investment to the value of total output.

The rate of investment in turn can be accounted for in two ways which do not seem to be connected with each other. Investment is determined, in one sense, by profit expectations, the 'animal spirits'[3] of entrepreneurs which incline them to take the risks of investment, and the state of supply of finance, which may be subsumed under the head of the level of interest rates.

In another sense, the rate of investment that can be maintained over the long run depends on technical conditions and the supply of labour.[4] According to this view, the rate at which the effective supply of labour is growing, allowing for increasing output per man-hour due to inventions and improvements in methods of production, limits the rate at which capital can accumulate, because there would be no point in bringing capital goods into existence when there is not going to be labour to operate them.

The fourth proposition is mere common sense. It is that the relative shares depend upon the relative bargaining strength of workers and employers.

I

Each of these propositions seems, on the face of it, to contain an important element of truth. How are they to be reconciled with each other?

Let us begin in a short-period situation with given productive capacity in existence. A certain rate of gross investment in capital equipment is going on. In so far as this represents new productive capacity coming into use, it is accompanied by an appropriate rate of investment in working capital and stocks. Thus, the rate of outlay on capital goods of all sorts is given. The flow of money demand for consumption goods and services, or *commodities* for

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[1] Op. cit., Part I, section 2.   [2] Cf. Kaldor, op. cit.

[3] Keynes, *General Theory*, p. 161.

[4] This is the idea expressed by Harrod's 'natural rate of growth', *Towards a Dynamic Economics*.

short, is equal to the wages bill *minus* workers' net saving *plus* the outlay of rentiers (that is, of capitalists, including recipients of dividends, looked at in their capacity as passive owners of wealth, as opposed to their capacity as active entrepreneurs) *plus* any unemployment allowances which are not at the expense of other consumption.

Saving out of wages and unemployment allowances complicate exposition very much, though they do not introduce any difficulty of principle. We may simplify by assuming them away for the moment. The total flow of money demand for commodities is then the wages bill *plus* rentier expenditure.

The outlay of workers engaged on producing commodities provides just enough receipts to the firms concerned to cover their wages bill. Gross profits, therefore, are equal to the wages bill for gross investment *plus* rentier expenditure. The value of gross investment (including profit on the sale of capital goods) is matched partly by the amortization of capital (at whatever rate, rightly or wrongly, it is being allowed for) and partly by the savings of rentiers. The balancing item which equates the value of net investment to net saving is the undistributed profits of firms. There are all sorts of metaphysical problems involved in this item, concerning the division of gross profit between amortization and net profit, and the notional value to be attached to capital goods produced within a firm for its own use, but these need not concern us. We are interested only in the interchange of actual money transactions between entrepreneurs, workers and rentiers. The global total of gross profit on the sale of commodities is equal to the wages bill for gross investment *plus* rentier expenditure, and these are not metaphysical concepts, but actual money flows. So much for the global total of gross profit. How is it distributed over the flow of output of commodities?

When output is determined by the capacity of equipment in existence the answer is simple. The stream of money demand encounters a flow of output limited by capacity, and prices are set at the level which equates demand to supply. Here the degree of monopoly has nothing to say, for prices would be just as high under perfect competition. Output, and therefore the wages bill at any given level of money-wage rates, is fixed by the brute facts of productive capacity; the average level of profit margins is simply the ratio of the global gross profits (fixed by investment

and rentier consumption) to the wages bill (fixed by employment at capacity), the distribution of profit margins over particular markets being set by the pattern of supply and demand, and the division of output between stages of production. But this situation is found only in extreme conditions of a seller's market. Normally, the level of utilization of plant depends partly on the price-policy of the firms concerned and the degree of monopoly has to be brought into the question of the determination of margins.

It would be tedious to go over the old controversies about marginal revenue, full cost and kinked demand curves. All that we need to say, for our present purposes, is that, as Mr. Kaldor puts it, 'profit margins are what they are because the forces of competition prevent them from being higher than they are and are not powerful enough to make them lower than they are'.[1]

Whether margins are governed by supply and demand or by the price-policy of firms, it is evident that, with a given rate of investment going on, the level of employment and the output of commodities is lower the higher is the level of profit margins, for a given flow of money-wages provides purchasing power for less commodities when prices are higher, and a given global profit is recovered from a smaller output when profit per unit of output is greater.

In general this is obvious, but in detail it is somewhat complicated. For one thing, a higher level of prices may incline rentiers to spend at either a higher or a lower total rate. If their demands are rigid in real terms, they spend more when prices are higher; if they are elastic, they spend less. In so far as they spend more when prices are higher, gross profits are greater, and, if dividends are distributed accordingly, rentiers have so much the more to spend. However, not the whole of profits is distributed, so that there is a limit to the level to which prices can be pushed by this phenomenon.

Furthermore, the pattern of profit margins reacts on total expenditure. If it so happens that goods with an inelastic over-all demand are those on which margins are high, they deflect purchasing power from other markets, whereas if they carry low margins, demand in other markets is so much the greater.

[1] Op. cit., p. 93.

The division into stages of production, and the pyramiding of profits on profits when margins are fixed as a percentage on prime cost including raw materials, is a further complication.

But however the details work out, by and large it is clear that the higher the general level of prices relatively to money wages, the smaller the quantity of goods that can be bought and the lower the level of employment in the consumption-good sector.

This is no more than a restatement of the familiar Keynesian proposition that, given the rate of investment, the level of employment will be lower the smaller is the propensity to consume in the economy as a whole. A smaller share of a given output going to the workers entails a lower propensity to consume for the economy as a whole, because the propensity to consume out of profits is less than out of wages.

We can now see how to reconcile the view that, with given propensities to consume of each class, the share of wages in national income is determined by the ratio of investment to income, with the view that (when there is surplus capacity) it is determined by the degree of monopoly. The share of profit in income is determined by the *ratio* of investment to income, but the amount of income associated with a given *rate* of investment is influenced by the amount of capacity in existence and the degree of monopoly. The lower is the level of margins the larger is the output of consumption goods accompanying a given *rate* of investment, and therefore the lower is the *ratio* of investment to income. The proposition that the share of profits in income is a function of the ratio of investment to income is perfectly correct, but capacity and the degree of monopoly have to be brought in to determine what income it is that profits are a share of, and investment is a ratio to.

To illustrate the influence of the degree of monopoly, let us consider an economy in which there is both unemployment and surplus capacity and inquire what would happen if there was an outbreak of competitive price-cutting, assuming (though, of course, this is quite arbitrary) that the rate of investment remains unchanged in money terms.

Let us suppose that rentier outlay in money terms has sufficient inertia to keep it constant for some time, whatever happens, and that workers' total expenditure is equal to wages. Then (with an unchanged rate of investment going on) the total of gross profits

in money terms is unaffected, in the first instance, by price-cutting. Taking one with another, firms in the consumption sector are receiving the same total sums, in excess of their total wages bill, as before. Employment, the wages bill and the rate of output are increased, and the same global total of margins as before is spread over a larger volume of sales. Prices have fallen and the real-wage rate has risen.

In time, rentier consumption will react one way or the other to the change in prices and increase or reduce profits accordingly. In so far as rentiers spend less when prices are lower (or if the mere fear that price-cutting is going to lower profits reduces the amount of dividends distributed, and rentiers respond by reducing money expenditure), the total of gross profits in money terms is correspondingly reduced. Similarly, if there is a non-transfer element in unemployment allowances which falls as men are taken into work (or if workers save more as the total of wages rises), gross profits in money terms fall. But these are minor reactions. Looking at it by and large, the cut in prices raises real wage rates without appreciably reducing profits.

By the same token, an increase in monopoly raising profit margins reduces real wages without appreciably increasing profits.

This is the appropriate place to consider the fourth proposition, and bring bargaining power into the argument. Suppose that money wages are raised in an industry supplying markets where profit margins were fairly high. The group of firms concerned were working below capacity in the situation that we have assumed, and they will not raise prices fully in proportion to the rise of wages. Indeed, for a moderate rise they may prefer to keep prices constant if the over-all elasticity of demand for their output is appreciable, for otherwise sales would fall further below capacity output. The additional demand due to the expenditure of the additional money wages increases demand for wage goods of all kinds while prices remain more or less constant, for producers generally prefer to meet additional demand, up to capacity, rather than to raise prices. The workers then attack somewhere else, and the story repeats itself. All round, prices may be raised, but less than in proportion to the all-round rise in money wages. Thus the exercise of bargaining strength playing against monopolistic power raises real wages and increases employment.

When either of these influences, or a combination of them, has carried the economy up to the point of full capacity in a large number of lines, any further increase in money outlay raises prices, as demand strikes against the barrier of rising marginal costs. The degree of monopoly having been eroded by price-cutting or wage-bargaining, the physical limitations upon output come into action to defend profit margins from a further fall. We are back in the situation of a seller's market that we began by discussing.

When full employment is reached before full capacity, the consumption sector may try to draw labour away from investment, but in the prevailing situation investment in all kinds of labour-saving equipment appears highly profitable and the capital-good industries are unwilling to part with workers. On the assumption that the investment sector maintains its employment, the total output of commodities reaches a maximum when full employment is attained.

Beyond this the exercise of bargaining power by the workers loses itself in a vicious spiral which persists as long as investment and rentier consumption in real terms are maintained.

Real wages can then be increased only by an increase in the workers' own saving, by a reduction in rentier consumption (whether due to a spontaneous increase in saving, or enforced by the rise in prices relatively to money income) or by a reduction in the rate of investment.

This is a situation with which we have lately grown familiar.

The sad moral of this tale is that, when there is unemployment (combined with excess capacity), a rise in money-wage rates raises real wages and increases prosperity all round, whereas when there is already full employment it yields, at best, an advantage to the workers at the expense of the rentiers and at worst disrupts the whole economy. Yet raising money wages in the face of unemployment is very difficult and in face of full employment only too easy.

The argument so far can be summed up as follows. The share of wages in full-employment income tends to be lower the higher the level of investment and the lower the level of thriftiness. Given the propensities to consume and the rate of investment, there is a certain level of profit margins that is compatible with

full employment in any given short-period situation. Full employ-
ment without inflationary pressure is attainable only if there is
adequate capacity. For any level of capacity above this minimum
there is one level of profit margins that will just secure full employ-
ment. If interaction of the degree of monopoly and the state of
bargaining power have failed to set profit margins at the right
level, there is either unemployment or inflationary pressure, as the
case may be.

All this applies to differences in the degree of monopoly with
a given rate of investment. Now consider the effect of a difference
in the rate of investment in given short-period conditions, with
constant money-wage rates. With a lower level of employment
in the investment sector (compared to a higher level), effective
demand for commodities is less. In general, we should expect
prices to be lower, partly because marginal cost (including user
cost) is lower and partly because competition is likely to be more
active when the degree of excess capacity is greater. If so, the
relative share of wages is higher. The matter is not quite so
simple as it is made to appear in some trade cycle models, for
history comes in. The same rate of investment to-day, if it has
been approached from a higher level in the recent past (we are
going down into a slump), is likely to be associated with higher
profit margins than if it has been approached from below (we are
ascending towards a boom); for in the intervening depression
there may have been price-cutting by 'weak sellers', and even if
rings have been tightened up in consequence, they may have only
been able to prevent further price-cutting without restoring
margins to their pre-slump level. It is a case where the distance
from A to B is not the same as the distance from B to A.

But the behaviour of relative shares over the trade cycle, and
its influence upon the course of the cycle, requires a paper to
itself.

To sum up so far, in a short-period situation, with given produc-
tive capacity, the share of wages in the value of output is the
resultant of three independent sets of influences. (1) It tends to
be greater the lower the rate of investment. (2) It tends to be less
the greater the degree of monopoly, which results from the inter-
action of the price-policy of firms and the bargaining position in
the labour market. (3) It tends to be greater the lower the propen-
sity to consume of individuals and the propensity of firms to

distribute profits. We now turn to the long-period aspects of the question.

II

So far we have taken the stock of capital in existence as an arbitrary datum, and looked only at short-period situations. We must now consider differences in the ratio of capital to labour and inquire how the first of our four propositions, that the levels of wages and profits are governed by the supplies of the factors, fits in with the rest.[1]

Since we have now moved into the sphere of long-period concepts we must take profit margins net of amortization and investment net of replacements. Let us agree to lock this tiresome skeleton firmly into its cupboard by assuming that, in the economy as a whole, amortization allowances and current replacements are in gear with each other.

The best approach to the question of differences in the factor ratio is by means of comparing economies endowed by past history with different amounts of productive capacity. We first compare economies with different amounts of equipment for producing consumer goods embodying the same techniques of production.

One economy, say Alaph, has a considerably larger productive capacity than another, Beth. The propensities to consume are the same in each economy, money-wage rates are the same, and we arbitrarily assume that the same rate of net investment per annum (measured in money-wage units) is going on in each; then if profit margins were also the same in each, the rate of output of commodities would be the same, and Alaph, with the greater stock of capital, would have a large amount of idle capacity. But capacity would not have been maintained in the long run (beyond a small margin to give elbow room) if it could not be used. Therefore, Alaph must have a lower level of prices.

To account for the difference we have to delve into past history. Was it that capacity somehow came into existence in Alaph and led to the erosion of profit margins through competition and pressure from the workers? Or is it that a higher degree of monopoly in Beth (combined with lower bargaining power of workers) causing effect demand to be lower has restrained invest-

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[1] The remaining part of this paper follows the argument of my *Accumulation of Capital.*

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ment in the past, and is the cause of Beth having less productive capacity? In either case, a higher ratio of capital to labour is associated with a lower degree of monopoly and a larger relative share of wages.

Here we assumed the techniques of production in the two economies were identical, though the wage rates differed; in short, there was no substitutability of factors. Where there is a range of possible techniques to choose from, each individual producer will be inclined to organize production so that the less labour is required per unit of output, the greater is the cost of labour to him in terms of his own product. Thus a higher level of real wages, which means a higher ratio of money wages to prices all round, leads to the use of more mechanized techniques of production in any given state of technical knowledge. At the same time, the relative prices of commodities of which output per head is low for technical reasons tend to be higher the higher the level of real wages, and in so far as demands are elastic to price, less of them is consumed.

Comparing two economies in the same phase of technical development, one with higher real wages than the other (whether because the degree of monopoly in the past has been lower and the bargaining power of workers greater, or because the urge to accumulate capital has been greater), the economy with higher real wages is using more mechanized methods of production and consuming more relatively capital-intensive products. High wages, therefore, are associated with high output per man employed. It follows that when techniques are malleable we cannot say, in general, that an economy with a higher rate of real wages has a higher share of wages in income. Higher wages are associated with higher output per head, and relative shares may go either way.

This is sometimes expressed by saying that the elasticity of substitution between labour and capital may be greater or less than unity. That is not a very helpful way of putting the point,[1] but the idea that the 'elasticity of substitution' is trying to express is an important element in the theory of relative shares.

We must now reconcile the proposition that the relative shares are determined by the conditions of substitutability of factors

[1] See p. 140.

with the proposition that they are a function of the ratio of investment to income.

The ratio of net investment to the value of the stock of capital (given the propensities to consume) determines the rate of profit on capital. Where the technical conditions are such that a high *rate* of profit is associated with a high *share* of profit they are such that output per unit of value of capital is low, and for that very reason the ratio of investment to income is high. Where a high *rate* of profit is associated with a low *share* of profit, output per unit of capital is high, and for that very reason the ratio of investment to income is low. These are purely formal relationships. The operative forces, in a comparison between economies with the same technical knowledge and different factor endowments are: the amount of accumulation that has taken place up to date (which has affected and been affected by the degree of monopoly and bargaining power of workers over the past), and the technical conditions of substitutability of factors and the pattern of demand, which together with the amount of accumulation determine the amount and the form of productive capacity in the existing situation; the interplay of monopoly and bargaining power in the existing situation, which governs the level of utilization of productive capacity; and the propensities to consume and the rate at which investment is going on, which govern the shares of wages and profits in the output so determined.

III

So far we have taken the rate of investment as an arbitrary datum. We must now attempt to reconcile the two views of what governs investment—that it depends upon animal spirits and the supply of finance and that it is determined over the long run (ignoring the trade cycle, and comparing boom to boom and slump to slump) by the real forces of population growth and technical progress. When the animal spirits of the entrepreneurs incline them to a rate of investment higher than the real forces justify, then they must either speed up technical progress (perhaps at the same time giving it a capital-using bias[1]) so that the real

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[1] Mr. Kaldor's 'technical progress function' depicts a situation in which the rate of technical progress (as measured at the neutral point) is independent of the rate of investment, but the technical situation is such that it can be given any required bias, so that any rate of accumulation can be accommodated without a falling rate of profit.

forces expand to make room for them, or they will force up the cost of labour against themselves by raising wage rates relatively to productivity, lower the general rate of profit and find a vent for accumulation in raising the degree of mechanization.

Since a falling rate of profit is associated with rising capital per unit of output, relative shares once more may go either way. The greater the substitutability between factors in production and between commodities in demand the more accumulation can be absorbed with a given long-run fall in the level of the rates of profit on capital, and the greater the tendency for the relative share of profits to rise.

When animal spirits are deficient or the interest rates fail to fall with rates of profit, while the degree of monopoly is rigid, the economy sinks into the state of stagnation depicted by Keynes. Investment fails to keep up with the pace set by the real forces, and chronic unemployment sets in.

In conditions of under-employment we cannot make any simple generalizations about the behaviour of relative shares through time. They will wobble along somehow or other, as the various influences that we have discussed play upon them.

The theory of relative shares with full employment, and a rate of accumulation governed by the real forces, can be summarized as follows: the rate of accumulation together with the thriftiness conditions determine the rate of profit on capital, and so, in conjunction with technical conditions, the equilibrium ratio of capital to labour and the relative shares.

Provided that it is possible for accumulation to keep up with the real forces—that is to say, that they do not require such a high ratio of investment to full employment income as to drive wages below the tolerable minimum, and that over the long run the real forces establish a steady rate of growth; that the animal spirits of entrepreneurs, in conjunction with the conditions of supply of finance, are just sufficient to keep up with the real forces; that technical progress is neutral, without bias in the capital-saving or capital-using direction, and that the development of demand is neutral as between less and more capital-intensive products; that the interplay of the degree of monopoly and bargaining power, having been such as to allow full employment in the first place, maintain it by keeping real wages rising in step with productivity; and that the propensities to consume

remain constant; then the value of capital per unit of output remains constant through time, and so does the general rate of profit on capital. The relative shares, therefore, remain constant at whatever level they were when the story began.

This direct approach to the constancy of the shares through time is all that is necessary in such a case, but there is no difficulty in seeing that it agrees with our four propositions. The postulate of neutrality means that the conditions of substitutability are not altering. The degree of monopoly and wage-bargaining are continuously adapting themselves to the growth of capacity so as to preserve full employment, and since the ratio of net investment and of income to the value of the stock of capital are both constant, their ratio to each other is also constant. Thus, all four propositions are satisfied by the constancy of relative shares.

When technical progress and the development of demand are biased in the capital-saving direction, and accumulation slows down so as to keep the rate of profit constant, the relative share of profits falls accordingly. If the capital-saving bias is compensated by an increase in the degree of mechanization, the rate of profit falls. The opposing effects of a capital-saving bias in technical progress and of an increase in the degree of mechanization tend to keep the ratio of capital to income more or less constant, so that, with a falling rate of profit, there is a presumption that the share of profits falls also in this case. Conversely, a capital-using bias tends to raise the share of profits. But in this case it is important to remember the proviso that the rate of accumulation required to provide equipment for all available labour is not so great as to drive real wages below the tolerable level.

A bias in technical progress can be expressed in terms of the first proposition, as a change in the conditions of substitutability favourable or adverse to labour, while the movements of investment and of income relatively to the stock of capital can be expressed in terms of their ratio to each other, so that there is no conflict between a statement of the effects of biased progress in terms of the rate of profit and the capital/income ratio and a statement in terms of our four propositions.

All this concerns the analysis of relative shares under conditions of full employment. But full employment is a postulate, not a result of the theory. In various circumstances the degree of monopoly may be too high (and bargaining power too weak) to

permit of full employment at the rate of investment which the animal spirits of the entrepreneurs decree, accumulation may fail to keep pace with the growth of the effective supply of labour, or the bargaining power of the workers may be so strong as to generate a disruptive inflation. It is at the points where the theory breaks down that it begins to become interesting.

CAPITAL, TECHNIQUE AND RELATIVE SHARES

NOWADAYS, productive capital is usually thought of as consisting primarily of machines; earlier notions that ran in terms of the time-pattern of production, or the wages advanced by employer to worker, have been pushed out of fashion without being superseded. It is not too late to go back to the beginning to try to evolve an integrated set of concepts for the discussion of accumulation and technical change.

There are three quite distinct groups of questions involving capital regarded as means of production which should be dealt with before we can embark upon the analysis of accumulation.

1. The choice which has to be made by an individual producer as to the form in which an investment should be embodied. (The *ex ante* production functions.)

2. The effect, in an economy considered as a whole, of having a larger or smaller quantity of capital, other things equal. (The *ex post* factor ratios.)

3. The reaction of an economy to a change in technical knowledge. (Accumulation and technical progress.)

These questions are here discussed in terms of comparisons of stationary positions, in a series of extremely simplified models.

INTRODUCTION

General Simplifying Assumptions. There is a two-class, freely competitive, capitalist economy, in which wages and profits exhaust income. There is no government, no foreign trade and land is a free good. There is a constant homogeneous labour force. The only final output is a homogeneous commodity, which, following classical tradition, we call corn. The climate is so propitious that corn can be harvested all round the year. The gestation period of corn is appreciable and workers are obliged to take employment at wages from a capitalist because they cannot support themselves from seedtime to harvest. All wages are consumed currently as they are received (workers do not save).

This paper has not previously been published. I wrote it to clear my own mind on some fundamental points of theory. I hope it will not have the opposite effect on others.

Land is appropriated but each capitalist can use as much as he likes without payment. Internal economies of scale are exhausted at a small rate of output; no capitalist produces at less than the optimum rate and there are no general economies of scale to the economy as a whole, so that constant returns prevail both for the individual capitalist and for total output.

The unit of employment is a team of men of the minimum size that permits all economies of division of labour to be enjoyed. The output of a team is credited as so much per head to its members.

All values are reckoned and bargains made in terms of corn.

Stationary Conditions. We wish to postulate stationary conditions with full employment. This entails that there is in existence a sufficient stock of capital to employ all available labour. Capitalists are keeping the existing stock intact, without net saving or dissaving.

In the equilibrium situation which we take as a starting-point for our analysis there is a complete circle of equations. The wage rate is such that, given the corn-value of capital in existence, it employs all the labour, and, with the income which that wage rate leaves to the capitalists, they are maintaining that stock of capital. The quantity of capital which the capitalists are willing to maintain when they enjoy that income is such that it will employ all the labour at the wage rate that permits them to enjoy it.

The existence of such an equilibrium is simply postulated for the sake of the exercise, and we make no pretence of endowing it with a plausible history.

Thriftiness Conditions. Stationary equilibrium implies that capitalists are keeping capital intact because the level of income, value of capital and expected rate of profit on investment are such that they are satisfied to remain as they are. (This must apply to each and everyone, not only to the representative individual, for if some were more thrifty than others a progressive concentration of wealth would be going on, which is incompatible with full stationary equilibrium.)

Our second group of questions will require us to compare economies, each in stationary equilibrium, in the same technical conditions with different values of capital; we then have to postulate an appropriate difference in the thriftiness conditions.

The third group will require us to compare positions with different technical conditions and the same thriftiness conditions. This is not simple, for the thriftiness conditions are themselves complex. To make the analysis manageable we will split them into three separate simple cases.

1. In one type of case, we assume that accumulation is a function of capitalists' income, and is not affected by the rate of profit or the value of capital. But if we postulate that, out of any increase in income above that enjoyed in the equilibrium position, they save and invest a part, then a chance increase in receipts would start off a process of accumulation which would continue indefinitely without reaching a new stationary equilibrium.[1] We choose, rather, an alternative postulate, which is quite different from the conventional concept of a propensity to consume function. We postulate that the capitalists have a view as to the proper level of income and are not interested in increasing it. They preserve whatever quantity of capital will give them that income; any chance windfall is dissipated in immediate consumption. Then, whatever the technical conditions, the capitalists' net income is always the same.

2. In the second type of case, the capitalists react only to the level of the expected rate of profit. They have a view as to what is the proper rate of profit, irrespective of income and the value of capital in existence. If the marginal efficiency of investment rises above that level they continue investing until it comes down to the proper level. Then in all possible positions the rate of profit is the same.

3. In the third type of case, they react only to the value of capital. They have a view as to the value of capital that they are willing to possess. When their total wealth is above or below the desired amount they dissave or save and invest until it reaches that figure.

This view of the thriftiness conditions, of course, is not to be taken seriously in the context of the analysis of accumulation. We need it here only to simplify the analysis of technical change.

Balanced Production. Each capitalist operates a balanced productive unit which produces a steady rate of output per month. This was built up originally by making an investment month by month until the time when a steady flow of output first began to

[1] Cf. below, p. 183.

emerge. From then on net investment ceased and a constant rate of outlay produced a constant flow of output, while preserving the invested capital intact. This investment occurred in the past. In the stationary situation, the monthly flow of costs and output and the value of capital have long been constant and are expected to remain so. (There may, however, be some capitalists who own more capital than they operate and others who operate on borrowed funds.)

Output per head, wage per head, the length of the interval between paying wages and enjoying receipts, the time-pattern of payments within it, and the income of a capitalist per man employed, are all facts which have an objective existence. An equilibrium value of capital and rate of profit are a particular way in which these facts can be expressed. They are derived from two equations which, in the case where there is no fixed capital, are as follows:

1. When C is the value of capital owned by a capitalist and r the rate of profit, then rC is the income of the capitalist.

2. rC is equal to compound interest at the rate r on each sum paid out as wages over the interval from the moment when it was paid till the moment when the harvest is recovered (with fixed capital a further complication is introduced, but no different in principle[1]).

This rate of profit is equal to the marginal efficiency of investment, in the sense of the return which an individual capitalist would lose by withdrawing from investment a unit of finance (say that required to keep a team of men employed). It is also equal (in a riskless equilibrium) to the rate interest that must be paid on a sum of borrowed finance and that is taken into account as an element of cost by a capitalist using his own funds.

Model One: Single Sector, Single Technique

The simplest possible case is that in which the only investment required to build up a productive unit is the payment of wages (we may imagine that corn seeds itself, and that workers make any tools they need, in their spare time, from free materials). Capital, then, consists of a wage fund. The length of the gestation period of corn, from harvest to harvest or seedtime to seedtime,

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[1] See below, p. 173.

on any one plot of ground, is given by nature, and so is the time-pattern of the various operations that have to be performed during the gestation period. Proceeds per head per month (the harvest falling due in a month divided by the number of men employed) *minus* the wage per man-month is the profit per head, and the income of any capitalist is equal to this quantity of corn multiplied by the number of men employed with the capital that he owns. The investment required to employ a man depends partly on the length of the gestation period (which determines the length of the period of waiting from the moment when investment begins to the first harvest), partly upon the time-pattern of the payment for employment of labour within that period (which influences the amount of wages advanced by the capitalist before the first harvest is recovered), and partly on the intervals at which wages are paid (which determines how much work is advanced by the man before the first wage is received).

With this model, in which labour is the only factor of production employed and the time-patterns are fixed by nature, the first two groups of questions are easily dealt with. (1) The individual capitalist simply employs the method of production that maximizes output per head. (2) A comparison between economies with different total values of capital yields only the familiar classical proposition that (given technical conditions) a larger value of capital is associated with a higher wage rate and a lower rate of profit.[1]

[1] The formal statement of Model One was set out by Mr. R. C. O. Matthews as follows:

C = capital, W = wage per man per month, Q = total output per month, all measured in corn, r = rate of profit per cent per month, N = employment.

We then have:

(1) Output is divided between wages and profits:
$$Cr + WN = Q \quad .. \qquad .. \qquad .. \qquad .. \qquad (1)$$

(2) Capital is equal to a multiple of the wage bill:
$$C = bWN \quad .. \qquad .. \qquad .. \qquad .. \qquad .. \qquad (2)$$

where b is a constant which depends on the gestation period and the time-pattern of wage payments within it. By substitution between (1) and (2) we have

$$Cr + \frac{C}{b} = Q$$

$$r = \frac{Q}{C} - \frac{1}{b}$$

In the case where the thriftiness conditions run in terms of capitalist's income only, stationary full-employment equilibrium is a fluke. Where they run in terms of the rate of profit or the value of capital there is a determinate position of equilibrium corresponding to each value of r.

The third group of questions, the effect of technical progress, is sufficiently complicated, even with this model. We approach it by conceiving an economy which has been settled in stationary equilibrium for some time, when a once-for-all improvement in technical knowledge occurs. We then consider the new position of stationary equilibrium which it is conceived to reach with each of the three types of thriftiness conditions. (This, of course, is not intended to correspond to any possible kind of historical episode; it is purely an analytical exercise intended to get the concepts clear.)

An Invention to Save Waiting. The first case we take is the discovery of a strain of corn that ripens in less time, without altering output per head or the time-pattern of production within the gestation period.

1. *Constant income of capitalists.* In the case where the total income of the capitalists is the same in the new stationary position as at the base date, the wages bill is also the same (for employment and output per head are unchanged). The wages fund is reduced in proportion to the fall in the length of the gestation period, and the rate of profit on capital is correspondingly higher. The finance made redundant by the new process of production has simply evaporated.

We can see how this occurred as follows: During the period of transition the capitalists enjoyed more than the normal receipts and they consumed the surplus. The interval between sowing and harvest on one plot of ground was originally, let us say, ten months and with the new seed it is nine months. The new line gradually displaced the old. A particular capitalist, in January, was still using the old seed, but in February sows with the new. In October, the plot sown in January is harvested and the February plot, which would formerly have been ready in November, is also reaped. The capitalist pays out the same wages as before and consumes the extra corn himself. In this way the capital saved by the innovation is eaten up and the capitalist's income is kept at its proper level.

2. *Constant rate of profit.* When the rate of profit is the same in the new position as at the base date, the wages fund has been reduced in a smaller proportion than in the above case and the income of the capitalists has been reduced.

Taking the same example as above, the capitalist who gets an extra harvest in October, seeing that (on the basis of the existing wage rate) the marginal efficiency of investment is higher than the old rate of profit, wants to enlarge his operations by employing more men. But others are in the same case. The wage rate is driven up by competition for labour until the point at which the marginal efficiency of investment is no greater than before. Total output per annum is unchanged. The workers receive more and the capitalists less than at the base date, but not in as great a proportion as in the first case; the reduction in the wage fund, consequent on the shortening of the gestation period, has been partly compensated by the increase consequent upon the rise in the wage rate.

3. *Constant value of capital.* Where the value of capital is the same in the new position as at the base date the wage rate is higher and the rate of profit lower.

The transition can be conceived as follows: The capitalists regard it as the proper thing to reinvest all the finance released by the shortening of the gestation period. In October, when the extra harvest comes into hand, the capitalist seeks to invest the excess over his normal consumption by employing more labour. Competition for labour goes further than in the last case and the rise in the wage rate goes to the point where the total value of the wage fund is no less than before. The rate of profit is lower than in the initial position. The rise in wages and fall in capitalists' income have gone further than in the last case, where the rate of profit was constant.

The over-all value of capital in terms of corn is *ex hypothesi* the same as at the base date, before the innovation occurred. But the concept of constant capital is not unambiguous. The purchasing power of this capital over labour and the rate of return that it earns are less than before. We have assumed that each individual capitalist has kept his outstanding investments in terms of corn constant, and it is in this sense that the total value of capital is the same as before. The capitalists, taken collectively, may have cause to regret what has happened, but no individual can do anything about it.

An Invention to Increase Productivity. We now consider a case in which the gestation period of corn and the time-pattern of operations within it remain constant and fixed by nature, but a

new strain is developed which gives a higher output per team of men employed.

1. *Constant income of capitalists.* When the income of capitalists is the same in the new position as at the base date, part of the labour is unemployed. Output per head is greater, so that, if the wage is constant, a smaller number of workers give each capitalist his unchanged income. If wages fall under the influence of unemployment, unemployment increases all the more. Since the capitalists, in this case, neither increase their own consumption nor raise the wage rate (which would involve them in providing more finance for a larger wages fund) the additional productivity is wasted and equilibrium with full employment is impossible.

2. *Constant rate of profit.* At the wage rate ruling at the base date, the marginal efficiency of investment was higher, after the innovation, than the old rate of profit. The capitalists, each endeavouring to increase his scale of operations during the period of transition, drove the wage rate up to the point where the rate of profit was no greater than before. Since the wage fund has now risen in the same proportion as the wage rate, and the rate of profit is constant, the relative shares of workers and capitalists in the new, larger, product are the same as before. The wage rate has risen in the same proportion as output per head.

3. *Constant value of capital.* Where the value of capital is held constant, the wage rate is constant and the whole addition to product accrues to the capitalists. The rate of profit has risen and the share of wages in the value of output has fallen.

Partial Improvements. So far we have considered improvements in knowledge which make possible a single new technique that is clearly superior to the old one. It might happen that a discovery made it possible to increase output per head only at the expense of making the gestation period longer. Whether it was worth while to make use of this discovery would depend upon the ruling rate of profit. In the second position there is a choice of techniques and a rudimentary production function has come into existence.[1]

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[1] It is customary to regard all the technical possibilities shown in a production function as somehow already in existence and new discoveries to consist only of unambiguous improvements which render the pre-existing production function obsolete. But this is clearly an illogical distinction. The distinction between partial and true improvements is not a matter of which technique is the newest, but which are eligible at all rates of profit and which only at some.

If the situation is such that profit per unit of capital could be increased by adopting the new, longer gestation period, capitalists in the first instance dismiss some workers and devote the finance so released to lengthening the gestation period. There is then a tendency for wages to fall.

If the rate of profit is the same as before when the wage rate is also the same, the new and the old techniques are equally profitable at the ruling wage rate and the additional capital required to employ a team of men for the longer gestation period is just rewarded by the additional output that it makes possible.

The borderline case between a partial and a true improvement is that in which the new technique is preferable at any wage rate greater than zero.

The record of past discoveries yielding partial improvements constitutes the production function which we shall discuss in terms of other models.

Relative Shares. Even this austerely simple first model enables us to see the main lines of the analysis of relative shares. First, we observe that (with the three types of mentality of capitalists that we are illustrating) when the innovation reduced the gestation period, the relative share of wages in output was at worst constant (in the case where redundant capital was consumed), and in two cases rose. When the innovation raised output per man, the relative share of wages was at best constant (where the rate of profit on capital was constant) and in two cases fell. This is as it should be in the light of neo-classical moral ideas, for the first type of innovation, so to say, makes capital less necessary to production, and the second type makes labour less necessary. The first type of innovation belongs to the class properly described as *capital saving* and the second, *labour saving*. Similarly, partial improvements which enlarge the scope for substituting capital for labour tend to increase the share of profit in output and those with the reverse tendency, to reduce it.

Our simple model also enables us to see that, while the technical nature of the innovation sets up a certain tendency in the direction of the change in relative shares, what actually happens to relative shares does not depend on technical factors alone but also depends on what happens to the accumulation of capital in the process of adjustment to technical change.

As we complicate the successive models, the first type of thriftiness—leading to constant income for capitalists—grows less and less plausible; and the third—constant value of capital—grows more and more ambiguous. We shall conduct the rest of the argument in terms of the case in which the rate of profit remains constant and only glance at the effects which follow when it does not.

Model Two: Single Sector, Variable Technique

Variable Input. We now introduce another factor into the model in the form of capital goods. The gestation period and the time-pattern within it are still given by nature, but seed corn has to be provided out of the harvest, and the technical conditions are such that more seed corn used per man employed means more output per man. (Since land is free, we may suppose that a team of men can operate on a larger or smaller area according to the amount of seed corn provided.)

As well as the wage fund, there is now a revolving stock of seed which is continuously being recovered from the harvest and resown.

There is a production function in seed corn and labour as inputs and corn as output. Beyond a certain ratio of seed corn to labour, diminishing returns prevail, in the sense that an addition of seed corn with given labour employed leads to a smaller proportionate addition to the rate of output of corn.

(The production function may be regarded as the result of past discoveries leading to partial improvements, which have been filed to be used when the factor prices make them appropriate. A true improvement makes all the positions on the old production function inferior, so that the files representing the old 'state of technical knowledge' are no longer worth keeping.)

Choice of Technique. The individual capitalist, faced with a given wage rate and ruling rate of interest, is assumed to choose the technique of production (that is, the ratio of seed corn to labour) in such a way as to maximize the profit on any investment of finance. He adjusts the proportions of the factors in such a way that he could not increase the profit on a given investment of finance by devoting a little more of it to the wage fund (by employing more labour at the given wage rate) and the corresponding amount less to the seed-corn fund or vice versa.

This means that the marginal products of the factors are proportional to the costs of employing them. The cost of employing a unit of labour is the monthly wage bill per team *plus* interest on the corresponding wage fund; the cost per unit of employing seed corn is a unit sown per month *plus* interest on the corresponding seed fund. When the marginal product of each, given the quantity of the other, is equal to its cost, it is impossible to reduce the cost of a given output (or increase the profit on a given investment) by altering the proportions in which the factors are combined. Technical conditions and the wage rate and rate of profit thus determine the combination to be chosen.

The harvest (that is, gross output) per team per month is a quantity of corn which is equal to the wage per team per month *plus* a month's interest on the wage fund (which together are equal to the marginal product of labour) *plus* the seed used per month multiplied by its marginal product. (This satisfies the conditions of Euler's theorem.)

Net output per team is the harvest per month less a quantity of corn equal to the seed from which it grew. Net output is equal to the wage *plus* profit per team, the latter being equal to interest on the two funds that constitute working capital.

In this particular case, where output and input are made of the same stuff, it would not be meaningless to speak of 'physical net output', but in general that expression is self-contradictory. The physical, technical conditions of production must necessarily be described in gross terms, while the reduction to net quantities has to be made in terms of value.

When there is a continuous variation of output per head with seed corn per head, there are two techniques of production that are equally profitable at any given wage rate and rate of interest— one involving a little more seed corn per team of workers than the other, and yielding just enough extra output to pay for the extra seed at the ruling rate of interest.

When there are perceptible discontinuities in the function, there may be only one possible combination that will be chosen at a given wage rate, and instead of stating the minimum cost condition in terms of the equality of marginal product with cost of factor we must say that the marginal product is *not less than* the cost of employing a unit of the factor.

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The Capital/Labour Ratio. To compare positions on the production function at which different wage rates are ruling, we have to compare two economies with identical technical conditions that have come into static equilibrium with different rates of profit, each having the value of capital appropriate to its position. (This entails that they have different thriftiness conditions.) The one with the higher wage rate has the lower rate of profit and interest. A higher wage rate tends to raise the cost of employing labour relatively to seed corn, and so tends to increase seed corn used per head.

We also have to consider the effect of the lower interest rate on the proportions in which factors are employed. Lower interest reduces the cost of employing a unit of each, but it does not affect them in the same proportion. The ratio of the fund of finance required to employ a unit of a factor to the monthly outlay upon it depends upon the time-pattern of payments within the gestation period, and this in general will be different for labour and for seed corn. (For instance, we may take it that the seed is used once for all soon after the harvest, while labour is used all round the crop cycle, with perhaps a peak at the harvest.) When the ratio is greater for seed than for labour, the effect of lower interest enhances the effect of a higher wage rate in raising seed corn per head, and in the converse case, mitigates it.

The difference in the ratio of factors will be whatever is required to alter their relative marginal products in proportion to the difference in their relative costs. This can be expressed in terms of the elasticity of substitution between labour and seed corn. Capital per man employed is greater in the position where the wage rate is higher, both because the wage fund is larger and because more seed corn is used per man employed. The elasticity of substitution between seed corn and labour enters into the determination of the difference in the ratio of capital to labour, but the main influence is simply the difference in wages itself.

Variable Gestation Period. We now introduce a further technical condition. With any given quantity of seed per team of workers, the longer it is left in the ground, the larger the harvest will be. To find the most profitable technique, with any given wage rate and quantity of seed, the capitalists choose such a length for the gestation period that the extra harvest due to waiting for the last unit of time just covers the extra interest cost on the finance

involved. (This is the case elaborated by Wicksell in terms of a stand of timber.)

When the time-pattern of operations is variable, a lower rate of interest makes techniques eligible which require greater preparation in the early stages. The analysis of such a case is very complicated, and after this brief glance we will leave it alone, postulating that any change in the length of the gestation period takes place without altering the pattern.

If the production function is continuously variable in the gestation-period dimension as well as in the seed-per-team dimension, there are, in general, four techniques which are equally profitable at any one wage rate and rate of interest; for each of two gestation periods, two quantities of seed.

Comparing equilibrium positions with different thriftiness conditions and the same technical conditions, that with the higher wage rate will have the longer gestation period as well as the larger quantity of seed per team employed and so, for three reasons, the larger value of capital per head.

Neutral and Biased Improvements. An improvement in technical knowledge makes possible an increase in productivity. It may be regarded as raising the production function. At the same time as raising it, it may alter the shape on one or both of its dimensions. An innovation which raises output per head in the same proportion for each ratio of seed to output; which raises output per head in the same proportion for all lengths of gestation period; and which does not affect the time-pattern of payments within the gestation period, raises the production function without distorting it. Such an innovation is labour-saving and neutral in respect to capital.

Innovations which raise output per head in a greater proportion where seed per head is heavier, or the gestation period longer, have a capital-using bias; they make it more eligible than before to substitute capital for labour in producing a given output. The extreme case of capital-using bias (which is also the border-line case between partial and true improvements) is where output per head is raised no more than in proportion to seed corn per head. Contrariwise, if output per head is raised by more on the lower than the higher reaches of each dimension of the production function, the innovation has a capital-saving bias. The extreme case of a capital-saving bias is where seed per unit

of output is reduced, or the gestation period shortened (as in our first example), while output per head remains the same.

To distinguish the bias in a round of innovations, we can appeal to the case where the rate of profit is the same in the two equilibrium positions. Then, where there has been a neutral round of innovations, the wage rate has risen in the same ratio as output per head, the wage fund per man and seed corn per man have risen in the same ratio as output per man, and the ratio of capital to output is constant. A bias in one direction on one dimension of a production function combined with an opposite bias on the other would be described as neutral provided that the net effect is such that, when the rate of profit is constant, the ratio of capital to output is constant.

When innovations have a capital-saving bias, with a constant rate of profit, the wage rate has risen more than in proportion to output per head and capital per unit of output has fallen. A capital-using bias means that the wage rate has risen less than in proportion to output per head and capital per unit of output has risen.

This definition, in terms of what would happen if the rate of profit were constant, is not circular, for the technical characteristics of the innovations can be described in purely technical terms. The characteristics do not depend upon the rate of profit. The criterion of the capital/output ratio at a constant rate of profit is not a definition of the various types of innovation but merely a convenient way of classifying them.

It follows immediately that, in a case where the rate of profit actually is constant, the share of wages rises or falls according to the degree of capital-saving or capital-using bias. It is to be observed that the bias is expressed in terms of the capital/output ratio. The capital/labour ratio does not necessarily move in the direction of the bias.

MODEL THREE: TWO SECTORS, VARIABLE TECHNIQUE

Capital Equipment. We now introduce fixed capital into the story. To complete the production of corn for consumption it has to be ground in windmills. One sector of the economy is occupied in building windmills. The workers in this sector do not use any equipment provided by capitalists, so that the capital in this sector is only a wage fund.

At the base date, with the economy in stationary equilibrium, there is in existence a stock of windmills of balanced age composition, continually being kept intact by replacements. The relevant difference between fixed and working capital is in the time-pattern of the build-up to the stationary state. With working capital only, the build-up is completed in a single gestation period, and the product begins to be enjoyed at the full rate from the end of the first gestation period. With windmills, a part of the final yield begins to be enjoyed as soon as the first one is in operation; the first contributes, in the form of an amortization allowance, to the finance required to build the next, and so on until a balanced stock has been built up. To reach balance with a steady rate of investment would take a period equal to the lifetime of a windmill. At the end of that period the 'tale-off' into balanced self-perpetuating production is complete.[1] A build-up at a faster rate leaves an unbalanced stock of equipment, involving endless 'echoes' in fluctuations in the rate of gross investment. For our present purposes, however, these complications are ruled out by the hypothesis that the economy has already got into a stationary equilibrium position when our story begins, and gets back into stationary equilibrium (we do not ask how) after a round of innovations has occurred.

A simple formula is available, showing how the relation of the value of a balanced set of mills to their initial cost depends upon the rate of interest and length of useful life of a mill, for the case where they are of the one-hoss-shay type.[2] More complicated cases could no doubt be treated in the same manner but would require more complicated formulae.

Costs of production of final output now include, in addition to those already listed, depreciation allowances on the stock of mills in existence, which just pay the wage bill and interest on the wage fund for those engaged in the mill-building sector in replacing mills wearing out.

In the case of a stationary balanced stock, physical replacement corresponds to depreciation in terms of value but (as we remarked in the case of seed corn) it is misleading to regard them as being the same thing. It is the depreciation of value rather than the physical replacement which constitutes cost from the point of

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[1] Cf. below, p. 213.   [2] See below, p. 201.

view of the capitalist. It is this which must be deducted from the value of output to arrive at net value of output.

Choice of Technique. The possible choices of techniques at a given rate of profit and wage rate are now enriched by the need to select the most profitable type of mill. An Alpha-type mill offering a larger output when operated by a given labour force than a Beta type, or promising a longer working life, has a higher initial cost. Two more dimensions are added to the production function and, with continuous variation in each respect, two more combinations of capital cost and current cost that are equally eligible at each level of wages and rate of profit.[1] (The assumptions necessary to reduce the production function to a plane diagram, such as is used in my *Accumulation of Capital*, are very restrictive.)

The Capital/Labour Ratio. Comparing two equilibrium positions in the same technical conditions, one with a higher wage rate and lower rate of profit than the other, the former involves a different ratio of capital to labour in respect to:

1. A larger wage fund in each sector, due to the higher wage rate.

2. A longer gestation period in each sector, depending upon the shape of each production function in its time dimension.

3. An offset against the above due to the lower rate of interest.

4. A larger and longer-lived type of windmill to be operated by a given team of workers.

The effect of the technical specification of the mill upon the value of capital per head is not simple. There are four kinds of differences involved. (*a*) The Beta type of mill used when the wage rate is lower would have a different initial cost in terms of corn at the higher wage rate and lower rate of interest. This might go either way, depending on the ratios of wage cost and interest cost in the production of corn and of windmills. (This is sometimes called a positive or reverse Wicksell effect.) (*b*) The Alpha type of mill chosen, at the higher wage rate, has a higher cost than the Beta type at any given wage rate. (*c*) The ratio of the average value of a mill to its initial cost tends to be lower in respect to the lower rate of interest and (*d*) higher in respect to the longer life.

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[1] I am indebted to W. E. G. Salter ('The Production Function and the Durability of Capital', *Economic Record*, April 1959) for elaborating this point.

At any given rate of interest an Alpha mill, employing a given number of men, costs more than a Beta one offering the same employment, but it is not necessarily true that an Alpha mill at the lower rate of interest costs more than the Beta one at the higher rate.

5. The division of the labour force between the sectors is different, according as the greater amount of work required to build an Alpha mill is more or less then offset by the less frequent replacements required.

There is a general presumption (but not a logical necessity) that the net effect of all these influences is that a higher wage rate is associated with a larger value of capital per man employed.

Since output per head is also higher when the wage rate is higher, we cannot in general say how relative shares are related to the capital/labour ratio. (It adds nothing to express the result in terms of an elasticity of substitution between 'capital' and labour or a 'Cobb-Douglas production function', for we have to know what happens to relative shares before we can express it in these terms.)

Capital-creating Innovations. The general discussion of innovations with fixed capital is postponed till we have set up the fourth model. Meanwhile, we must remark that the existence of the windmills introduces the possibility of a further type of innovation besides those which we have already discussed. This is an innovation which, without altering anything else, makes it possible, at no greater cost than before, to build a more durable windmill. After the transition readjusting the economy to this discovery, a set of windmills, each of which is just like the old type from the point of view of current output, is more valuable because its rate of depreciation is less and the income which it is yielding to a capitalist is greater. It would be appropriate to call such an innovation *capital creating* for it means that the wealth of the capitalists has been increased without any net saving being required.

In the case where the rate of profit is the same in the new position as the old, the value of capital per mill is higher, and this value has simply fallen into the lap of windmill owners as an 'unearned increment' of wealth. The normal depreciation on a mill of the old type, reinvested in the new type, has procured a greater value for the same cost.

There has been a release of labour from the windmill-building sector (since a smaller number of mills now need to be replaced every year) which involves some investment to get them employed in the consumption sector. The income and consumption of the capitalists has increased. The impact of the innovation was to raise the net profit yielded by equipment of a given cost. To reach a new equilibrium with the same rate of profit as before requires some rise in the wage rate and in the value of capital per man (a move along the new production function to compensate for the rise in it) so that, in one sense, this type of innovation has a capital-using bias, though in itself it reduces the cost of productive capacity. It therefore does not fit exactly into the categories we have used so far, and needs a pigeon-hole to itself.

MODEL FOUR: THREE SECTORS, VARIABLE TECHNIQUE

Equipment to Produce Equipment. To reach the final stage in complexity to be attempted in this paper, we introduce an engineering industry which consists of two sectors, one producing its own equipment and the other building the equipment for the consumer-good sector.

To draw up a production function for the engineering industry is not a simple matter; the output—equipment for the corn sector and for its own use—is not homogeneous; we cannot simply subtract part of the output to be used as input, as we could in the case of seed corn. Assuming that each outfit of equipment has a fairly definite normal rate of output that (in equilibrium conditions) does not vary appreciably with factor prices, we can reckon equipment regarded as output in terms of units of productive capacity (so that a particular type of Alpha equipment represents the same output as a quantity of a Beta type with the same capacity, irrespective of the amount of labour that will have to be employed to operate them) and to reckon equipment regarded as productive capacity in terms of its real cost in labour-time in the engineering sector. Then the ratio or inputs of equipment and labour in each engineering sector can be expressed in terms of the number of man-hours of work required to equip a man, and their outputs in terms of units of productive capacity for another sector.

Both the product—productive capacity to be used over a stretch of the future—and the input—work invested in the past—have a time dimension, and to reduce each to a simple quantity they have to be discounted at the ruling rate of interest. Thus, the production function for the engineering sector has to be represented by a family of curves, each corresponding to a different rate of interest. (It is sometimes argued, however, that we should be content with an index of physical capital as a measure both of input and output.[1])

Choice of Technique. The selection of the eligible techniques in each sector, with one rate of profit ruling (and expected to continue to rule) can be analysed, in principle, in the same manner as before, using the production functions appropriate to a rate of interest equal to that rate of profit; but the technique in one sector affects costs in the next and the analysis is excessively intricate, even in a rarefied model such as this.

The Capital/Labour Ratio. The existence of the engineering industry further loosens the connection between value of capital per man employed and capital per head in a physical, technical sense (equipment per man, reckoned in terms of labour-time invested, length of gestation period, etc.) in given technical conditions and enlarges the scope for situations in which differences between them are of opposite sign. Physical capital (except in very cranky cases) is greater, on any reasonable measure, where the wage rate is higher and the rate of profit lower, but value of capital can easily be less. When the engineering industry has a higher ratio of value of capital per unit of value of output than the economy as a whole, a higher wage rate is associated with a lower initial cost of equipment of any given type, and this (the so-called 'reverse Wicksell effect') is reinforced by the influence of a lower interest rate in reducing the ratio of average value of equipment to initial cost. These influences may be strong enough to offset or more than offset the effect of having more capital per head in a physical, technical sense (longer gestation periods, Alpha instead of Beta mills, etc.).

On the other hand, in the contrary case, where higher initial cost is less than offset by the effect of lower interest, the difference in value of capital per head exaggerates the difference in physical capital per head, on any reasonable measure.

[1] See, for example, L. Klein, *Econometrica*, October 1958, p. 622.

Neutral and Biased Improvements. A round of innovations that raises output per head equally in all sectors, and is neutral within each sector, is neutral from the point of view of the economy as a whole. (Output per head in the sectors producing equipment is reckoned in terms of productive capacity for the sector where it will be used.) The improvements may come about by reducing the labour required both to produce and to operate equipment of a constant physical type with a constant output per physical unit or (more plausibly) through a redesign of equipment, so that, for instance, a new type of mill produced by a given quantity of engineering labour with unchanged equipment, has a larger productive capacity when operated by the same amount of labour as the type that it has superseded.

When innovations have been neutral and the rate of profit is constant, the division of the labour force between sectors is the same in the second equilibrium position as in the first. A constant number of men in the basic industry which produces equipment for producing equipment are keeping intact a quantity of productive capacity which permits a constant number of men in the rest of the engineering industry to produce a larger flow of output of equipment for the corn sector, and so to keep intact a larger stock of productive capacity in the corn sector (more or larger windmills), which is being operated by a constant labour force to produce a greater flow of output of processed corn. A constant labour force occupied in growing corn is producing a rate of output that has risen in the same proportion.

Departures from neutrality may be of three kinds. First, an innovation may be biased within the sector where it occurs. Second, a round of innovations, while raising output per head equally in all sectors, may also shorten the gestation period in one sector or another, so that the total effect has a capital-saving bias, or may increase durability of equipment so as to add an element of capital creation to the other improvements. Finally, a round of innovations that is neutral within each sector and does not disturb the time dimension, has a capital-saving bias from the point of view of the economy as a whole if it increases output per head more in producing equipment than in producing final output, so that it entails a shift of labour out of the engineering sector into corn-growing; there is a capital-using bias in the converse case.

The relation between sectors is more important than the bias within a sector. To take an example, suppose that a purely capital-saving innovation occurs in growing corn—a reduction in seed per unit of output, without any change in output per head. When the rate of profit is constant the wage rate has risen (as we saw in the first model). In the other sectors (where the production functions are unchanged) more capital-using techniques become eligible, capital per head rises and there is a transfer of labour out of the corn-growing sector. The over-all effect is likely to be to raise the capital/output ratio. At the opposite extreme, any innovation in the basic industry, however capital-using in that sector, increases output per head in terms of equipment for other sectors, and causes a shift of labour out of the basic industry into the others; from the point of view of the economy as a whole it is likely to have a capital-saving bias. An innovation in the intermediate sector, which uses equipment to produce equipment, may generate either kind of bias for the economy as a whole.

When there has been a mixed bag of innovations of various kinds, scattered over the various sectors, we can still apply the criterion of the net effect on the capital/output ratio at a constant rate of profit and say that they are neutral on balance when that ratio is constant. But the claim that this definition is not circular begins to wear rather thin.

Relative Shares. The classification of innovations in terms of their effect upon the capital/output ratio at a constant rate of profit immediately tells us what happens to the relative shares of wages and profits in net income in the case where the rate of profit actually is constant. Neutral innovations leave them unchanged. Capital-saving innovations raise the share of wages, and capital-using or capital-creating innovations raise the share of profits.

The classification of inventions, however, is independent of what actually happens to relative shares.

When innovations have been neutral on balance, while the thriftiness conditions have been such that the value of capital has not increased sufficiently to keep the rate of profit constant, the wage rate has failed to rise as much as output per head and the rate of profit has risen. In this case physical capital per head tends to be reduced by shortening the gestation periods,

using less seed, smaller and shorter-lived types of mill, less equipment per man in the engineering sector, etc. We cannot then say in general which way relative shares have gone.

Similarly, when the over-all effect of innovations has been capital-saving but the value of stock of capital has not been reduced so much as to keep the rate of profit constant, the fall in the rate of profit induces a movement along the new production function in the capital-using direction which partly or wholly offsets the initial capital-saving bias of the innovations.

When there has been capital creation which has not been supported by a sufficient addition to capital in the consumption sector to restore the demand for labour or when there is a capital-using bias which has not been met by a sufficient increase in the stock of capital, the rate of profit rises. There may be a fall in wages or unemployment.

If relative shares happen to be constant when there have been capital-saving innovations, the rate of profit has risen. When capital-using, the rate of profit has fallen.

CONCLUSION

It would, of course, be wrong to attempt to draw, from static comparisons of a one-commodity model, with free land and homogeneous labour, any hypotheses to be confronted with empirical evidence. The argument so far does no more than provide categories that may be found useful for further development and, perhaps, smoke out some confusions in the terminology in which this subject is usually discussed.

However, it is safe to say that it would not be surprising, in a period of fairly prosperous capitalist development, to find that the capital/output ratio and the share of wages in the value of output seemed to have been more or less constant. The most likely explanation is that any bias there may have been in technical progress was not strong enough to show up in the figures.

When the capital/output ratio seems to have been changing appreciably, it is vain to hope that historical statistics can be used to separate movements along the production functions from the influence of biased progress or changes in the composition of output.[1]

[1] See L. L. Pasinetti, 'Concepts and Measures of Changes in Productivity' and his reply to R. M. Solow, *Review of Economics and Statistics*, August 1959.

No amount of econometric investigation of past history, even in the most favourable conditions, can find out the production functions. Recorded figures, at best, show the technical choices that actually were made, not those that *would have been made* if factor prices had been different. The search for the *ex post* production function (to which some contemporary American economists seem to be incurably addicted[1]) is to look in a dark room for a black cat which *certainly* is not there.

To interpret past history in terms of the over-all capital/output and capital/labour ratios, everything has to be boiled in together. When it appears that the capital/output ratio has been fairly constant and relative shares have been constant, we can say that accumulation appears to have taken place in a neutral manner. When the capital/output ratio has been falling or rising we may say that accumulation has been correspondingly biased. To find out whether the bias was due to a bias in technical progress, a change in the composition of output, a failure of the growth in value of capital stock to keep in step with technical progress, a change in the rate of accumulation, or short-period changes in the utilization of physical capital, or whether it is all just a statistical optical illusion, requires much closer study.

The production functions *ex ante*, which influence investment decisions, have a genuine operational meaning, but they are distressingly vague; they concern future returns which are clouded in uncertainty. Here we are looking into a fog for a grey cat that very likely is there but will never stop still.

Progress in this field is bound to be difficult; it is certainly not made any easier by the meaningless formulae and self-contradictory terminology in which much of the current argument goes on. The function of the above models is to serve as a filter to get the concepts clear, in simple unambiguous cases, as a preliminary to toughening them up to deal with the ambiguities of actual data.

APPENDIX

ANOTHER MODEL

A different type of model has been suggested[2] in which there is no working capital (gestation periods being shorter than the

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[1] Ibid.

[2] See T. Swan, 'Economic Growth and Capital Accumulation', *Economic Record*, November 1956. I have also had the benefit of some as yet unpublished work of Professor Meade in which a somewhat similar model is elaborated.

interval of wage payments) and in which there is a single homo-
geneous, indestructible and versatile capital good—steel—which
enters as an input into its own production as well as into the
production of corn. The production functions of corn and steel
are identical, so that the cost in terms of corn of producing a ton
of steel is constant whatever happens.

From the point of view of the steel-producing sector, steel is
something like corn in our Model Two; from the point of view of
the corn sector, it is something like windmills in our Model Three.

Comparing one position with another on the twin production
functions, we see that the assumptions have been chosen so as to
make the difference in capital per head identical with the differ-
ence in steel per head. In this case, therefore, we can discuss the
difference in relative shares at different points on the production
function in terms of the elasticity of substitution between labour
and steel.

The mentality of capitalists is that, whenever the marginal
efficiency of investment is greater than a certain normal rate of
profit, they save and invest a proportion of their income, the ratio
of saving to income depending upon the level of the marginal
efficiency of investment.

At the base date (Stage I) the marginal efficiency of investment
is at the zero-saving level. The whole stock of steel is devoted to
producing corn. The wage rate is such as to lead to full employ-
ment of available labour. Since there is no working capital, the
cost of employing a team of men is simply their wage; the wage
rate is equal to the marginal productivity of labour in terms of
corn at the point of full employment with the given stock of steel.
Each capitalist owns a particular quantity of steel and is content
to consume the income that it yields him. The value of capital is
calculated on the basis of a rate of profit equal to the marginal
efficiency of investment and the price of a ton of steel is equal to
its potential cost of production (though, in fact, none is being
produced).

An innovation occurs that raises the twin production functions.
The improvements are immediately embodied in all the steel in
existence and the output of corn rises. Competition for labour
drives up the wage rate till it is equal to the new marginal produc-
tivity at the full employment point with the same quantity of now
improved steel. At this moment (Stage II) the share of wages

has remained the same, risen or fallen (relatively to Stage I) according as the rise in the corn-production function was neutral or biased in the capital-saving or the capital-using direction.

Now profit per unit of steel has risen, but *ex hypothesi* the cost of production of steel in terms of corn is constant. The marginal product of investment is greater than the rate of profit that was ruling at Stage I. Either the rate of profit has risen or the price of a ton of steel is greater than its cost, whichever way you like to look at it. Saving and investment now begins (Stage III). Men and steel are transferred to steel-making. The wage rate is initially unchanged at the level reached at Stage II; the reduced output of corn due to the transfer of resources to investment comes entirely from reduced consumption by capitalists. Relative shares are constant at the Stage II level but the capitalists are taking part of their share in the form of new steel instead of corn.

Steel is now accumulating at the rate dictated by the capitalists' investment-and-saving function. Steel, as it accumulates, is added to the equipment of each sector in such a way as to keep the value of its marginal product equal in each, and since the production functions in the sectors are the same, this means adding an equal proportion to steel per head in each. As output per head rises with the growth of steel per head, competition for labour drives up the wage rate. The marginal efficiency of investment gradually falls. The rate of accumulation of steel, which was at a maximum when Stage III began, is decelerating continuously. The system is tending towards an asymptote at which the stock of steel is such as to restore the rate of profit to normal.

The behaviour of relative shares as accumulation goes on depends upon the shape of the twin production functions that came into existence at Stage II, when the stock of steel was adapted to the invention that started the story off.

If the post-innovation elasticity of substitution between steel and labour is equal to unity, the relative shares remain at what they became at Stage II. If the elasticity of substitution turns against steel as steel per head rises, the share of profits is falling as time goes by.

The peculiarity of this story is due to the indestructible and versatile nature of steel. The postulated innovation was capital-saving; it reduced steel per unit of output, and in this model capital is identified with steel; owing to the indestructibility of

steel, it was impossible to get the output/steel ratio back to normal except by increasing the steel/labour ratio.

A neutral innovation would be one that left steel per unit of output constant while reducing labour per unit of output equally in each sector. Then an increase in the stock of steel would be necessary to restore equilibrium. When the rate of profit is back to normal, with full employment, steel per head has risen in the same proportion as output per head and relative shares are constant. Then stationary equilibrium rules once more.

Another type of situation would be seen if the stock of steel is never altered but an innovation increases output per head with the given stock of steel. The relative share of wages then rises or falls according as the marginal product of labour at the full employment point has increased more or less than output per head. The capitalists simply consume the extra income that they receive, whatever it may be. This sounds somewhat fanciful in terms of a stock of steel, but would be quite familiar if we called steel, land; and profit per ton, rent per acre.

THE REAL WICKSELL EFFECT

THE puzzle which goes under the name of the *Wicksell effect*[1] concerns the evolution of an economy which is undertaking deepening investment, increasing the ratio of capital to labour and capital to output, going down the production function, raising the degree of mechanization of technique, lengthening the period of production or whatever you like to call it. As this process goes on, the real wage of labour rises and the rate of profit on capital falls. The puzzle concerns the effect of these changes on the value of an item of capital equipment.

The setting of the question is in the highest degree academic. We are asked to contemplate an economy in which accumulation is going on, with a falling rate of profit, subject to all the rules of long-period equilibrium, including the proviso that the technique of production is that which maximizes profits. No adverse effect of the expectation of falling profits, and no short-period perturbations, are allowed into the argument. Since we are concerned with a traditional puzzle, we must set up the question in its traditional form.

To get the problem into simple terms we make the following assumptions:

1. The whole economy divides into two sectors, producing consumption goods, which we shall call cloth, and investment goods, which we shall call looms. The workers in the first section we shall call weavers, and in the second, engineers.

2. One weaver operates one loom. There are three types of looms, Alpha, Beta and Gamma, representing techniques of descending degrees of mechanization. A loom appropriate to a lower degree of mechanization is produced by a smaller amount of engineering labour and yields a lower output of cloth than that for a higher degree. The engineers supply themselves with whatever tools they require, in their spare time, so that no investment

[1] See, for example, T. W. Swan, 'Economic Growth and Capital Accumulation', *The Economic Record*, November 1956, and I. M. D. Little, 'Classical Growth', *Oxford Economic Papers*, June 1957.

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in the investment sector comes into the story. The gestation period of each type of loom is very short. The gestation period of cloth is very short, so that a loom begins to yield output as soon as it is produced. The looms are highly durable and can be operated at full efficiency for an indefinite period.

3. Let Ca, Cb and Cg be the rates of cloth output per man per week with the respective types of loom and Ka, Kb and Kg the amounts of engineering labour required to produce one of each type.

The weekly cloth wage per man Wb (uniform for all workers) is equal to Cg and the cloth wage Wa is equal to Cb. That is to say that when the Beta wage rate rules, Gamma technique only just covers its costs and yields no profit; when the Alpha wage rate rules, Beta technique yields no profit. (The violence of these assumptions is made for simplicity. Cases of greater elaboration can easily be devised.)

4. The labour force is constant. Workers are versatile, and any individual can work in either sector equally well.

5. All wages are currently spent on cloth.

We have to contemplate accumulation going on under conditions of equilibrium. We shall proceed by postulating that a particular course of history is laid down in terms of real investment, and that everything else adapts to it in such a way as to preserve equilibrium (say, through the operation of appropriate monetary and fiscal policy).

The history that we first specify is that the division of the labour force between weavers (Lc) and engineers (Li) remains constant, and that all workers are always fully employed. This means that a constant rate of investment in terms of labour-time is being carried out throughout the story.

When our story begins the weavers are equipped with a mixture of Beta and Gamma looms, the cloth-wage rate is Wb and investment in Beta looms is taking place. As each new Beta loom is delivered, a weaver has to be taken off a Gamma loom, which is then scrapped.

During this phase the cloth-wage rate remains constant and the total of current profits is gradually rising as looms yielding $Cb - Wb$ replace those yielding nil $(Cg - Wb)$. The consumption of cloth by capitalists, to fulfil the postulated conditions, must therefore be increasing. Since the rate of investment, $WbLi$, is

constant while income is increasing, there is a gradual decline in thriftiness going on.

Now, a moment comes when the last Gamma loom has disappeared. All weavers are equipped with Beta looms. For investment to continue, Alpha looms must begin to be built. To fulfil our specified conditions, the consumption of capitalists must fall and the cloth-wage rate rise to Wa, so as to make Beta looms unprofitable and release labour for use on Alpha looms. The next phase then proceeds exactly like the last one, with thriftiness gradually falling from the level to which it suddenly jumped. Since the given number of engineers now turn out fewer looms, the process of transition from Beta to Alpha techniques takes longer to complete than did the transition from Gamma to Beta.

We can equally well specify a different history. The proportion of current profits saved is constant, and investment adapts to it in such a way as to preserve full employment. Beginning again at the same point, the gradual rise in current profits as Beta looms replace Gamma leads to an increase in investment (to absorb increased saving). Workers are transferred from weaving to engineering and the whole process accelerates as it goes on. The number of weavers reaches a minimum, all supplied with Beta looms. Current profits are now at a maximum. Beta looms continue to be produced, but to man the new batch, some workers have to be transferred back from engineering to weaving. As the rate of investment falls in consequence, profits fall and the ratio of cloth output to total income rises—the real-wage rate must rise to absorb the output of cloth.

The rise in wages goes on gradually (instead of suddenly as in the first story) until it reaches Wa.

At that level Alpha looms can be manned, investment begins to increase again and the wage rate is stabilized at Wa. The whole process begins again with Alpha looms replacing Beta and investment accelerating from the low level to which it fell during the transition.

Many variations on these stories can be devised. The only essential is to get round the corner from Gamma to Alpha without violating the condition of full employment.

Now consider the situation of an individual capitalist who owns n Beta looms when the story begins. They cost him $n(WbKb)$ in terms of cloth and his current profit is $n(Cb - Wb)$. If he con-

sumed the whole of this he might on a superficial view be considered as doing zero saving, but in reality he would be consuming his capital. He would be behaving as though his current profit was expected to be permanent, whereas, in fact, his Beta looms will one day be scrapped (rendered obsolete by Alpha looms). To preserve his original capital (valued in terms of cloth) he must amortize it over the service life of the Beta looms. But when he comes to reinvest the original sum in Alpha looms, each costing $WaKa$, he finds that it cannot buy the equivalent of n Beta looms, for this would require an expenditure of $n(Kb \cdot Wa)$, and he has provided himself with an amortization fund of only $n(Kb \cdot Wb)$. This is the Wicksell effect in real terms. It is the rise in the reproduction cost of a Beta loom above its historic cost due to the rise in the real-wage rate.

We rigged the initial assumptions so that there was no allowance for interest in the cost of looms. Let us now suppose that each type has a rather long gestation period. The appropriate interest rate to take into account is the current rate of profit, that is $Cb - Wb/WbKb$ during the Gamma-Beta phase of investment and $Ca - Wa/WaKa$ during the Beta-Alpha phase; this represents the loss of profit due to having to wait for an investment to begin to earn. Now, at the moment of transition of the wage rate from Wb to Wa in the first story, and gradually over the transition period in the second, this cost of waiting falls. The cost of a new Alpha loom then exceeds the original cost of an old Beta loom in a smaller ratio than $KaWa/KbWb$ because the cost of waiting over the gestation period (which we assume to be more or less the same in magnitude and pattern for both) is compounded at a lower rate of interest on the outlay of $KaWa$ than on that of $KbWb$.

It might happen, then, that the effect of a lower interest rate was so strong that the notional reproduction cost of Beta looms was less than their actual historic cost. If so, what appears to the individual capitalist as merely amortization of the historic cost of looms is contributing to net saving for the economy.

This is sometimes called a 'reverse Wicksell effect', but if we are thinking in real terms there seems no point in boiling up the cloth wages of engineers with the interest-cost of waiting in a single sum.

So far everything is quite above board. There is no mysterious revaluation of capital goods on account of a change in the interest

rates. Indeed, there is no need to value the looms at all, and since the value of those in existence at any moment depends upon beliefs about their future earnings, it is not at all obvious how we should set about doing it if we did.

The value of capital goods has a definite meaning only if future profits are believed to be known for certain, and a simple meaning only if the future rate of profit is expected to be constant. (A level of profits which is expected to alter in the future is not a single rate in the present, but a complex of rates applying to different lengths of future time.)

To discuss the value of capital goods we may set up the following case. We now assume that looms have a definite physical life at full efficiency (the one-hoss-shay assumption) and that we are examining an economy in static equilibrium. A stock of Beta looms is in use, of balanced age composition, and there is a flow of output of new looms just sufficient to maintain the stock in being. The wage rate is Wb, and the surplus output of cloth $(Cb - Wb)Lc$ is being consumed by capitalists. It is possible on this basis to work out the rate of profit and the value of the stock of looms (with the assistance of Professors Kahn and Champernowne).

This case can be compared with others in which Gamma or Alpha techniques are in use, or with cases in which Gamma and Beta looms co-exist and in which Beta and Alpha looms co-exist. We can work out the rate of profit and the value of capital in each case and compare them. We can analyse the difference in cost of capital, and allocate it between the difference in the degree of mechanization, the difference in the wage rate and the difference in the rate of profit. This, again, is somewhat artificial, but it is all above board.

It is quite another matter to consider the effects of a change in the rate of profit. Let us imagine, in the situation where a balanced stock of Beta looms has been maintained for some time, that suddenly one day the capitalists grow more thrifty. The cloth-wage rate rises to Wa and the current rate of profit falls. Equilibrium is ruptured and all is in turmoil. Investment in Alpha looms has suddenly become profitable. There is a new static equilibrium position which can be reached after a period of positive investment has been worked through, and in that position there is a lower rate of profit.

If we begin already the day after wages rose to reckon the value of capital on the basis of a rate of interest equal to the Alpha rate of profit, then we certainly have to revalue capital goods. The value of existing Beta looms is raised (unless the effect of reduced cost of waiting is sufficient to offset the rise in the wages bill). An entrepreneur who has new Beta looms experiences a capital gain. One whose Beta looms were near the end of their life finds himself without a sufficient amortization fund to replace them. We could work out the value of the total existing stock of looms at the new rate of profit. But there seems to be an inherent contradiction in discussing an out-of-equilibrium situation in terms appropriate to a static state. Moreover, there is a good deal of haziness about the meaning both of the rate of profit and of the value of capital when the future rate of profit is no longer expected to be constant.

The difference between this financial pseudo-Wicksell effect and the real Wicksell effect is that in the first the initiating cause is a change in prices and the phenomenon to be discussed concerns book-keeping while in the second the initiating cause is an increase in productive capacity and the phenomenon to be discussed concerns output, consumption and the distribution of income.

Certainly, the question is only a class-room exercise. We do not expect a process of accumulation with a falling rate of profit, in real life, to be carried out with continuous full employment in equilibrium conditions. But that is the question that was asked.

SAVING WITHOUT INVESTMENT

In a pure consumption-loan economy, with no durable goods that can be kept even over-night and no money tokens, present consumption can be exchanged against future consumption by lending goods and taking a dated IOU (expressed in goods) from the borrower. The rules of the game that make this possible are that all debts are punctually paid on the agreed terms.

The sum expressed in an IOU may be greater or less than the sum received by the borrower, according to the state of demand and supply in the loan market. IOUs cannot be sold at second-hand (if they were they would constitute a form of money), but it is possible to borrow from one man and re-lend to another simultaneously. If the characters concerned are good at arithmetic and fly enough to take advantage of the possibilities of arbitrage, the terms of lending will be evened out and an equilibrium rate of interest, positive or negative, established in the market. Then each IOU drawn adds to or deducts from the sum received by the borrower compound interest (reckoned on a daily basis) at the market rate over the period that it will run. (Expectations that the rate of interest will alter as time goes by very much complicate the story without affecting the principle, and we will assume the ruling rate is always expected to remain constant, so that there is only one rate of interest for all terms of loan.)

In the case to be discussed, men cease to earn at a certain age and thereafter live in retirement. The subsistence of children is counted as part of their parents' consumption. (The complementary case, where orphans need to consume before they earn, while the old die in harness, is not here discussed.) The date of death is foreseen, and everyone ends his life without leaving either debts or claims behind him. The problem is to provide for consumption after earning has ceased.

When young men are prepared to borrow to consume in excess of daily income, middle-aged men can save up and lend to them

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This paper has not hitherto been published. It was suggested by Prof. Samuelson's 'Exact Consumption-Loan Model of Interest' in the *Journal of Political Economy*, December 1958.

on long term, thus postponing consumption in the period of
retirement.

For example, suppose that at a particular moment Mr. Smith,
aged 40, is paying Mr. Brown, now in his sixties, to whom he
gave an IOU twenty years ago. At the same time he is saving up
and lending to young Jones (who consumes more than he earns)
for repayment twenty years hence. Twenty years later, Jones is
paying Smith, who has just reached the statutory retiring age of
60 (Brown has died). If Smith expects to live till 80, he needs
an IOU from a man at least twenty years younger than himself,
who will have earnings from which to redeem it in twenty years'
time. If he has not yet been able to arrange one, he can re-lend
part of what Jones is paying him to a new young man, thus
spreading the consumption of his past savings out over his period
of retirement.

The essential feature of the situation is the excess consumption
of young Jones. If there are no spendthrifts and all are determined
to start saving up as soon as they begin to earn, there is no
equilibrium and there is an indefinitely great negative rate of
interest. Negative interest wipes out the principal of a loan in a
shorter time the greater the negative rate. (At -100 per cent
per diem it would be impossible to carry consumption forward
from one day to the next.) For the system to provide for any life
after retirement, the level of the rate of interest must be at least
high enough to make it possible to carry forward at least a
subsistence level of daily consumption for at least an appreciable
time, without depressing present consumption below the sub-
sistence level.

Borrowing is encouraged by low interest. An elderly man
cannot afford to borrow even at a negative rate, for he has little
time left to repay and to save up for his retirement. But a young
man has enough earning time to look forward to, and he can
respond to the bait. The system will work provided that there
is a propensity to borrow that is at least sufficient to keep the
market rate of interest from falling to the level which starves the
retired out of existence.

A three-phase pattern of adult life is then established, with an
excess of daily consumption over daily earnings both in youth and
age, and consumption less than earnings in the middle years.
Every day, total consumption for the economy as a whole is equal

to total earnings, and total borrowing to total lending. But over the course of a lifetime any individual may borrow more than he lends or lend more than he borrows. If he borrows more, he receives more interest than he pays over his lifetime, and consumes more than he earns, when the rate of interest is negative, and less when it is positive. And conversely. When the rate of interest is zero, his lifetime consumption and earnings are equal, whatever the relation of his lending to his borrowing.

The level at which the rate of interest settles is governed by the age-composition of the population and by the subjective preferences of individuals, which are influenced by the circumstances that they will meet and by their expectations about their own future states of mind, as they pass through the various phases of life.

A propensity to 'discount the future' is expressed in greater willingness to borrow and less willingness to save up, at any given rate of interest, and so tends to make the equilibrium rate higher. A man who in the past has discounted the future is now, in middle age, kicking himself for having borrowed too much, or, after retirement, for having saved up too little.

Excess consumption, even at a positive rate of interest, does not, however, necessarily imply that anyone discounts the future. It may be that a typical man in middle age, now stinting himself both to repay IOUs given in youth and to save up for future consumption, may feel perfectly satisfied that he did the right thing to borrow when young blood was in his veins. Moreover, his children may now be earning, and all his consumption going into his own mouth, so that his standard of life is not necessarily lower than it was earlier.

A longer period of retirement increases the motive for saving and so tends to lower the rate of interest. Furthermore, it tends to increase re-lending after retirement. (If the interval between retirement and death is longer than the interval between the age when borrowing ceases and retirement, some re-lending is absolutely necessary to carry consumption to the last day of life.) Re-lending by the retired to postpone dis-saving of their accumulated claims, so to speak, poaches on a younger generation of potential borrowers, and leaves fewer to accommodate middle-aged savers; this also tends to lower the rate of interest. (When the rate of interest is negative, the elderly, who have already had

to sacrifice part of their savings to get them carried forward to retirement, then lose another part in shifting them from the earlier to the later years within it. A positive rate of interest helps them on both tacks.)

So much for personal circumstances and preferences. To discuss the effect of the age composition of the population it is convenient to set out a simplified example. We postulate that everyone enjoys level earnings from 20 to 60 years of age and then retires and lives to 80. No one under 40 saves and no one over 40 consumes more than his income. No one over 60 lends. Then we have the three phases of life of equal length for each individual, and there are three quite distinct age groups in the population at any moment—the young (aged 20–40), who indulge in excess consumption, the middle-aged (40–60), who both save up for retirement and repay any borrowing of their youth, and the retired (60–80), who consume the repayments made to them.

With a stable population the life story of a man who follows the average behaviour of each age group as he passes through it corresponds to a cross-section of the economy at any moment. For the economy, total daily consumption is equal to total daily earnings, and the sum borrowed daily is equal to the sum saved up (for there is no re-lending by the retired). For the average man, saving up over his lifetime is equal to borrowing, and consumption is equal to earnings. The total, over his life, of interest added to (or subtracted from) the payments that he makes to redeem his debts is equal to that which he receives (or forgoes) in the payments made to him. A man who (over his life) borrows less than the average and saves up more, receives more interest than he pays when the rate of interest is positive, and pays more than he receives when it is negative.

With a stationary population our three age-groups are equal in numbers. When the population is increasing, each generation is larger than the last, and the numbers in each age-group stand in relation to the next in the ratio $1/(1+g)^T$, where g is the rate of growth of population and T the length of each phase of life (20 years in our example). At any moment, the total debt being incurred by the young is equal to the total of saving up by the middle-aged, and since the young are more numerous, borrowing per head is less than saving up per head. (By the same token, a larger middle-aged generation is making repayments to a smaller

retired generation, and payments per head are less than receipts per head.) In any given pattern of subjective preferences, evidently, the equilibrium rate of interest will be higher the more rapidly the population is growing. (The influence of age-composition on the rate of interest is weaker the more sensitive is individual behaviour to differences in the rate of interest.)

Since borrowing per head at any moment is less than saving per head, the average individual over his life saves up more than he borrows. The average man, therefore, over his life receives more interest than he pays (and consumes more than he earns) if the rate of interest is positive and pays more than he receives if it is negative.

When the rate of interest is zero, not only the average man but (as we have already remarked) each and every individual consumes over his lifetime just what he earns.

The case of a free-market rate of interest equal to zero would be a fluke. It is quite a different matter if there is a law against usury, forbidding lending at positive interest and borrowing at negative interest.

With such rules of the game, it would still be possible for the three-phase pattern of life to be established, provided that the conditions are such that the equilibrium rate of interest (if there were one) would be positive. Young men who would have been prepared to promise interest for loans then get them for nothing, while the middle-aged have to be content to have their consumption carried forward without any premium. (Since demand for loans exceeds supply, the middle-aged can dole them out amongst their favourites.)

Where the equilibrium rate of interest would be negative, the middle-aged cannot find sufficient borrowers to accommodate them. In this case, to provide for consumption for all during retirement, some other rule must be introduced.

The introduction of money tokens which could be hoarded would be disastrous unless the first generation of retired men were given a free issue. But social insurance would do the trick. There could be a system by which each income-earner pays a subscription to the retired, enjoying at the same time the knowledge that he will be looked after when his turn comes. Adult life, then, has only two phases, earning and retirement. The timing of an individual's consumption over his life has to be decided in

the terms laid down for the scheme. For instance, if the decision is in favour of a level rate of consumption over adult life, then the ratio of daily consumption to daily income is equal, for a stationary population, to the ratio of the length of the earning period to adult life—in our example two-thirds. Each individual in this case subscribes one-third of a day's income every day for forty years and receives two-thirds for twenty years. Each receives, during retirement, sums equal to what he himself subscribed in the past.

When the population is growing at a steady rate, the age-group of each year is smaller than the next in the ratio $1/(1 + g)$, where g is the annual rate of growth. The subscription out of earnings necessary to provide the retired generation with a level rate of consumption is correspondingly reduced, and each man, during retirement, receives a sum equal to his own past subscriptions *plus* compound interest on each instalment, over the period that elapses between making the payment and receiving the benefit, at a rate equal to the rate of growth of the population.[1]

When conditions are such that the free market rate of interest is heavily negative, the social insurance system seems more humane than the consumption-loan system, and more consonant with traditional morality. But it might be resented by spend-thrifts and those who have their children early. Can this be expressed in a social welfare function?

[1] Prof. Samuelson (loc. cit.) regards this as a 'biological rate of interest' received by lenders, but it is not seen in a loan economy where individuals are free to lend as much as they like; it occurs under the rules of a uniform subscription system, and it has not much resemblance to interest on loans.

SOME PROBLEMS OF DEFINITION AND
MEASUREMENT OF CAPITAL

WE are concerned, in this paper, with capital as a factor of
production; that is, capital in the sense in which it consists of a
mass of buildings, machinery, roads, ditches, stocks of goods, etc.
We are not at the moment interested in drawing the line between
capital goods and land, or between producer's and consumer's
capital. We are concerned, rather, with the problems of measure-
ment which arise after the decision has been made as to what
concrete items are to be included in the enumeration.

In particular, we are concerned with the difficulty that arises
out of the fact that the use of capital goods is spread out through
time while the measure that we are looking for is a value at a
moment of time.

I

Why do we want to be able to measure a collection of capital
goods? They are what they are and they will be what they will
be. Adding numerical labels to them will not affect their perfor-
mance. All the same, it is convenient to be able to talk about
them in quantitative terms.

The questions into which quantities of capital goods enter may
be divided into descriptive and operational. The questions which
I call descriptive involve the valuation of stocks of capital goods
in existence. We may be interested in comparing stocks at one
date and another in a particular country, in order to see how it
is doing. How far has recent investment exceeded the wear and
tear of old equipment? Have the ravages of war been made good?
Has productive capital been increasing as fast or faster than the
potential labour force? Or, again, we may be interested in
comparing stocks of capital in different countries at the same
date. How far is the superior productivity of American industry
due to having more capital and how far to superior organization
and technique? Or, combining the two, we may be interested in
comparing rates of growth of the stock of capital in two economies.

Similarly, we may be interested in questions concerning particular industries. All this has implications for policy, but the questions in themselves are concerned only with description.

The operational questions are directly concerned with what is to be done—how can given investible resources best be used? Here is a fund not yet embodied in concrete form—how should the choice be made of the form it is to take? This involves comparing potential stocks of capital goods in terms of their potential performance in order to choose which of the possible alternatives is to be made actual in a scheme of investment.

<div style="text-align:center">II</div>

In both sets of questions the value of capital is, so to say, a forward-looking concept. The significance of a stock of capital goods lies in its earning power to a business or its productivity to society, and the historic cost of the stock is of importance only as a clue to its value.

To-day is a break in time dividing an irrevocable past from an uncertain future. In general, the stock of capital in existence to-day has been influenced by expectations held in the past which have turned out to have been at least partly mistaken. The stock to-day is not just what it would have been if all those concerned in the past had known what expectations about the future would be held to-day. Its value to-day is to some extent out of line with its costs (how much out of line depending upon the extent to which events have been upsetting expectations over the relevant past). Moreover, its value to-day depends upon estimates of the future which vary from one man to another and are in any case known to be liable to error.

Here lie the most formidable difficulties surrounding the concept of capital, which, in fact, make it impossible to give an unambiguous simple meaning to the phrase 'the value of a stock of capital goods'. But it is all a matter of degree. Some periods falsify expectations less than others. Let us, for the sake of argument, reduce the degree of ambiguity to vanishing-point by postulating an economy which has long been evolving in conditions of perfect tranquillity with expectations, confidently held, which, in fact, have never been falsified as time rolls on in an eventless history. If we further postulate that these expectations, ever justified and therefore renewed, are that the rate of return

realized on investment will always be constant, then there is no inherent difficulty in valuing capital, though there are a number of puzzles to be cleared up.

III

First, we must clear out of the way a point that has often caused misunderstandings. Capitalist firms are extremely various and extremely complicated in nature. To conduct a simple analysis it is necessary to take a highly stylized 'firm' as the subject of the argument. One way is to endow the firm with an existence of its own as a 'unit of entrepreneurship' which enjoys diminishing returns from the application of factors of production to itself. Its objective, in the various decisions it has to take, is to maximize *net profit per annum to the firm,* and it can borrow finance, just as it hires labour, in an open factor market.

In the other stylized picture, the firm is simply the capital invested in it, managed by a disembodied entrepreneur, and its object is to secure the highest *rate of profit on capital.* In this picture the size of the firm need not be limited by any technical or managerial considerations, yielding diminishing returns to size, but at any moment it has limited resources already embodied in it and a limited amount of new finance that it can invest in the immediate future, though there need be no limit to the size that it can reach, given endless time.

In my first book I used the former picture, but it now seems to me both more complicated and less lifelike than the latter. In any case, for the purpose of the present discussion, I shall postulate that firms carry out their investment plans with a view to obtaining the best possible rate of profit on the finance that is available to them. If so, the supply price of finance for a particular scheme of investment is an opportunity cost—the profit that could have been expected from the best alternative scheme. In our ideal tranquil world, assuming mobility of investment between markets, the cost of finance to any one line is simply the general rate of profit, and the rate of interest paid for loans is assimilated to it.

IV

Now, in our tranquil world where steady and confident expectations have long prevailed, there is a definite rate of profit which is entailed by the past and expected future prices, wage

rates, technical conditions, etc. Since to-morrow is always in course of becoming yesterday without any perceptible break at to-day, the value of a stock of capital goods regarded as discounted future earnings must be equal to its cost, including in cost interest on outlays made in the past compounded up to-day, and deducting from cost earnings, similarly compounded, that have already accrued. The value and the cost must be equal simply because we assume that no mistakes have been made. The costs would not have been incurred if they were not going to produce the value.

We can imagine that an all-seeing observer finds out the rate of profit entailed in a given pattern of past and future prices, wages, etc., by the following procedure. Begin by guessing a rate of interest and reckon the value and the cost of capital goods on that basis. If, say, the cost appears to exceed the value, the rate of interest chosen was too high. At a lower rate of discount the present value of the same future earnings is higher and at a lower rate of interest the cost is lower. The rate of interest which equalizes value and cost is the rate of profit inherent in the given present and future prices, wage rates, etc.

Once we have discovered the rate of profit ruling in our tranquil world we can use it as a rate of interest entering into the cost and the valuation of particular capital goods, and so reduce them all to a common unit of measurement.

But what do we mean, exactly, by a unit of measurement to be applied to capital goods which offer a variety of time-patterns of future yields? It seems to me that the natural approach is to reduce each to terms of an equivalent balanced stock of capital goods; that is, a stock whose age composition is such that a given rate of growth (which may be zero) in annual gross investment produces the same rate of growth in the stock.

There is entailed in the stock to-day a particular past history, and if the stock is balanced there must have been a particular historical pattern in the gross investment which has brought it into being. To take the simple static case, suppose that the stock is being just maintained, without growth. Then if the investment which brought it into being began at a particular date in the past, a rate of gross investment equal to its present wear and tear must have been carried out from the beginning. Say it is made up of separate sets of items of equipment, each costing K when

new, having a useful life of T years. Then if there is in existence to-day a static stock of this equipment, there must have been an investment of K every year for the last T years.

There is no reason why any particular capitalist or any whole economy should get into balance in this way, but the balanced stock provides a standard of comparison, and a formula which permits us to reduce all stocks, whatever their time-pattern, to terms of an equivalent balanced stock, provides the unit of measurement that we are looking for.

A formula has been provided by Professors Kahn and Champernowne[1] which operates on certain simplifying assumptions.

First, the gestation period during which outlay is incurred to build up the stock of capital goods is taken to be sharply distinct from the period when earning begins. This means that we can take a definite sum, K, as the cost of a particular item of equipment brand new and just ready to begin production. Second, it is assumed that quasi-rent (that is, total receipts *minus* wages and other running costs) accrues continuously at an even rate over the lifetime of the equipment and that its life comes to a sudden end, leaving no scrap value, at a particular age (this is known as the one-hoss-shay assumption, in allusion to the famous poem[2]).

The third assumption which the formula requires is static conditions, in the sense that the value of the stock of capital to which it applies is constant through time.

The formula is
$$C/K = \frac{1}{1 - e^{-rT}} - \frac{1}{rT}$$

where C is the value of the investment represented by the equipment whose cost is K, r the instantaneous rate of profit and T the length of life of the equipment.

This yields useful simple approximations for two ranges of values of rT. For values of rT above 4 the approximation is: $C/K = 1 - (1/rT)$ and for values below 2, $C/K = \frac{1}{2} + \frac{1}{12}rT$. Thus if T is, say, 50 years and r something more than 8 per cent per annum, the value of the investment is more than three-quarters of the initial cost. If T is, say, 10 years and r something

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[1] See the Appendix to my *Accumulation of Capital*.

[2] Have you heard of the wonderful one-hoss shay
   That was built in such a logical way
   It ran a hundred years to a day?
   The Deacon's Masterpiece by Oliver Wendell Holmes.

O

less than 20 per cent, the value exceeds half the initial cost by less than one-sixth.

What is the significance of the assumptions that lead to these simple results?

The first simplification (treating the gestation period and earning period separately) is merely an expository device and involves no point of principle.

The second (the one-hoss-shay assumption) merely means that a particular pattern of earnings (the simplest) has been picked out to illustrate the general case.

The third assumption, static conditions, involves a matter of principle. The conception of a balanced stock of plant, continually maintained in being by a constant rate of gross investment, and yielding a constant flow of output, would be inappropriate in a growing economy.

This limitation upon the formula can be removed provided that growth is conceived to take place at a steady rate.[1]

When a is the steady rate of growth:

$$C/K = \frac{1}{1 - e^{-rT}} - \frac{1}{(r-a)T} \cdot \frac{aT}{e^{aT} - 1} \cdot \frac{1 - e^{-(r-a)T}}{1 - e^{-rT}}.$$

When $a = 0$, this reduces to the original formula given above. When rT and aT are small, the following approximation is useful:

$$C/K = \tfrac{1}{2} + \tfrac{1}{12}(r + a)T.$$

Taking the second example above, with $T = 10$ years and $r = 20$ per cent, so that in the static case $C = (\tfrac{1}{2} + \tfrac{1}{6})K$, then i a is, say, 4 per cent, $C = (\tfrac{1}{2} + \tfrac{1}{5})K$.

On this basis, provided that perfect tranquillity prevails and the rate of profit is constant, we can value a stock of capital goods just as before. The only difference is that we take into account the fact that the more rapid the steady rate of growth that is taking place (other things equal) the lower is the average age of individual items of equipment and so the higher is the ratio of C to K. With very rapid rates of growth, C approximates to K.

V

So far we have relied upon a constant, uniform and unambiguous rate of profit. It is possible to compare situations technically alike with different rates of profit, the given rate of

[1] The amended formula has been supplied by Professor Champernowne who assures me that the proof is elementary.

profit having been constant for some time in each, and being expected to remain so.[1] This is at best a class-room exercise, for in reality it is very improbable that the same technical conditions would be found with different interest rates. It is useful, however, to draw attention to certain conceptual notions. When we are comparing two situations with different rates of profit there is no unit of value which is in common between them, for the pattern of purchasing power is different. If near enough the same commodities are consumed in each economy, in near enough the same proportions, we can use a basket of consumer goods as a unit of measurement, but the real wage rate must be different when technical conditions are alike and the rate of profit different. The purchasing power of commodities over labour is therefore different in the two cases. Thus our two situations have no measuring rod in common. To evaluate our two stocks of capital (granted all the data and all the tranquillity and all the confidence in expectations that we can ask for) we have to use a multiple measure—say, one is so much greater than the other when valued in terms of labour time but so much smaller when valued in terms of commodities. All this is very much 'economics for economists' and most even of economists seem to find it rather funny.

VI

When it comes to comparing actual stocks of capital goods at actual moments of time in actual economies, generally both rates of profit and technical conditions are different, and we have to admit frankly that we cannot even say with any exactitude what it is we are trying to measure. On top of that the data that we have to deal with are imperfect and ambiguous to an exasperating extent.

This is not a reason to fall into a state of intellectual nihilism and refuse to say anything.

In common-sense terms the stock of capital *is* larger in some economies than in others, and in most it is changing through time. The crudest measures—say, cost written down at the rate permitted by the tax authorities, the businessman's own valuation as shown by the books of firms, or estimated replacement cost with a rough allowance for age—are better than none.

[1] Cf. *Accumulation of Capital*, chapters 11 and 12.

The important thing is to keep a firm grip on the distinction between value of capital per unit of output and value of capital per man employed. In technically progressive economies we expect to find capital per unit of output more or less constant over the long run while capital per man employed is steadily rising. Where capital per man and capital per unit of output are both constant there is no technical progress, but accumulation is adjusted to the growth of the labour force. Where capital per head and capital per unit of output are both rising we have a case that can be interpreted in terms of a neo-classical production function.

Questions of this kind are of the greatest interest, and it is worth while to try to answer them, no matter that the measurements involved are crude, imprecise or even ambiguous when it comes to fine details.

<div align="center">VII</div>

So much for the descriptive questions. Now consider operational questions, connected with investment decisions, returning once more to the tranquil world of confident expectations and a single ruling rate of profit. The operational questions are set out in a manner quite different from the descriptive questions. We stand, so to say, at the elbow of a would-be investor, to-day, looking into the future. The investor has to dispose of un-committed funds of the value K, and he is considering how to use them. The concept of a balanced stock of capital is now of no relevance. To build up and maintain a static balanced stock he would have to continue into the future investing K per unit of time. This, indeed, is how working capital operates, but for long-lived equipment there is no sense in asking our investor to commit himself to such a programme. (It is true that an individual investor can acquire a balanced stock of plant by buying in the second-hand market, but this is only shifting the problem from his shoulders to others.) We must consider the present act of investment of K on its own merits.

Let us suppose that the investor is contemplating the purchase of a one-hoss-shay type of equipment, ready to start production, which promises to yield an excess of receipts over running cost (quasi-rent) of Q per annum for T years.

To see whether this investment will yield the going rate of profit, he must discount the dated future Qs at the ruling rate back to to-day; if the sum so arrived at is not less than K, the investment passes the test of eligibility.

Another way of looking at the calculation is to consider what income could permanently be drawn from the investment. This means that each incarnation of the finance in concrete capital goods is amortized over the lifetime of the equipment, so that every T years the finance, K, appears again in a liquid form ready to be invested, while all the time a constant income per annum is being netted off. If Y is the permanent disposable income, then when Y/K is not less than the ruling rate of profit, the investment is eligible. (The proof that these two ways of looking at the question are equivalent is set out in the appendix below.)

On this basis the investor can be conceived to choose between possible schemes of investment, rejecting any that do not promise to yield at least the going rate of profit on the sum K.

The basis of the calculation is an implied understanding that any investment of finance, once made, is to be a permanent addition to the stock of capital. It is true that an individual capitalist may contemplate consuming his gross profits, so that at the end of T years he is left with nothing, but an economist would account for his behaviour by saying that he discounts the future at more than the ruling rate of profit. The investment which is intended to be permanent is the normal one that provides the basis for the calculation. If it were normal to allow an investment of finance to evaporate with the physical life of the plant in which it is embodied (as is, indeed, normal in the case of consumer's capital) our whole approach would be different. For the descriptive question we took as normal a stock of capital kept in being by replacements. In this case we take it as normal that an investment of finance, once made, will not be disinvested, though the capital goods in which it is first embodied disintegrate in time. Thus, in both cases we are basing our arithmetic upon the moral principle of 'keeping capital intact'.

At first sight there seems to be an inconsistency between the two formulations. How can the very same act of investment produce a capital of K and a capital of only C? The answer is that it depends upon the point of view—the point of view of the individual investor or of the economy as a whole—the points of

view of finance capital and of physical capital. Our investor who owns funds of K looks for a return at the ruling rate on K, and this he can get by purchasing a piece of equipment whose earnings will enable him to amortize the investment over its life. He is in possession of physical equipment which will have an average value over its life equal to C. But from his own point of view he is confidently looking forward to a perpetual yield equal to the ruling rate of profit on K. For him, the difference between K and C is made up by lending his amortization quotas to finance other physical investments. When the economy of which he forms part is stationary, these other physical investments are replacements of pre-existing equipment. When the economy is growing, what from his point of view is only amortization helps to finance new investment. This is shown in the formula by the fact that C/K is greater the more rapid the rate of accumulation that is going on.

VIII

In our operational, as in our descriptive problems, we are relying heavily on the postulate of a single, constant, confidently expected rate of profit in the economy as a whole.

When there is an expectation that the rate of profit is going to change in the future the analysis becomes extremely complicated. There is then a different rate of interest appropriate to every length of time—for instance, if the complex of profit rates is expected to fall, each shorter rate is higher than the next longer (as with the bill and bond rate in the money market). To choose an investment, different possible schemes must be compared with the appropriate discount rate applied to each piece of equipment according to its length of life.

This, once more, is economics for economists. Or rather it is not even that, for so far as I know, it has never been systematically worked out, and it is certainly beyond my powers to offer a formula to deal with it.

IX

When we descend further towards reality, and admit that future quasi-rents are uncertain and rates of profit ambiguous, we are in as thick a fog as that surrounding descriptive questions about the value of actual stocks of capital goods.

But there is one big difference. If no one is brave enough to tackle the descriptive questions they go unanswered. *Tant pis.* But the operational questions have to be answered. Somehow or other investment decisions have to be taken. Even if they are taken on instinct or common sense, they conform more or less to our calculations, for the essence of the argument shown in our formulae is that the higher the rate of interest the greater the relative importance of yields in the near future compared to yields in a further future. Whether the rate of interest is taken to represent the scarcity of capital in a developing society, or the prospects of potential profits surrounding an individual firm, clearly the higher it is taken to be the greater the preference for quick-yielding investments. But to compare various alternatives with different time-patterns, so to speak, with the naked eye, is possible only in very simple cases. Generally some calculation is necessary to reinforce common sense. For making the operational calculations no rate of interest is ever just the right one, but any rate of interest is better than none.

APPENDIX

An equipment, costing K when new, will yield a gross profit (quasi-rent) Q per annum for T years. At the rate of interest r, the present value of the investment is V.

$$V = Q \int_0^T e^{-rT}\, dt$$

$$\therefore V = \frac{Q}{r}\left(1 - e^{-rT}\right). \tag{1}$$

Y = annual disposable income = $Q - x$.

A sinking fund is set up to provide a replacement costing K in T years.

Value of sinking fund (from x) after T years is

$$x \int_0^T e^{r(T-t)}\, dt = \frac{x}{r}\left(e^{rT} - 1\right).$$

$$\therefore x = \frac{Kr}{e^{rT} - 1}.$$

$$\therefore Y = Q - \frac{Kr}{e^{rT} - 1}.$$

It is required to prove that, when $K = V$, $\dfrac{Y}{K} = r$.

Now $\dfrac{Y}{K} = \dfrac{Q}{K} - \dfrac{r}{e^{rT} - 1}$.

$\therefore$ if $K = V$, $\dfrac{Y}{K} = \dfrac{Q}{V} - \dfrac{r}{e^{rT} - 1}$.

From (1), it then follows that $\dfrac{Y}{K} = \dfrac{r}{1 - e^{-rT}} - \dfrac{r}{e^{rT} - 1}$.

$$\therefore \frac{Y}{K} = \frac{r\, e^{rT}}{e^{rT} - 1} - \frac{r}{e^{rT} - 1}.$$

$$\therefore \frac{Y}{K} = r.$$

DEPRECIATION

The subject to be discussed is so perplexing that I make no excuse for treating it in highly abstract terms.[1]

Assumptions

1. In an economy composed of competitive capitalist firms, perfect tranquillity prevails and expectations are held with complete confidence. A single and uniform rate of profit on capital obtains throughout the economy. Firms can lend and borrow freely at a rate of interest equal to that rate of profit. Labour is freely available at a constant real-wage rate.

2. The plants from which the flow of output of consumer goods is produced are all alike. They are of the one-hoss-shay type, operating for a definite length of time at full efficiency and then disintegrating.

3. Taking as the unit of time the natural year in terms of which interest is customarily reckoned, the gestation period for building a plant is one year (this is in no way essential, but is convenient for exposition). There is no fixed capital required for producing plants, so that in that sector there is only working capital. Contrariwise, the gestation period of consumer goods is very short, so that in that sector working capital can be neglected.

All values are reckoned in terms of consumer goods, which are treated as homogeneous.

Notation

T is the length of life of a plant. $T = n$ years.

r is the rate of profit and of interest.

K is the cost of a plant ready to begin production.

Q is the quasi-rent (total value of output minus wages bill) per plant per annum.

[1] This note follows the same line of thought as the appendix by Profs. Kahn and Champernowne to my *Accumulation of Capital*. I have once more relied heavily upon their assistance for the mathematical statement of the argument.

V is the value of a plant; that is, the present value of future quasi-rents discounted at the rate r.

V_T is the value of a new plant with n years to run.

V_{T-t} is the value of a plant, which has been working for the time t.

C is the average value of a plant over its life (the integral of V over the period T, divided by T).

C' is the average value per plant of the park of plants in existence at a particular moment.

d is the annual contribution to a sinking fund that, accumulated at r over n years, yields the sum of K.

D_t is the value of the fund after time t.

g is the annual proportional growth of a stock of plants.

EQUATIONS

Q, the annual quasi-rent yielded by a plant, so to speak, stands on its own feet. It is determined by technical and market facts. The time-pattern of the construction and use of plants is given, and so is the real-wage rate. Inherent in these data (in the tranquil equilibrium conditions postulated) is a rate of profit. It is equal to the rate of discount at which the value of the series o n future Qs is equal to K, when K includes interest at the same rate on the working capital involved in the production of a plant.

With this rate of interest, r, are derived V at each stage in the life of a plant; C, the average of these values; d, the depreciation allowance which accumulates to K over n years; and C', the average value per plant of a stock of plants of given age composition.

It can be shown that, in equilibrium conditions, with K equal to V_T, the following relationships hold.[1]

$$Q = rC + K/T \qquad (1)$$
$$Q = rK + d \qquad (2)$$
$$(K/T) - d = r(K - C) \qquad (3)$$
$$V_{T-t} + D_t = K \qquad (4)$$
$$K > C > \tfrac{1}{2}K \qquad (5)$$

[1] See the appendix, below, for proofs.

A Balanced Firm

First consider the situation of a firm which is in a state of balance, keeping its capital intact (both in physical and value terms) and neither borrowing nor lending. It is a producer of consumption goods and buys plant ready-made from outside. It owns n plants of such an age composition that one disintegrates at the end of each year. It therefore spends K each year on a replacement, so as to maintain its position. Just before the end of each year it has one plant of each age from almost one year to almost n years. At the beginning of each year it has one plant of each age from brand new to n-1 years. The small variation in value over a year of its park of plants is made up by the investment going on over the year in the new plant which is being produced to replace the one which will disintegrate at the end of its nth year of life. Neglecting the variation over a year, C' is equal to C and the value of the park of plants is nC. The manner in which the rate of profit is calculated means that the firm has a net profit of rnC. Thus, the annual quasi-rent per plant, Q, is equal to the required contribution to replacement, plus interest on the average value of a plant (as expressed in equation (1)).

Here we have unearthed a puzzle. Each plant is contributing at the rate K/T (K/n per annum) to the replacement cost that keeps capital intact, which looks just like an amortization of K on the straight-line system. Yet the value that is being kept intact is not K per plant, but C.

The mystification arises from identifying depreciation with replacement. The depreciation of the n plants over a year is not just the loss of the one that disintegrates but the loss of value of the whole park, each member of which is one year older. Instead of regarding the rate of contribution to replacement as K/T per plant we might allocate it to each plant according to the value that it is actually losing. Over a year, the plant that was brand new at the beginning of the year has lost the value of Q in n years' time. The plant already one year old has lost the value of Q in n-1 years' time, which, carrying one less year's discount, is so much the greater. The plant which is ending its life loses value equal to almost the whole of its last Q. Similarly for each intermediate plant. These losses of value add up to the total discounted quasi-rents of one plant's lifetime, V_T, which is equal to K. Thus, a

depreciation allowance of K per annum keeps intact a value of nC.

A One-Plant Firm

Now consider a firm which operates only a single plant. At a particular date, it spends K on a new plant and, out of the Q that it yields for each of n years, provides a fund to replace it at the end of its life. Over the next incarnation of the investment it again provides for replacement, and so on indefinitely. Now, Q, as we have just seen, is equal to $(K/n) + rC$. If this is the only investment open to the firm there is no way by which it can earn profit at the ruling rate on an investment of K. It must set aside K/n per annum, so as to be able to replace the plant, and it can draw an income equal only to rC. But if it can lend its depreciation allowances outside, to finance investment by other firms, and can draw interest on its loans at the rate r, then it will be sufficient to set aside d per annum and to accumulate the interest on it. Now, $(K/n) - d = r(K - C)$ (3). This means that the compound interest on the depreciation allowance makes up the difference and permits the firm to draw an income of rK, instead of only rC, from the investment.

Over each incarnation, as value ebbs out of the plant, it flows into the depreciation fund, and at each moment the value of the two together is equal to K, the initial investment (as expressed in equation (4)). This follows from the assumption that the same rate of interest is used in accumulating the depreciation fund and discounting the future quasi-rents that the plant is confidently expected to yield.

Of course, in reality the interest obtainable on outside lending is generally much less than the profit expected from a firm's active investment, but this is because of the influences of risk and uncertainty that have been ruled out by our deliberately unreal assumptions.

A firm which has no capital of its own may be supposed to borrow K to invest in a plant. It may now proceed to pay rK to its creditors each year, while accumulating d at compound interest by lending to third parties, so that it can replace the plant in due time, and continue to carry the debt. Or it can repay the debt by instalments that gradually rise as the interest on the remainder falls—repaying d at the end of the first year,

$d(1 + r)$ at the end of the second and so forth. It is then free of debt at the moment when its plant disintegrates, and can re-borrow and start the cycle over again.

All intermediate cases are possible. It might happen by a fluke that a firm owned exactly C. To make an investment in a plant it borrows $K - C$. It enjoys an income of rC and pays $r(K - C)$ to its creditors; it is therefore left with d, which (accumulated as usual) is sufficient to repay the debt and restore the sum of C, so that at the end of one incarnation of the investment the firm again borrows $K - C$ to start a fresh incarnation.

If a firm buys a second-hand plant for the value of its remaining life, the seller retains the depreciation fund, accumulated up to date, which makes up the value to K. The buyer, while drawing an income from the investment equal to r on the sum that he has expended, can recover no more than that sum over the remaining life of the plant. To carry on when it disintegrates he must borrow enough to invest in a new plant, or again find a seller to accommodate him with a second-hand one of an appropriate age.

Getting into Balance

We have now uncovered another puzzle—how can it be that an investment of K in a single plant yields rK (to the operating firm together with its creditors) while the firm in balance which has invested K, n times over, only earns rC per plant?

To disentangle this thread, let us imagine how the firm may get into balance in the first place. Suppose that it starts at a certain date, and spends K per annum on a new plant every year from then on. Evidently, after n years it will have reached balance and will continue in balance thereafter. Let us suppose that it proceeds by raising equity capital as required, and that it regularly pays dividends to shareholders at the rate of r on their subscriptions. At the end of the first year it has invested K, received Q from one plant and paid rK to shareholders. It has therefore retained $Q - rK$, which is equal to d, and for the second plant it raises $K - d$ of new finance; from the second Q it pays out $r(K - d)$, retaining $Q - d(1 + r)$; and so forth. Since d per annum, accumulated at r over n years, amounts to K, it follows that after the nth year its retention is equal to K and it requires no further finance. The average amount of finance raised is C per

plant, so that the total finance invested is equal to the value of the park of plants, nC, and shareholders are drawing rnC from it.

Every time an investment of K is to be made it must be scrutinized to see that it will yield at least rK, but the yield does not come solely from the plant purchased by that outlay of K; it comes partly from the contribution which its depreciation makes to investment in other plants.

A Balanced Economy

If the whole economy is in a balanced, stationary state, with no net saving, the value of the flow of output from each plant (as well as providing for the wages bill for its own workers) contributes rC to the consumption of capitalists who own it and K/n per annum to the consumption of workers and capitalists concerned in the production of the new plants which each year are replacing those that disintegrate.

On the average, wealth owned per plant is equal to C. If some firms happen to own more, there must be others that own less (assuming that there is no outlet for interest-bearing loans except the investments of firms who require outside finance); if none had occasion to borrow, none would have an opportunity to lend. The age composition of the park of plants may be unbalanced for any one firm, but, if so, the unbalance of one firm is compensated by the unbalance of others, so that for the economy as a whole the park is balanced. The annual depreciation of the whole park is equal to the annual outlay on renewals, which maintains a constant flow of output of new plants from the investment sector equal to wastage. The physical stock of plants is thus maintained, and so is the average value of C per plant.

This analysis can readily be extended to the case of steady growth. To simplify comparisons, we take everything except the rate of growth to be the same, so that K, Q and r have the same values in a growing as in a stationary economy and each plant, as before, is a one-hoss shay that works time T (n years) and then disintegrates.

Suppose that the economy, having got into balance with the appropriate age composition of its park of plants, is growing at the rate g, a regular proportion per annum. Then gross investment made each year is $(1 + g)$ times the gross investment made the year before. The plants disintegrating each year at those that

were new n years ago, and the latest generation is e^{gT} larger than that which it replaces. The life history of an individual plant is the same as in the stationary economy, but the average age of all the plants in existence is now less, for the younger generations are larger than the older, and C', the average value per plant, is greater than C, the average value over the life of a plant; the average depreciation per plant is therefore less than K/T; annual net profit per plant, rC', is greater than rC. But consumption by capitalists is less; now each plant, while providing as before for the wages bill of its own workers, has to make a larger contribution to the consumption of the plant-building industry, and this is provided for by saving out of net profits. (If capitalists were not willing to save at this rate, in the given conditions, the real-wage rate and rate of profit could not be the same in the growing as in the stationary economy.)

If each individual firm is growing at the same rate as the economy as a whole, the number of firms remains constant, and each provides the finance for its own investment, either by retaining the appropriate part of net profit or by re-borrowing the equivalent of the savings of its own shareholders. If individual firms get into stationary balance and cease to grow beyond a certain size, then savings out of the profits of old firms are being continuously lent to finance newcomers, and the number of firms grows with the growth of the economy as a whole.

A Numerical Illustration

The difference between C and K (or, when growth is appreciable, between C and C') is by no means negligible.

For low values of rT, C is approximately equal to $K_{\frac{1}{2}} + \dfrac{rT}{12}$.

Let us take for example, $r = 12$ per cent per annum and $T = 10$ years. Then C is approximately $\frac{3}{5} K$. Putting $K = 100$,

C is approximately 60;

rK is 12 per annum;

rC is approximately 7·2 per annum;

K/T is 10;

Q is approximately 17·2 per annum;

$r(K - C)$ is approximately 4·8 per annum.

Therefore d is approximately 5·2 per annum.

For low values of $(r + g) T$, C' is approximately equal to $K(\frac{1}{2} + \frac{1}{12} (r + g) T)$. If g is 6 per cent per annum, and the other quantities are as above, C' is approximately 65. The average annual profit per plant (at 12 per cent) is then approximately 7·8, and since Q, as before, is approximately 17·2 the appropriate depreciation allowance per plant in a balanced stock is approximately 9·4 per annum. This situation, however, is sustained by the growth which is going on and this requires (in the postulated conditions) saving out of net profit of approximately 3·9 per plant per annum (6 per cent of approximately 65).

STRAIGHT-LINE DEPRECIATION

The view of depreciation set out above is very far from normal business practice. With one-hoss shays and perfectly confident expectations of steady quasi-rents, the obviously correct course would generally be considered to be to write down the value of plants on the straight-line system; that is, at the rate K/T (K/n per annum). In the case of a firm in stationary balance this gives the same value for annual net profit as appears on our reckoning, for rC is equal to $Q - (K/n)$, but in every other case it gives different results.

For a growing firm, with a preponderance of younger over older plants, net profit per plant, on the average, is greater than $Q - (K/T)$ because the average depreciation per plant is less than K/T.[1]

A firm which gets into balance by expending K per annum from a certain date onwards must, as before, raise finance of K to start the investment. If it adopts the straight-line principle, it retains K/n from the first Q. For the second plant, therefore, it raises new finance equal to $K(1 - 1/n)$, for the third, $K(1 - 2/n)$ and so forth. For the completed park of n plants, the average finance per plant is reckoned as $K/2$ instead of C. Part of what, in our view, is net saving by the earlier shareholders is treated by the firm as depreciation.

A one-plant firm that writes down its capital on the straight-line system and brings interest on its depreciation fund into its income account, reckons its income as rC plus a variable amount, rising from zero to almost rK over each incarnation of the investment.

[1] Cf. Domar, *Essays in the Theory of Economic Growth*, VII.

Even when, as in the case of stationary balance, the calculation of net profit is the same on either basis, the calculation of the rate of profit is quite different, for on our basis the average value per plant is C, while the average written down value is $K/2$. In our numerical example, $K = 100$, $C = 60$ and $r = 12$ per cent per annum. The annual profit per plant, 7·2, then appears as a rate of 14·4 per cent on the written down value of the capital.

Have these discrepancies any importance in practice? Let us consider in what contexts the valuation of capital and the rate of profit come into operation.

The main purpose of a firm in making allowances for depreciation is to prevent an excessive amount of gross receipts being treated as net profit and drawn out of the business. It is prudent to exaggerate the necessary allowance, and in so far as the straight-line method does so, it is a fault on the right side. In any case, for a growing firm which reckons to finance some part of its net investment from its own profits, it is not a matter of much importance just where the line is drawn between depreciation allowances and net savings.

On the other hand, in the calculation of the rate of profit as a criterion for judging possible schemes of investment, the fault may be on the wrong side. In the case of a small business, no doubt, investment decisions are made mainly on hunch, without much benefit of arithmetic, but in large departmentalized concerns there has to be some standard rule—'We do not touch any scheme unless it promises at least our usual rate of return'. A method of calculation that exaggerates the return on existing capital may then be discouraging to new investment, for any new scheme has to show a return on K, not on $K/2$, per plant to be set up.

A calculation of the value of capital comes up in another way when a firm has to defend itself, say, before a commission investigating monopolies, against an accusation of having made extortionate profits. The firm now wishes to claim that capital invested in the business is K per plant, so as to keep down the apparent rate of profit. This the investigator rejects, but he has to admit that $K/2$ is too little. In short, he is groping for the concept of C, though he cannot make much sense of it unless he has a clear view of what a permissible, non-monopolistic, rate of profit would be.

P

A one-plant firm which holds a depreciation fund in a liquid form may claim that it is 'employed in the business' and so dilutes the rate of profit. This is unacceptable. There is no objection to the firm holding its funds as it pleases, but the advantages of liquidity must be considered to compensate it for low yields. It cannot justify charging its customers something extra to make up the yield on liquid funds to the level of the earnings of active investments.

It is another matter when a firm in a strong monopolistic position intends to pursue a moderate policy, charging prices for its output that yield no more than a 'fair profit' on the capital invested. Then if it reckons capital per plant at the written-down value it is 'practically giving the stuff away'—or would be if its conception of a 'fair profit' were not high enough to allow a margin for error.

Our highly formalized assumptions permit a kind of precision which is not attainable in any discussion of actual cases. In reality the peculiarities of individual firms, the infinite variety of technical and market conditions and the all-pervading uncertainty of expectations, create a fog in which nice distinctions between K and C, or C and C' cannot be made. All the same, it is just as well to be clear as to what it is that we are being vague about.

Social Capital

The foregoing discussion concerns capital from a capitalist's point of view; that is, as a source of profit. It can throw only an indirect light on the valuation of capital from the social point of view.

As we have seen, an individual firm whose plants are not in balance can draw a steady income from them by lending appropriate sums outside, but a closed economy that is not in balance has no means of carrying depreciation forward until it is needed. It must suffer all the losses and dislocations of violent fluctuations in the load on its investment-sector industries. The advantage of having a balanced park of plants is of an entirely different character when we look at it from the social point of view.

Again, in a case, such as we have been assuming, in which the amount of employment depends on the amount of plant in existence, the loss of output due to not having an item of plant

includes the loss of the whole of the wages that it permits workers to produce; on other assumptions, with full employment in any case guaranteed, less equipment per man means a smaller wages bill as well as less profit. Thus, the value of capital as measured by profit much underestimates its value to society.

Looking deeper, we have set out a story in which all capital consists of real productive capacity; our Qs represent outputs of honest-to-goodness consumable commodities. But in reality capital from a capitalist's point of view consists partly of good-will, selling power or the means to throw rivals out of a market.

We shall have to have an agreement as to what we really mean by social capital before we can begin to discuss the proper system for reckoning its depreciation.

Appendix

The meaning of the symbols is set out above.[1]

The value, V_{T-t}, of a plant aged t years, that is, with $T-t$ more years to live, is

$$Q \int_0^{T-t} e^{-rt}\, dt$$

$$\therefore \quad V_{T-t} = \frac{Q}{r} \left\{ 1 - e^{-r(T-t)} \right\} \tag{I}$$

The value of a new plant is given by equating t to zero.

$$\therefore \quad V_T = \frac{Q}{r} \left\{ 1 - e^{-rT} \right\} \tag{II}$$

In equilibrium this is equal to K. (IIa)

The rate of loss of value of a plant is $-\dfrac{dV_{T-t}}{dt}$ and so, from (I), is equal to

$$Q\, e^{-r(T-t)} \tag{III}$$

This is the rate of depreciation of a plant when it is t years old. It is the current discounted value of the quasi-rent, Q, to be earned in the final year of life of the plant. It is $Q\, e^{-rT}$ for a new plant and rises to Q for a plant which is at the end of its life.

[1] See pp. 209-10.

For a balanced firm in a stationary state the average value per plant of the rate of depreciation is, from (III),

$$\frac{Q}{T}\int_0^T e^{-r\,(T-t)}\,dt$$

or

$$\frac{Q}{rT}\{\,1 - e^{-rT}\,\}\,.$$

Since $V_T = K$, this is equal to $\dfrac{T}{K}$, from (II).

The average value of V_{T-t} over a plant's life (or equally the average value per plant of a balanced firm in a stationary state) is C. From (I),

$$C = \frac{Q}{rT}\int_0^T \{\,1 - e^{-r\,(T-t)}\,\}\,dt\,.$$

$$\therefore\; C = \frac{Q}{r} - \frac{1}{rT}\frac{Q}{r}\{\,1 - e^{-rT}\,\}$$

$$\therefore\;\text{ from (IIa), } C = \frac{Q}{r} - \frac{K}{rT}$$

$$\therefore\;\; Q = rC + \frac{K}{T}.\text{ This is equation (1) of the text.}$$

It also follows from (IIa) that

$$C = \frac{K}{1 - e^{-rT}} - \frac{1}{rT}K$$

that is,

$$C = K\left\{\frac{1}{1 - e^{-rT}} - \frac{1}{rT}\right\} \tag{IV}$$

(See *The Accumulation of Capital*, Appendix, p. 432.)

If this expression is expanded for small positive values of T, it is seen at once that its limiting value as T approaches zero is $\tfrac{1}{2}K$. If rT is large and approaches infinity, the limiting value is K. It is easy to show that $\dfrac{C}{K}$ increases steadily from $\tfrac{1}{2}$ to 1 as T increases from zero to infinity. From this it follows that once $K > C > \tfrac{1}{2}K$. This is equation (5) of the text.

d accumulated over t years adds up to D_t.

$$\therefore \quad D_t = d \int_0^t e^{r\,(t-t')}dt'$$

$$\therefore \quad D_t = \frac{d}{r}\,(e^{rt} - 1) \tag{V}$$

When $t = T$, $D_t = K$.

$$\therefore \quad K = \frac{d}{r}\,(e^{rT} - 1)$$

$$\therefore \quad \text{from (IIa)},\; d = Q\,e^{-rT} \tag{VI}$$

Then from (V),

$$D_t = \frac{Q}{r}\,\{e^{-r\,(T-t)} - e^{-rT}\} \tag{VII}$$

The interest on this accumulated sinking fund at time t is

$$Q\,\{e^{-r\,(T-t)} - e^{-rT}\}$$

This added to d, given by (VI), adds up to the rate of depreciation of a plant when it is t years old, as given by (III) (d is equal to the rate of depreciation of a new plant, for which $t = 0$).

From (IIa) and (VI), $Q = rK + d$. This is equation (2) of the text.

From (1) and (2) of the text, $\left(\dfrac{K}{T} - d\right) = r(K - C)$. This is

equation (3) of the text.

From (I) and (VII), $V_{T-t} + D_t = \dfrac{Q}{r}\,\{1 - e^{-rT}\}$

Then from (IIa), $V_{T-t} + D_t = K$. This is equation (4) of the text.

g is the rate of growth of a balanced firm, and C' is the average value per plant of the equipment.

$$\frac{C'}{K} = -\frac{\displaystyle\int_0^T e^{g(T-t)}\,V_{T-t}\,dt}{V_T \displaystyle\int_0^T e^{g(T-t)}\,dt}$$

Or, from (I), $\dfrac{C'}{K} = \dfrac{(e^{gT} - 1) - \dfrac{g}{r-g}\{1 - e^{-(r-g)\,T}\}}{(1 - e^{-rT})\,(e^{gt} - 1)}$ \hfill (VIII)

PART III

'IMPERFECT COMPETITION' REVISITED

The Economics of Imperfect Competition was a scholastic book. It was directed to analysing the slogans of the text-books of twenty years ago: 'price tends to equal marginal cost' and 'wages equal the marginal product of labour'; and it treated of text-book questions, such as a comparison of the price and output of a commodity under conditions of monopoly and of competition, demand and costs being given. The assumptions which were adequate (or which I hoped were adequate) for dealing with such questions are by no means a suitable basis for an analysis of the problems of prices, production and distribution which present themselves in reality.[1]

INDUSTRIES AND MARKETS

The assumption that each firm produces a single commodity conceals the distinction between the output of an *industry*—that is, a group of firms engaged in production of commodities alike in their methods of manufacture, and the supply to a *market*—that is, the demand for a group of commodities which are close substitutes for each other. In ordinary language when we speak of the cotton industry, the iron-founding industry, the boot-and-shoe industry (leather) we are thinking of a group of firms engaged in a certain type of production, governed by the kinds of object produced and the materials of which they are made. Sometimes a single firm produces very diverse objects which are complements to each other, and therefore sold together (pens and blotting-paper, low-power electric motors and artificial teeth) and sometimes quite

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[1] I should like to take this opportunity of saying that I have never been able to grasp the nature of the distinction between *imperfect* and *monopolistic* competition to which Professor Chamberlin attaches so much importance. (Cf. 'Monopolistic Competition Revisited', *Economica*, November 1951.) It appears to me that where we dealt with the same question, in our respective books, and made the same assumptions we reached the same results (errors and omissions excepted). When we dealt with different questions we naturally made different assumptions. In many respects Professor Chamberlin's assumptions were more interesting than mine, in particular in connection with oligopoly and with product differentiation as a dynamic process.

unrelated objects are bound together in production because they are bound together in selling by conventional shopping habits (hair-brushes and medicines). Many of the products of a single industry are extremely remote substitutes for each other. There is no overlap, for instance, between the markets for men's and children's shoes or for drain-pipes and stoves. On the other hand, products of totally different industries may be quite close substitutes—rubber and leather shoes; asbestos and cast-iron drain-pipes.

The concept of an industry, though amorphous and impossible to demarcate sharply at the edges, is of importance for the theory of competition. It represents the area within which a firm finds it relatively easy to expand as it grows. There are often certain basic processes required for the production of the most diverse commodities (tennis balls, motor tyres and mattresses) and economies in the utilization of by-products under one roof. The know-how and trade connections established for one range of products make it easier to add different commodities of the same technical nature to a firm's output than it is to add mutually substitutable commodities made of different materials, or made or marketed by radically different methods. Moreover, the members of an industry have common interests and a common language, and feel a kind of patriotism which links them together, even when they are in competition with each other. It is much easier to organize control over one industry serving many markets than over one market served by the products of several industries.

The degree of concentration in an industry, measured by the proportion of its output produced by, say, the three largest firms, or the degree of monopoly in the sense of the closeness of the organization binding the firms, may have little relation to the degree of monopoly in the markets which it serves, in the sense of power to control prices. An unconcentrated and unorganized industry may contain a number of very strong small monopolies over particular commodities, while another, highly concentrated or tightly organized, may be meeting competition in some or all of its markets from the products of rival industries which are substitutes for its own.

Generally speaking, the supply of a commodity (using that term in a broad sense to cover a group of fairly close substitutes) to a market can be expanded much more readily than can the

productive capacity of an industry, for to increase capacity usually requires investment in plant and recruitment of labour, while to increase the output of a commodity often means merely switching over from one line of production to another within a plant.

Dropping the fiction of one-commodity firms destroys the simplicity of the analysis of imperfect competition, but enlarges its scope. Cases where the imperfection of markets combined with ease of entry lead to an excessive number of businesses with low turnover occur mainly in special fields (service and bespoke trades, small shops, petrol filling stations), whereas every efficiency expert who comments on British manufacturing industry points out the almost universal prevalence of uneconomically short runs and small batches in the output of individual lines of production.

To provide an analysis of this situation within the framework of the *Economics of Imperfect Competition* it is necessary to combine (with certain modifications) the treatment of polypoly in an imperfect market with the treatment of price discrimination, which shows how prices are fixed by a firm selling in a number of separate markets.[1]

There may be good reasons for the production under one roof of what, from a technical point of view, is an excessive number of separate commodities; there may be genuine economies (in transport, correspondence, etc.) in offering a 'full line' to buyers, as well as commercial advantage to the individual seller, and the principle of gaining on the roundabouts when the swings are slack reduces risk, unemployment and wastage of capacity. Moreover, non-commercial motives, such as pride in covering the whole field, may enter into the matter; but there can be little doubt that the main cause is the imperfection of competition, in the sense that if either buying were rationalized so as to make markets more perfect or monopoly was more complete, productive efficiency would be improved.

The general moral of the *Economics of Imperfect Competition* which points to the rationalizing monopsonist as the best pilot to find a channel between the Scylla of competitive inefficiency and the Charybdis of monopolistic exploitation seems to remain

[1] See Eli W. Clemens, 'Price Discrimination and the Multiple-Product Firm', *Review of Economic Studies*, Volume XIX (1), 48, 1951–2. 'Price discrimination and multiple-product production are not exceptions to general practice, but are rather the essence of customary action. . . . The theory of price discrimination must be viewed as the heart of price-cost theory rather than as a peripheral case.'

valid when the assumption of one-commodity firms is dropped, though this is not the kind of proposition that can be established by geometry alone.

Who Maximizes What?

The treatment of the entrepreneur and his profits in the *Economics of Imperfect Competition* is extremely primitive. Clearly, in modern times there is no single universal type of entrepreneur. At the one extreme there is the individual who founds, owns and manages a business, in the Marshallian style; at the other, the great company of the 'managerial revolution', nominally owned by a large and shifting population of shareholders totally ignorant of its workings, and controlled by a self-perpetuating cadre of managers and directors; in between, the type of concern which is legally a public company but in effect a family business, and the type of concern which is controlled by a group of large, permanent shareholders, though it may be more than half-owned at any moment by casual shareholders whose brokers happen to have advised them to put their money into it for a time; there are quasi-independent subsidiaries of other concerns; concerns owned by holding companies; nominally independent concerns linked by overlapping directorates and so in, in bewildering variety. But all have some characteristics in common. A manufacturing business in modern technical conditions requires a high degree of co-operation and continuity. Industry, as opposed to commerce, could not have developed in an economy where the capitalists were all ruthlessly individualistic childless orphans. A successful business has a kind of personality, like a college, with which many, and successive, individuals identify themselves, and the sub-ordination of the interest of casual shareholders, who want immediate profit, to the interest of management, which flourishes with the life of the concern, means that a public company is more like a family business in effect than it is in legal form. I therefore feel that for a first shot at a simple stylized analysis the most useful starting-point is still 'the entrepreneur', regarded as the personification of a 'firm' rather than as a particular individual in a pair of trousers.[1]

What is the aim of the entrepreneur, in this sense? If we

[1] Cf. B. S. Keirstead, *The Theory of Profits and Income Distribution*, p. 40.

neglect the promoter, who starts a business in order to sell it to the public, and the short-lived 'mushroom' who springs up to make a quick profit in a seller's market, it seems to me that the most valid simple generalization is that the aim of the entrepreneur is for the firm first to survive, and secondly to grow. To this end he must pursue profit, but he must avoid action which, though profitable in the present, will damage his future position, and, since this is partly bound up with reputation, his course of conduct will be much influenced by the climate of opinion in which he operates. All this is sadly vague, and the subject needs much more field study of business behaviour. Meanwhile, I am inclined to retort to those who grouse about the assumption that the entrepreneur's aim is to maximize profits in the immortal words of Old Bill: If you know a better 'ole, go to it.

A more obvious defect is the uncritical acceptance of the idea of a 'normal level of profit' at which the size of a firm is in equilibrium. To discuss the size of firms it is necessary to break up the notion of an industry, and consider its separate stages or branches. In many industries alongside of mass production there is a considerable amount of jobbing or bespoke work (building repairs, electric shop signs, hand-sewn shoes), where the 'little man' has positive advantages compared to the large firm. Since such types of production can be started with a small investment of capital, they are easy to enter for an individual with the requisite know-how, and the rate of profit in them is kept low. An individual who makes a success in such business is more likely to grow out of it than to expand laterally. Here there may be no very definite equilibrium size, but the argument in terms of an equilibrium rate of profit seems to be a useful starting-point for analysis. In other types of manufacture, where the variegated nature of the material (wool, leather) is inimical to mass production, or where highly imperfect markets impose a very variegated output (fashion trades, publishing), the flexibility of one-man management may give advantages to a moderate-sized firm over a great departmentalized concern, and, in general, there are risks and difficulties and loss of amenities in going through the stage of growth involved by changing from the one type of organization to the other. Once that threshold is passed, there seems no reason to expect dis-

economies of scale to be important—certainly not important enough to outweigh the strategic advantages of size.[1]

The rate of growth of a firm is limited by the imperfection of the capital market (here Mr. Kalecki's principle of increasing risk[2] is the best starting-point for analysis, though his formulation, in turn, is over-simplified[3]) and by the need to consolidate and fortify each new position after it has been captured. But, given time to accumulate capital out of profits and to acquire know-how and trade connections, there seems to be no limit to the ultimate size of a firm, until a condition of oligopoly is reached in each of the markets for the commodities supplied by the industry, so that the last stages of the competitive struggle are too costly to be fought out. Even then, firms may continue to grow by crossing the boundary which divides industries and seeking quite fresh fields in which it is possible to expand without challenging too powerful opposition. (Nowadays it is quite common for new industries to be started by large firms already established in a monopoly or oligopoly position in an older industry, rather than by new small-scale firms.)

The profitability of a market is not the same thing as the profitability of an industry. We should expect the profit obtainable in a particular market to be strongly influenced by the difficulty of entering it. Commonly a firm enjoys different profit rates on different parts of its output—less on its 'bread-and-butter lines', which are standardized commodities where the market is nearly perfect and easy to enter, and higher on specialities in which it has individual advantages. But as between industries, and still more as between firms, it is hard to make any kind of simple generalization about profit rates, and the notion of a 'normal level of profits' and an 'equilibrium size of firm' seems to have very little application to reality.[4]

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[1] Cf. N. S. Ross, 'Management and the Size of the Firm', *Review of Economic Studies*, Volume XIX (3), 50, 1952–3.

[2] *Essays in the Theory of Economic Fluctuations*.

[3] L. Wellisz, 'Entrepreneur's Risk, Lender's Risk, and Investment', *Review of Economic Studies*, Volume XX (2), 52, 1952–3.

[4] Technical economies of scale may, of course, establish a minimum size of plant, and so a minimum size of firm, but they do not establish a maximum size of firm, since, at worst, plants can be duplicated.

OLIGOPOLY

The reason oligopoly is neglected in the *Economics of Imperfect Competition* is not that I thought it unimportant, but that I could not solve it. I tried to fence it off by means of what unfortunately was a fudge in the definition of the individual demand curve.[1]

FORMS OF COMPETITION

The assumption that price is the main vehicle for competition is a great over-simplification of reality. The very fact that markets are not perfect means that competition may take many forms. The main vehicles of competition may be summarized as: (1) imitation of products; (2) differentiation of products—and these may be in respect of qualities which affect practical usefulness or pleasure to the consumer, qualities which appeal to snobbishness or to pseudo-scientific notions, or simply methods of packing and labelling artcles; (3) services of all kinds, prompt delivery, long credit; (4) advertisement; (5) pure salesmanship, in the sense of the persuasiveness of travellers, etc.; (6) higher price—giving the impression of better quality; (7) lower price.

The multi-dimensional nature of competition is illustrated by the fact that rings formed to limit competition, which begin by agreeing only on a price list for their products, often go on to limit terms of sale, permissible types of advertising appeal and the specification of products, so that sometimes competition in pure salesmanship is all that is left unregulated, and rival travellers are found making offers to potential customers which are identical in all respects except the names on the labels of the goods.

In principle, it is possible to set out a system of simultaneous equations showing what combination of price, outlay on production costs and outlay on selling costs would yield the best profit for a particular commodity in a particular market, taking into account the reaction upon costs and sales of other commodities produced by the same firm. Even if he had the data, the business executive would need an electric, not a human, brain to work out from the equations the correct policy in time to put it into effect. And the data are necessarily extremely vague, since the consequences of a given policy cannot be isolated in ever-changing markets. The recent development of advertising of advertisement

[1] Op. cit., p. 21.

is a witness to the difficulty which manufacturers have in knowing the consequences of advertisement, for if they knew its effects there would be no scope for persuading them that it is greater than they think. In reality, evidently, an individual demand curve (for a particular product produced by a particular firm) is a mere smudge, to which it is vain to attribute elegant geometrical properties.

It is important to observe that even when competition takes the orthodox form of a lower price charged by a manufacturer there is not necessarily competition in price to the consumer. A common method by which newcomers try to make head against established firms in a particular market is to offer larger margins to dealers to induce them to stock and push the goods concerned. This kind of competition is most definitely seen where the established firms practise resale-price maintenance, or where there are conventional 'price tickets' which settle the retail price of an article of a certain range of (apparent) quality; but it may exist also wherever price competition between dealers is not very sharp.

Product differentiation and advertising, which appeal to the consumer over the head of the retailer, appear to be as much an element in the struggle for strategic advantage between manufacturers and dealers as a vehicle of competition between manufacturers.[1]

Once more the moral of the argument is strengthened rather than weakened by the complications which it is necessary to introduce into the analysis. The wastes of imperfect competition take many more forms besides sub-optimum scales of production, and the benefit of price competition, imposed by perfect markets (provided that it is not at the expense of wage rates), is in putting a premium on technical efficiency, as opposed to cunning salesmanship and strategic power, even more than in defending the consumer from exploitation.

Price Policy

The picture of an entrepreneur finding the most profitable price for a commodity by trial and error, while market and cost conditions remain constant for long enough for the experiment

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[1] N. Kaldor, 'The Economic Effects of Advertising', *Review of Economic Studies*, Volume XVIII (1), 45, 1949–50.

to be carried out, is exceedingly unlifelike. It must be very unusual for an entrepreneur to alter a price in cold blood, just to see what will happen, and even when a change clearly seems advantageous—say a rise in price following a rise in demand— he usually waits for some colourable excuse, say a rise in material costs, before putting it into effect. In many types of market (especially where the firm publishes a price list) overt price changes are avoided as much as possible. It is more common to alter the quality of a commodity at a given 'price ticket', or to offer special rebates to particular classes of buyer, than to make a change in listed prices.

There are a number of situations, however, in which an entrepreneur has to take a decision about price. How far is the kind of analysis suggested by the *Economics of Imperfect Competition* useful in discussing how he behaves?

(a) When an entrepreneur has to decide whether to add a new line of production to his output he must consider what gross receipts it can be expected to bring in over a certain period, and compare this estimate with an estimate of costs, including, where it is relevant, the opportunity-cost of displacing some other part of his output. In some cases (a new model motor car, a title in a publisher's list) the idea of elasticity of demand is present to his mind at least in a vague way—he thinks of what quantities are likely to sell at various prices. In some cases he has an idea of 'the right price', given by the prices of similar commodities already in the market; in other cases it is rather a matter of a shot in the dark. Comparing expected receipts with costs, he has to decide whether it is worth while to embark on the new line. In a small firm which cannot carry the overhead of a 'scientific' costing system he may proceed by adding to the prime cost, or the labour cost only, or the material cost only, the percentage margin which his other lines of production carry and then considering if the resulting price 'looks about right'. If the resulting price seems too high, he decides that the line in question is not for him. If anyone asks him what he does, he naturally replies that he fixes prices according to costs,[1] but clearly it would be absurd to work out cost, according to some formula, and then cast goods on the market at the corresponding price without consideration

[1] See R. L. Hall and C. J. Hitch, 'Price Theory and Business Behaviour', *Oxford Economic Papers*, May 1939.

of the conditions of demand.[1] Nor does the entrepreneur's idea of 'the right price' mean that he thinks that at a certain price there is an indefinite demand. It means rather that he thinks that a higher price would limit sales very much, and that at 'the right price' a sufficient quantity can be sold to make the venture profitable. It seems to be an over-formalization, rather than a totally misleading approach, to think of his decision as being taken on the basis of some sort of conception of an individual demand curve.

Both demand and costs have to be thought of in three dimensions—a certain rate of sales for a certain length of future time (or rather an uncertain length). The period over which any special investment, or cost of tooling-up, has to be recovered, and the length of time that the commodity will be saleable, are of the greatest importance. This aspect of the matter cannot be adequately dealt with by the concept of the 'long-period elasticity of demand' though the distinction between long- and short-run elasticities is a step in the right direction.[2]

(b) Most firms produce a number of products some of which are sold in more perfect markets than others—there are the 'bread-and-butter lines' where the firm has to meet close competition, and the specialities which are sufficiently different from their nearest substitutes to make demand for them relatively inelastic. In such cases it is often seen that the specialities carry higher gross margins than the more competitive lines. This may be represented as 'recovering overheads' where they can be got, but it comes to the same thing as working on the principle of 'charging what the traffic will bear'.[3]

(c) The entrepreneur has to reconsider prices when costs alter. How do industries react to changes in prime cost, due to changes in wage rates or material costs that affect the whole group of firms? On this question the kind of analysis set out in the *Economics of Imperfect Competition* throws very little light, for here the effect of oligopoly is dominant. The reaction of any one entrepreneur must depend very much upon how he expects others

[1] The 'full-cost theory' seems to imply that this is how entrepreneurs behave, but whenever 'full cost' is formulated in a precise form it turns out to mean something else.

[2] Cf. E. A. G. Robinson, 'The Pricing of Manufactured Products', *Economic Journal*, December 1950, p. 779, and 'The Pricing of Manufactured Products and the Case Against Imperfect Competition', *Economic Journal*, June 1951, p. 432.

[3] Cf. Clemens, loc. cit.

to behave. From one point of view it is dangerous to be the first to raise prices when costs have risen, or the last to cut when they have fallen. On the other hand, to be the last, or the first, means an unnecessary loss of profit. It is in this sort of situation that price leadership develops. The rank and file of firms 'wait and see' until a recognized leader reacts to the new situation. Perhaps price leadership should be regarded as a kind of convenient institution, like the monarchy in a feudal society. For when each firm knows that all will follow the leader's signal they are saved from a perplexing choice between raising prices (when cost has risen), debasing quality or submitting to a loss of profit, so that all have an interest in preserving a tradition of 'loyalty' to the price leader. Price leadership may be expected often to operate (from the consumer's point of view) on the system: heads I win and tails you lose. A price leader who is confident of the 'good discipline' of his followers will be inclined to raise prices when costs go up and hold them up when costs go down. But this cannot be an invariable rule. For instance, if the price leader is a strong firm anxious to expand, it may refrain from raising prices when costs go up, in the hope of bankrupting weaker rivals and taking over their share in the markets concerned. Buyers who are aware of a fall in costs may press successfully for a reduction in price. 'Discipline' may break down if the margins maintained by the leader are so high as to tempt some followers to try to increase their share in the market. Or when there is a 'disputed succession' between several strong firms, a fall in costs may set off a bout of violent competition that brings prices down even by more than costs have fallen.

(d) How does a firm react when it has succeeded in reducing costs by technical improvements? We can obtain some light on this question by observing what happens when there is a new invention of a low-cost substitute for an old commodity. In such a case it is open to the entrepreneur to price it at prime cost plus his usual gross margin, or to set its price in line with that of the old variety so that it carries an abnormally high margin. There have recently been one or two striking examples of the latter price policy, which have been exposed to public view by subsequent competition bringing the new commodity down to a small fraction of the original price. Presumably there are other cases which do not come to light because the low-cost commodity is sheltered

from competition by a patent, secret technical knowledge or by heavy investment or economies of scale in a preparatory process which it shares with a number of other products of the same firm.[1]

(e) How do entrepreneurs react to fluctuations in demand? In a seller's market, where demand, even at highly profitable prices, exceeds capacity output, it is often found that powerful firms prefer not to raise prices but rather to delay delivery, thus making an investment in goodwill for the future; whereas in highly competitive conditions, where markets are easy to enter and the number of sellers large, no one can expect to gain in the future by moderation in the present. Thus, we find the apparently paradoxical phenomenon of the imperfection of competition keeping prices below the competitive level.

When a fall in demand has occurred and conditions of a buyer's market set in, prices are likely to be maintained by an oligopoly, for an entrepreneur who supplies a large proportion of a market is strongly influenced by the knowledge that if he cuts price others will follow and he will be no further forward. In highly imperfect markets prices will tend to be sustained by the low elasticity of the shrunken demands for specialities. In fairly competitive markets margins may be held up by a feeling that it is wrong to be the first to cut. Here the famous 'full-cost principle' may play an important part, not as an instrument of analysis for the economist, but as part of the data to be analysed. For if entrepreneurs have taught themselves to believe that prices *are* determined by costs, they will not cut prices when average total costs have been raised by a fall in output, though they excuse themselves from actually raising prices by saying that although it would be *right* to do so, it is unfortunately impossible in the circumstances. In a prolonged slump, margins are cut sooner or later, unless there is a price agreement, and it is usually said to be the high-cost producers who cut first, because they are threatened with bankruptcy unless they can increase sales somehow or other.

It was in connection with slump conditions that the imperfect-market analysis was evolved (and Marshall himself introduced

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[1] This argument supports Mr. Harrod's view that the main determinant of an entrepreneur's pricing policy is not his own costs but what he believes to be the costs of actual or potential competitors. 'The Theory of Imperfect Competition Revised', *Economic Essays*.

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dislike of 'spoiling the market', to account for the maintenance of profit margins after a fall in demand[1]). It now appears much too simple, and oligopoly, price leadership and a feeling for 'playing the rules of the game' have to be brought in to supplement it.

A study of questions such as these, framed in terms of the kind of decisions that entrepreneurs actually have to make, may throw light on the problem of price policy, but it seems clearly impossible to replace the old text-book slogans with any simple generalizations. A debate which consists in defending or attacking 'principles', such as the 'full-cost principle', 'the marginal principle' or the 'normal-cost principle',[2] and trying to fit all types of situation into one system is obviously foredoomed to futility.

Equilibrium

In my opinion, the greatest weakness of the *Economics of Imperfect Competition* is one which it shares with the class of economic theory to which it belongs—the failure to deal with time. It is only in a metaphorical sense that price, rate of output, wage rate or what not can move in the plane depicted in a price-quantity diagram. Any movement must take place through time, and the position at any moment of time depends upon what it has been in the past. The point is not merely that any adjustment takes a certain time to complete and that (as has always been admitted) events may occur meanwhile which alter the position, so that the equilibrium towards which the system is said to be *tending* itself moves before it can be reached. The point is that the very process of moving has an effect upon the destination of the movement, so that there is no such thing as a position of long-run equilibrium which exists independently of the course which the economy is following at a particular date.

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[1] *Principles*, p. 375.

[2] Mr. Andrews' *Manufacturing Business* is full of dark sayings, but Miss Brunner ('Competition and the Theory of the Firm', *Economia Internazionale*, November 1952) makes the 'normal-cost theory' intelligible. Though couched in the form of an attack on imperfect-competition analysis, it seems to come to pretty much the same thing, as far as the hampering assumption of one-product firms permits. The difference is rather in tone and emphasis than in analysis. My generation, brought up on the view that everything in the garden was lovely, concentrated attention on the weeds. A generation to whom our weed manuals were the orthodox text-books naturally react by pointing out that there are after all many splendid blooms to be seen.

The most obvious example is the manner in which an industry reacts to large changes in demand for its output. When demand for the range of commodities concerned has risen in the recent past, so that it strains the capacity of plant in existence, or of a supply of skilled workers whom it takes a long time to train, current prices and the prospect of future profits are high, and new capacity is built up. In a text-book argument it is possible to imagine investment being made in continuous small steps, so that prospective profits fall gradually (demand remaining constant at the new level) and come to rest at the original level. But in reality, in an industry supplying markets which are competitive in the broad sense, investment plans are made by a large number of entrepreneurs at the same time, and are carried through while the high profits last, so that capacity is expanded in a long jump, and the rate of profit falls sharply when the new capacity comes into operation. Investment in plant once made persists for a long time (even if it bankrupts its first owners) and firms which have set up in one industry fight to survive where they are, even if the level of profit in other regions is now more attractive. At a date, say, five (or perhaps twenty) years later, whatever the conditions of demand may then be, the level of profit in that industry will be lower than it would have been if this expansion of demand had not occurred.

Similarly, the level of wages and the age composition of a labour force are very different when the present level of employment in an industry is appreciably less than it was five, or twenty, years ago than they would be, with the same present level, if employment in the past had been appreciably less. The irreversibility of the supply curve, which Marshall introduced in connection with economies of scale,[1] has to be extended to all kinds of long-run supply curves, and when it is, the very notion of a long-run supply curve, in its usual simple two-dimensional form, ceases to be admissible.

This kind of difficulty underlies all problems connected with prices, profits and wages, and there seems to be little point in adding more and more subtleties to the superstructure of a theory which is based upon such shaky foundations.

[1] *Principles*, appendix H.

The Causes of Monopoly

An interesting and important question which has received very little analytical treatment (though there is a good deal of historical information about it) is the causes of monopoly.[1]

The chief cause of monopoly (in a broad sense) is obviously competition. Firms are constantly striving to expand, and some must be more successful than others. It is easier to defend a position once gained than to conquer it, so that the most successful firms grow the most rapidly. There is no doubt much truth in Marshall's theory of the tendency (under a régime of nepotism) for old firms to fall into weak hands. But this does not check the process of concentration in industry. On the contrary, it means that at any moment a firm in the prime of its vigour finds itself surrounded by a number of easy victims to swallow up. If in its turn it grows weak with age, it is a large mouthful for someone else. Why did not Marshall think of fish in a pond instead of trees in a forest? An industry which is strongly competitive must be in the course of tending towards a condition of oligopoly; competition can be permanent only when it is hampered by highly imperfect markets or softened by a spirit of live and let live among the entrepreneurs concerned.

At the same time it is true that monopoly (or powerful oligopolists) at one stage in an industrial structure fosters competition at other stages. Thus, where wholesalers or retail chains dominate a market they foster polypoly among producers by making entry easy to the manufacturing stage of the industry.[2] An exceptional but instructive case is polypoly in the boot-and-shoe trade promoted by monopoly in the supply of machinery. Similarly, an oligopoly in manufacture fosters polypoly in retailing (tobacco is a familiar example).

The second main cause of monopoly is the occurrence of a severe decline in demand, or the failure of demand to continue to expand when an overshoot in investment has occurred in the manner referred to above. So long as a seller's market prevails, the limitation of capacity maintains profit margins, and polypoly is compatible with satisfactory profits even in a fairly perfect

[1] An extremely interesting attempt on this problem has been made by L. J. Zimmerman, *The Propensity to Monopolize*, North Holland Publishing Co., Amsterdam.

[2] Kaldor, loc. cit.

market. In a buyer's market when the imperfection of competition, the discipline of price followers or loyalty to the code of the full-cost principle are insufficient to maintain profit margins, firms are driven by the fear of extinction to reinforce them by price agreements, and though some agreements break down again or are eroded by outside competition when prosperity returns, many, once formed, persist permanently.

Such monopolies are produced, in the first place, by the fear of losses; others are due to exceptional hope of profit. Monopolies are relatively easy to form where the boundaries of an industry coincide with the boundaries of markets, as in the case of minerals with particular properties, specialized machinery or commodities such as matches or sewing-cotton which allow a relatively restricted scope for product differentiation. The lure of such victims is all the greater when the demand for the commodities concerned is inelastic.[1] Where there is a natural limitation on supply (as with mineral deposits) or very great economies of scale, or highly specialized know-how (as in many machine-making trades) a monopoly once formed is in a very strong position to maintain itself. Where there is no such 'natural' defence against outside competition, it may defend itself by establishing a hold over retailers, threatening patent actions, using 'fighting brands' to break competitors by localized price competition, and other devices, though it often tolerates the existence of a fringe of competitors, who are useful as a screen provided that they do not threaten to grow too much (small firms in such a situation sometimes make the highest profit rates to be found anywhere).

It is much easier to think of causes for monopoly and examples of monopolies being formed, than it is to think of causes or examples of monopolies breaking down There seems to be a general presumption, therefore, that every succeeding generation will contain more monopolies than the last.

This is the kind of question which comes into view with the breakdown of traditional theory, but I have the impression that in the twenty years since the Chamberlin-Robinson duopoly first set up in imperfectly monopolistic competition, a great deal of mental energy has been devoted to a theological discussion whether an existing state of imperfect (or impure) competition

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[1] Cf. Zimmerman, op. cit., p. 30.

is (*a*) beneficial, (*b*) harmless, (*c*) a necessary evil or (*d*) an un-
necessary evil, while an analysis (as opposed to historical studies)
of the causes and consequences of the process of survival or decline
of competition has hardly begun.

POSTSCRIPT

To elaborate on Old Bill's retort, the statement that a firm seeks
to 'maximize profits' has no meaning in itself. The firm, in a
general way, needs and desires profits in order to be able to
continue to exist, but as a statement of policy the slogan has no
precise content until it is reduced to particular questions. The
struggle of a firm to survive and grow cannot be expressed in terms
of maximizing any precise quantity at a particular moment of time.

On the other hand, when it has a certain amount of finance
available for investment it may be assumed to choose between
various possible projects on the basis of their expected profitability
(allowing, however, for considerations about prestige and so
forth). When it has to find the price for a new product that 'looks
about right' it may be taken to have in mind a price that, on the
one hand, will not choke off demand to less than what it hopes to be
able to sell and, on the other, will not needlessly sacrifice receipts.

When it has to decide how to react to a fall in prime costs it
may be assumed to consider whether a reduction of prices is
necessary to defend itself from competition (immediately from
existing rivals or a little later from new ones) or, if it is in a fairly
strong monopolistic position or is the price-leader for its group,
whether a reduction in prices will increase or diminish profits.
When the existing price (with the new lower costs) seems to be
the most profitable, it may be assumed to leave it alone. Con-
trariwise, when costs rise, it may be assumed to raise prices unless
there is reason to suppose that the old price would be more
profitable.

In all these decisions there may be a conflict between higher
immediate profits and prudence for the long run; there is bound
to be a great deal of uncertainty about the effects of any policy
and, partly for that reason, conventional rules may take the place
of calculation in making them; and the profit motive may be
mixed with many other impulses. All the same, I do not think
that any better 'ole has yet been sighted.

'IMPERFECT COMPETITION' TO-DAY

THE almost simultaneous publication of Professor Chamberlin's *Theory of Monopolistic Competition* and my *Economics of Imperfect Competition* was a mere coincidence, for he had been working on the subject much longer than I, but the 'enthusiastic and uncritical welcome'[1] which we shared was not accidental, for in the situation that existed in 1933 the problems that we (along with a number of other writers who contributed to the new theory) were concerned with had become painfully obvious and were crying out for discussion.

In conditions of a general and prolonged depression, text-book economic theory was hopelessly out of touch with reality. According to text-book theory, each productive unit carries output to the point at which marginal cost to that unit is equal to the price of the commodity produced. Output is limited by productive capacity, at any moment, and is prevented from being greater by the fact that marginal cost would exceed price for a larger output than that actually being produced. The unreality of this conception had been pointed out by Piero Sraffa.[2]

> Everyday experience shows that a very large number of undertakings—and the majority of those which produce manufactured consumers' goods—work under conditions of individual diminishing costs. . . . Businessmen, who regard themselves as being subject to competitive conditions, would consider absurd the assertion that the limit to their production is to be found in the internal conditions of production of their firm, which do not permit of the production of a greater quantity without an increase in cost. The chief obstacle against which they have to contend when they want gradually to increase their production does not lie in the cost of production—which, indeed, generally favours them in that direction—but in the difficulty of selling the larger quantity of goods without reducing the price, or without having to face increased marketing expenses.

When Sraffa's article appeared in English it was taken to be making a purely logical objection to Marshall and there was a

[1] J. K. Galbraith, *Monopoly and the Concentration of Economic Power* from *A Survey of Contemporary Economics*, edited by Howard S. Ellis, p. 103.
[2] *Annali di Economia*, Volume II, No. 1 (1925), p. 312 note. 'The Laws of Returns under Competitive Conditions', *Economic Journal*, December 1926, p. 542.

good deal of discussion about it on that plane (for instance, 'Symposium on the Representative Firm', *Economic Journal*, March 1930). This was all very much 'economics for economists' and its wider significance was not generally recognized until the seeds of doubt about orthodox theory germinated in the atmosphere of discontent with *laisser-faire* policy which prevailed in the great depression. The new analysis was framed in terms that purported to be perfectly general, but it was given point by the particular situation existing when the books appeared.

Marshall himself was well aware that the proposition that marginal cost equals price cannot apply in a buyer's market.

> The immediate effect of the expectation of a low price is to throw many appliances for production out of work, and slacken the work of others; and if the producers had no fear of spoiling their markets it would be worth their while to produce for a time for any price that covered the prime costs of production and rewarded them for their own trouble.

> But, as it is, they generally hold out for a higher price; each man fears to spoil his chance of getting a better price later on from his own customers; or, if he produces for a large and open market, he is more or less in fear of incurring the resentment of other producers, should he sell needlessly at a price that spoils the common market for all . . . and general opinion is not altogether hostile to that code of trade morality which condemns the action of anyone who 'spoils the market' by being too ready to accept a price that does little more than cover the prime cost of his goods and allows but little on account of his general expenses.[1]

The optimism of Marshall's view of the operations of *laisser-faire* capitalism and his conception of a steadily expending economy as the normal state of affairs prevented him from elaborating upon this situation.

Marshall also was well aware of the imperfection of markets for manufactured products, and he refers to the particular demand curve for the output of an individual producer.[2] This entails that marginal cost is equated, not to price, but to marginal revenue, and that the wage of the workers concerned is less than the value of their marginal product. It was alien to Marshall's outlook to stress these implications and he passed lightly over them, but in the thirties it had become obvious that the exception swallowed up the rule, and Marshall's evasive references were no longer satisfactory.

[1] *Principles* (7th edn.), pp. 374–5.   [2] Ibid., p. 458.

The new analysis, stressing market imperfection, oligopoly, deliberate product differentiation and selling costs, appeared to give precision to Marshall's vague concept of 'fear of spoiling the market' and provided the means for elaborating problems which would no longer be dismissed in a footnote.

The general discontent with the complacency of text-book economics found its main expression in Keynes' *General Theory*, and the theory of employment was, of course, far more important, both for analysis and for policy, than anything concerned with the theory of individual prices. Keynes himself was not much interested in price theory, but the two streams of thought were combined by Michal Kalecki.[1] He showed that the determination of gross profit margins is the key to the distribution of the product of industry between wages and profits, and is therefore highly relevant to the problem of effective demand and the level of employment. This very much enhanced the importance of the new analysis, and what began with Sraffa's objection to the lack of logic in orthodox economic theory and Professor Chamberlin's objection to its lack of realism opened up into a general indictment of the operations of the economic system itself.

Since the war the climate of opinion is very different. For obvious reasons (especially in the United States) fashion favours the defence of capitalism rather than criticisms of it, and nowadays it is the theories of the thirties which, in their turn, are being attacked for lack of realism. No one, indeed, tries to reinstate the old ideal of perfect competition in its old form, but now the argument runs—if imperfection of competition is a necessary feature of a market economy, and a market economy is a good thing, imperfect competition cannot be a bad thing.

The counter-attack was led by Schumpeter[2] with the conception of technical progress as a 'gale of creative destruction'.

In analysing such business strategy *ex visu* of a given point of time, the investigating economist or government agent sees price policies that seem to him predatory and restrictions of output that seem to him synonymous with loss of opportunities to produce. He does not see that restrictions of this type are, in the conditions of the perennial gale, incidents, often unavoidable incidents, of a long-run process of expansion which they protect rather than impede. There is no

[1] *Essays in the Theory of Economic Fluctuations.*
[2] *Capitalism, Socialism and Democracy*, p. 88.

more of paradox in this than there is in saying that motor cars are travelling faster than they otherwise would *because* they are provided with brakes.

The contrast between the theoretical failure of capitalism to live up to the competitive ideal with its practical achievements in the post-war period is elaborated by Galbraith.[1]

> Clearly the drift of the accepted ideas concerning the economy of the United States has been toward a most dismal set of conclusions. They suggest that the economy does not work at its highest efficiency; incentives do not reward most the man who produces what people most want at least cost. . . .
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> Yet most Americans, and most foreigners whose sources of information bear a perceptible relation to the truth, undoubtedly consider the American economy, as it has performed in the last decade, a considerable success.

Perfect competition, in his view, cannot be found in reality, for competition itself must lead to oligopoly, as successful competitors grow and wipe out the unsuccessful. Once oligopoly is established, competition in price becomes impossible. The situation described by Marshall in a buyer's market, where each seller refrains from cutting prices because he knows that his cut would be followed by others, and all would be worse off, is the normal situation in a market where sellers are few enough to be concerned with each other's reactions. But under oligopoly the competitive struggle is directed to cutting costs, and technical progress goes on all the faster. On this view, the old orthodox ideal was mistaken, not because perfect competition was impossible but because it was not ideal, and the attack upon it was misconceived, not so much for lack of logic as for lack of relevance. Another line of attack was developed under the banner of the 'full-cost principle'.[2] According to this view the individual demand curve is a myth, because no seller can know what it is. Businessmen do not attempt to maximize profits, but choose prices which will cover cost including a 'reasonable' rate of profit on the capital invested in the business. As a protest against the extreme formalism of the imperfect competition analysis (especially my version of it) this is certainly salutary, but it does not re-establish the old orthodoxy, for by denying that the individual seller aims to maximize profits it cuts

[1] *American Capitalism*, pp. 89 and 90.

[2] See, for example, C. T. Andrews, *Manufacturing Business*; Miss Brunner, 'Competition and the Theory of the Firm', *Economia Internazionale*, November 1952, and P. J. D. Wiles, *Price, Cost and Output*.

at the very root of the old system. It leaves us in a state of perfect nescientness—anything may happen. The moral seems to be that the approach to price theory through individual decisions will never lead to fruitful generalizations, and that it would be better to tackle the problem of the behaviour of profit margins in the economy as a whole through over-all statistics of costs, prices and the share of wages in the value of output.

There remain two important elements of imperfect-competition theory which have to be incorporated in the new apologia for capitalism.

According to the old orthodoxy, competition ensures that the value of the marginal product of labour is equal to the wage; and (with mobility of labour between occupations) the wage and therefore the marginal product tends to be equalized in all lines. When this condition is satisfied, the total output produced is the maximum possible and the real-wage rate is as high as it can be in existing technical conditions. Any attempt to raise real wages can only succeed by causing unemployment.

According to the imperfect-competition theory, wages are normally less than marginal products, and trade unions, far from interfering with the market mechanism in a deleterious manner, are necessary to reduce the imperfection of the labour market and bring it somewhat nearer to the competitive ideal. According to the new view, it is admitted that wages are normally less than marginal products, but since productivity is rising through time with technical progress, the workers do better by accepting a given share in a growing total than they could do by securing a larger share in a total which, for that very reason, would be growing less fast.

But in this scheme of ideas, the workers' pressure to raise money-wage rates is far from harmful. Indeed, it is indispensable to the proper functioning of the system. Under oligopolistic conditions price competition is avoided as much as possible, and if money-wage rates were constant, costs would be continually falling, as technical progress goes on. Consequently, there would be an upward drift of profit margins and a falling share of wages in proceeds, so that demand would not expand fast enough to absorb the growth of output due to rising productivity. The upward pressure of money-wage rates checking this growth of margins is necessary in order to keep the share of wages more or less con-

stant, and to prevent the oligopolists from frustrating themselves. This notion is embodied in Galbraith's theory of 'countervailing power'.[1] As usual, therefore, the counter-reformation accepts the most important principles of the reformation it is intended to counter.

The second legacy of imperfect competition theory to the new orthodoxy is also connected with the recognition that under oligopoly price competition ceases to operate. Competition in other forms remains, and advertising and selling costs of each oligopolist continually tend to grow just because those of the others are growing, like military expenditure by rival nations in an arms race. 'National income at market prices' purports to be a measure of goods and services contributing to national welfare, but under modern conditions (especially in the United States) an appreciable proportion of it is made up of the 'service' of persuading consumers to buy.

As Galbraith puts it:

> Not even the genius of the adman has been wholly equal to the task of proving that the paper, ether and skills employed in, say cigarette advertising are related to any urgent public need. As with cigarette advertising so, presumably, with highway billboards, redundant service stations, glossy packages, bread that is first de-natured and then fortified, high-pressure salesmanship, singing commercials and the concept of the captive audience. All, in one way or another, are apparently the result of incentives which guide the energies of men not toward but away from maximum social efficiency.[2]

In his view, this is an inescapable concomitant of the productive efficiency of the oligopolistic economy.

> Our proliferation of selling activity is the counterpart of comparative opulence. Much of it is inevitable with high levels of well-being. It may be waste but it is waste that exists because the community is too well off to care.[3]

This, no doubt, is true enough in the United States. If the public prefers it that way, it is not of much use for economists to object. But in less opulent economies the social efficiency of the market system must be a matter of concern, and Galbraith's cheerful cynicism is not an altogether adequate answer to the indictment.

[1] Op. cit., pp. 101, 102.   [2] Op. cit., p. 101.   [3] Ibid., p. 102.

After all this debate the beautiful simplicity of the doctrine that *laisser-faire* capitalism has a natural tendency to produce the maximum possible benefit for the community can never be restored, and a new orthodoxy, if one becomes established, will have to be a great deal more sophisticated than the old one.

PART IV

THE RATE OF INTEREST

THE problem to be discussed is the determination of the rate of interest in a closed economy, working under *laisser-faire* in the sense that the authorities use no means to influence conditions except monetary policy.

The question is to some extent imaginary because in the days when *laisser-faire* ruled, an important influence on the rate of interest in any one country was the state of its balance of payments, and the objective of momentary policy was control of the foreign exchanges. Now the break-up of the world capital market, and exchange control, have largely insulated interest rates in each country. But there is no longer *laisser-faire* in other respects. However, our problem is sufficiently complicated to justify drastic simplification.

INTRODUCTION

The most important influences upon interest rates—which account for, say, the difference between 30 per cent in an Indian village and 3 per cent in London—are social, legal and institutional. Side by side with the industrial revolution went great technical progress in the provision of credit and the reduction of lender's risk and great changes in social habits favourable to lending; and in the broad sweep of history these considerations are more significant than any others. But we are here concerned with an economy in which the most up-to-date credit facilities may be taken for granted and a capitalist system is fully developed.

First let us consider the influence upon interest rates of the 'fundamental phenomena of Productivity and Thrift'.[1] It is generally agreed that a fall in interest rates tends to stimulate investment and that a low rate of interest is more likely to discourage than to encourage saving. In any given situation, then,

[1] Robertson, *Essays in Monetary Theory*, p. 25.

This essay, which originally appeared in *Econometrica*, was the title-piece of *The Rate of Interest and Other Essays*. The last section is here omitted.

we may say that there is some value of the rate of interest so low as to lead to full employment (but at times this rate may be negative). The full-employment rate is strongly influenced by the 'real force' of thrift and, if not by the 'real force' of productivity, at least by beliefs about the future profitability of capital, which is related to it. In a *laisser-faire* competitive economy, with free wage-bargaining, if the full-employment rate were ever above the actual rate, inflation would set in through a rise of money-wage rates and the rate of interest would be driven up. The full-employment value of the rate of interest may therefore be regarded as, in a certain sense, a lower limit to the possible value of the rate of interest. If this limit always lies far below any value of the actual rate of interest ever experienced, it has little influence on the actual rate. But if from time to time the 'real forces' sweep the full-employment rate above the actual rate, and force the actual rate up (whether by causing inflation or by inducing the monetary authorities to raise the actual rate in order to avoid inflation), then clearly they do play a part in determining the course of the actual rate.

Moreover, an important influence upon the actual rate, at any moment, are expectations of the future course of interest rates, and expectations are strongly influenced by the historical experience of interest rates which the community has lived through. If the real forces play some part in shaping that historical experience, they have some influence upon the position of the rate of interest even when the full-employment rate, at the moment, is far below it. Thus, the real forces have a roundabout influence on the actual rate of interest, as well as upon the full-employment rate. There is then, after all, a Cheshire cat to grin at Professor Robertson,[1] but it often happens that the grin, cheerful or sour, remains after the circumstances which give rise to it in the past have completely vanished from the present scene.

The Structure of the Market

Let us turn to the monetary forces acting on the rate of interest. Keynes' theory treated the rate of interest as determined by the demand and supply of money. This was a useful simplification in the pioneering days of the theory, but it was always obvious

[1] Op. cit., p. 25.

that there is no such thing as *the* rate of interest and that the demand and supply of every type of asset has just as much right to be considered as the demand and supply of money.

To develop a more refined theory the notion of liquidity preference, measured by the reward required to induce owners of wealth to hold assets other than money, must be broken up into a number of aspects. Among the disadvantages of various kinds of assets compared to money we may distinguish:

1. Illiquidity in the narrow sense. Liquidity partly consists in the capacity of an asset to be realized in money. A limited and imperfect market, the cost and trouble of making a sale, and the time required to effect it, reduce the liquidity of an asset quite apart from variability in its price. Liquidity in the narrow sense depends upon the power to realize its value in cash, whatever the value may be at the moment. To avoid confusion with Keynes' language we will call this quality 'convenience' instead of 'liquidity'.

2. Uncertainty of future capital value, or capital-uncertainty for short, due not to any fear of failure by the borrower but to the possibility of changes in capital values owing to changes in the ruling rate of interest. (This is the main ingredient in Keynes' conception of liquidity preference. He regards the rate of interest primarily as a premium against the possible loss of capital if an asset has to be realized before its redemption date.)

3. Lender's risk; that is, the fear of partial or total failure of the borrower.

Further, when comparing long-term bonds with other paper assets we have to add one more factor:

4. Uncertainty as to the income that a sum of money now committed to the asset will yield in the future, or income-uncertainty for short.

These qualities make up the character, or, so to say, natural colour, of various types of assets. (The relationship of present to expected prices is a separate element in the complex of influences governing the demand for the various assets at any moment.)

A modern capital market represents a bewildering variety of assets, with these qualities in all sorts of combinations. To make our inquiry manageable we must draw a simplified and stylized picture of the market, selecting only a few sharply defined types of assets, say three months' bills, irredeemable bonds and ordinary

shares.[1] We will further simplify by assuming that owners of wealth hold only money or paper assets, while real assets are owned by entrepreneurs who hold them against borrowed funds;[2] that money consists only of bank deposits, without distinction between current and deposit accounts; and that the quantity of money is rigidly determined by the basis of credit which the Central Bank chooses to provide, as in the ideal text-book picture of the British banking system.[3]

Bills we will assume to be perfectly 'good' in the sense that they are free of lender's risk, and they are so short-dated that capital-uncertainty is very small.[4] Bills then differ from money in little except their inferior 'convenience'. Our bonds, we may suppose, also are perfectly good, and no less 'convenient' than bills, in the sense that they can be readily marketed at any time (or pledged against a loan).

The difference between them arises from uncertainty. In a world where past experience has been that interest rates vary from time to time there is uncertainty about future interest rates,

[1] The distinction between shares and loans raises some legal and philosophical problems. At one point in the *General Theory*, chapter 12, Keynes creates confusion by calling ordinary shares 'real assets', and describing a purchase of shares on the Stock Exchange as an act of investment. It seems both simpler and less unrealistic to go to the opposite extreme, treating shares as a type of paper asset like the rest and regarding their yield as one of the rates of interest. This is, in essence, the way that those in charge of real investment decisions probably most often look at the matter; to the managing director of a joint-stock company there is a great deal in common between a shareholder and a creditor.

The conception of yield also presents some complications. It may be calculated on the basis of earnings or of dividends, and on the basis of expected future returns or past realized returns. We shall not enter into these difficulties in the present discussion, but in general we are concerned with prospective yield.

[2] An entrepreneur operating real capital which he owns is regarded as *pro tanto* an owner of wealth lending to himself. Cf. Modigliani, 'Liquidity Preference and the Theory of Interest' (*Econometrica*, January 1944), p. 30. Where a citizen lives in his own house, we may regard him as an owner of wealth lending to himself as an entrepreneur who sells to himself as a consumer.

When there is doubt about the future purchasing power of money, owners of wealth become entrepreneurs; that is to say, there is 'flight into real values'. The whole question of liquidity then takes on quite a different aspect, and money ceases to be the asset to which liquidity preference attaches. We shall not concern ourselves with this problem, but assume that we are discussing a community which has confidence in the future purchasing power of its money.

[3] The argument can easily be modified to fit the case where the supply of money has some elasticity and responds to changes in the rate of interest which the banks can earn.

[4] But see below, p. 255.

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in the sense that, whatever an individual may believe about the most probable future course of interest rates, he does not hold his belief with perfect conviction. An owner of wealth who buys a bill to-day knows what his capital will be in three months' time, but he is uncertain what interest he will then be able to get by re-investing it.[1] If he buys a bond, he knows his income for as long as he likes to hold the bond, but he is uncertain about what his capital will be worth at any date in the future. Perfectly good bills thus offer negligible capital-uncertainty, but relatively high income-uncertainty, while perfectly good bonds offer perfect certainty of income, but relatively high capital-uncertainty.

Shares are subject to income-uncertainty of a special kind because of uncertainty about the future profits to be earned by the real assets to which they correspond. They are therefore subject to a double dose of capital-uncertainty, for their prices vary both with changes in profit-expectations and with changes in the rates of interest. Moreover, they are subject to lender's risk, in varying degrees, according to the standing and reputation of the firms which they represent.

These qualities of the various types of asset are differently evaluated by different individuals. Some (widows and orphans) set great store on income-certainty, and do not bother much about capital-uncertainty, as they do not intend to realize in any case. Financial institutions set great store on their balance sheets, and value capital-certainty very highly. Owners of wealth with a taste for speculation, or those who have such a large fortune that they can spread their risks widely, have a smaller aversion than either to uncertainty about any particular asset. The general pattern of interest rates depends upon the distribution of wealth between owners with different tastes, relatively to the supplies of the various kinds of assets.

Each type of asset is a potential alternative to every other; each has, so to speak, a common frontier with every other, and with

[1] It is uncertainty about the whole complex of interest rates that is relevant, not expectations about the bill rate only. Mr. Kalecki (*Studies in Economic Dynamics*, p. 37) takes as typical the case of a person comparing the result of 'holding one or the other type of security over a few years'—that is, choosing between buying a bond now and deciding now not to buy a bond for a few years, holding bills during that time. But usually an owner of wealth feels himself free to switch his capital from one asset to another at any time in the future if it seems good to him. Mr. Kaldor, 'Speculation and Economic Stability', *Review of Economic Studies*, October 1939, p. 13, uses a similar argument, which is subject to the same objection.

money. Equilibrium in the market is attained when the interest
rates are such that no wealth is moving across any frontier.
Prices are then such that the market is content to hold just that
quantity of each type of asset which is available at the moment.

The complex of demands and supplies is not static, but is
moving slowly through time. Over any period there is an
increment to total wealth from saving equal to the borrowing for
investment (and budget deficits) that has taken place during the
period. The total of wealth, representing a demand for paper
assets, increases with the supply. But the supply of any particular
type may alter relatively to the demand for it. For instance, a
budget deficit, financed by selling bonds, will generate savings
which the owners wish to put partly into money or shares. The
supply of bonds is then increasing relatively to demand.

A borrower who is free to choose the kind of paper assets he
creates will try to offer those which require the lowest interest,
and this sets up a certain tendency for supply gradually to be
adjusted to demand (though changes in business methods—the
growth of self-financing, the decay of the trade bill—may alter
supply in a way quite unrelated to changes in demand).

There is also a much more immediate way in which supply is
adjusted to demand. Where there is a difference between interest
rates there is a possible source of profit. If the short rate were
found on the average to rule above the long, because of the
dominance in the market of widows and orphans with a strong
preference for bonds, and if this situation were expected to con-
tinue, financial houses could issue bonds, which would be taken
up by the widows and orphans, and use the funds thus obtained
to carry bills. They would undergo a risk, for if there were an
unforeseen change, and the short rate fell permanently, they could
only get out of the now unprofitable business by redeeming their
bonds, which might meanwhile have risen in price. Thus, the
long rate would still have to remain normally lower than the short
rate.

In the reverse case (which is the usual one, at least in recent
times) where preference for capital-certainty predominates in the
market, so that the bond rate exceeds the bill rate, there is an
income to be made by borrowing short and lending long. This is
commonly done by taking a bank advance. Assuming the basis
of credit to remain constant, the banks must sell other assets when

they increase advances, and their assets are short-dated (in our simplified world they could only hold bills) so that the effect is the same as though dealers in credit issued bills in order to hold bonds. The risk involved in this operation is that there may be an unforeseen rise in the bill rate, so that the dealers have either to renew their loans at a higher cost or to sell out bonds whose price may have fallen. Thus, these operations require a margin between long- and short-term rates and, since there is not an un-limited amount of credit available to dealers, the margin they require will be larger the greater the amount of bonds that they are holding.

Investment trusts issue what are intended to be less speculative securities in order to carry more speculative ones.

Operations such as these to some extent smooth out the differ-ences in demand for securities of different types and bring the various interest rates closer together.

Changes in the Quantity of Money and in Expectations

Preferences for various types of asset, relatively to the supplies of them, determine the general pattern of interest rates, and it is against this sort of background that day-to-day changes in interest rates occur. The pattern most commonly found in actual markets is such that normally the bill rate is lower than the bond rate, and the yields of shares higher.

Given the general background, there are two quite distinct types of influence which play upon the equilibrium pattern of rates. One is the state of expectations and the other is the supply of money. To discuss them separately we require to be able to assume one constant when the other varies. It is difficult to frame the assumption that expectations are given without sawing off the bough we are sitting on. It is easiest to discuss expectations if they are quite definite. Everything can then be reduced to arithmetic. But if we assume that owners of wealth have clear and unanimous expectations about the exact future course of the prices of assets, in which they believe with perfect confidence, then we have ruled out uncertainty and stepped into a world quite unlike the one we want to discuss. Moreover, we have landed ourselves in a logical impasse, for either the expectations will turn out to be correct, in which case there is no more to be said, or they

will turn out mistaken, in which case perfect confidence cannot persist.

The whole subject of expectations bristles with psychological and philosophical difficulties,[1] and I can offer only a sketchy and superficial treatment of it. For the moment let us be content to assume that the bond rate is expected to move around the average level that has been experienced in the recent past, so that when it falls below that level it is expected to rise, some time or other, and when it rises above, to fall, but that everyone's view is hazy as to how long it will take to return to the average value and how far it will go meanwhile, so that there is great uncertainty about what its value will be at any particular date in the future. For simplicity of exposition we will suppose that we are examining the market at a moment when to-day's bond rate is equal to the average value. Further, we will assume that profits are expected to continue at the same level as in the recent past, so that the prices of shares are not expected to move except in response to changes in the rate of interest. Finally, we will neglect speculators operating on day-to-day changes in the price of assets.

Having thus tethered expectations, let us examine the effect upon the market of a change in the quantity of money. A change in the amount of bank deposits is a special case of the kind of change in the stock of assets relative to the total of wealth which we have already discussed.[2] The essence of the matter is that when the Central Bank, say, increases the basis of credit the member banks buy assets from the market to an amount which restores the normal ratio of their cash reserves to other assets. They thus reduce the amount of assets to be held by the market and so raise their prices. To maintain our simplifying assumptions we will assume that the banks buy only bills. The immediate consequence is a fall in the rate of interest on bills. What effect does this have upon the bond rate?

The bond rate is bound to be affected, for even if all owners of wealth have strong preferences, and are settled far from the frontier between bonds and bills, so that it would need a very large change in values to shift them, yet dealers in credit will react to small changes and so provide a continuously sensitive frontier

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[1] Cf. Shackle, *Expectation in Economics*, especially chapter 7, and Fellner, *Monetary Policies and Full Employment*, pp. 152 *et seq.*

[2] See p. 251.

between bills and bonds. The profit to be made by selling a bill and buying a bond is the difference in the interest on them for three months *minus* the fall (or *plus* the rise) in the price of the bond over three months. Dealing at to-day's prices, the difference in interest which will be enjoyed is known, but the change in price of the bond is unknown. A fall in the short rate increases the difference in interest rates, and so raises the demand for bonds, but the consequent rise in the price of bonds enhances the likelihood of a fall in their price in the future. If expectations are clear and definite, only a very small fall in the long-term rate of interest can occur. It needs a fall of only $\frac{1}{4}$ per cent in the price of bonds over three months to wipe out the effect of a fall of 1 per cent in the bill rate per annum, and a rise in to-day's price of bonds by $\frac{1}{4}$ per cent means a fall in the bond rate of interest in the ratio 400:401.[1] Suppose, for example, that there is a clear expectation that the bond rate will be back to its average in three months' time; then to-day's rate cannot fall by more than this ratio in response to each 1 per cent fall in the bill rate.[2] But if expectations of what the bond rate will be in three months' time are vague and dubious, the power of a rise in to-day's price of bonds to wipe out the attraction of holding them is so much the weaker. Thus, the effect of a fall in the short rate upon the long is greater, the greater the uncertainty in which the market dwells.

In the *Treatise on Money*, Keynes, so to speak, dramatized uncertainty as the existence of 'two views' leading to a 'bull-bear position'; that is, a dispersion of opinions, each confidently held.[3] The degree of uncertainty in the market as a whole then depends on the variety of opinion within it. The same effects follow where everyone is alike, but no one feels confident that his own best guess of what the future holds will turn out to be right. In any situation where there is inadequate evidence on which to base predictions, both elements will be present. Thus, a rise in to-day's price of bonds will induce some holders of bonds to sell before

[1] Cf. *General Theory*, p. 168.

[2] This relationship is quite sufficient to account for the observed sluggishness in the movement of the long-term rate of interest in response to changes in the shorts rate. It is unnecessary as well as unplausible to maintain that the long rate responds only to changes in the *expected future* short rate. Cf. above, p. 250, note.

[3] In the *Treatise*, chapter 15, the two views refer to future share prices, but Keyne applies the same idea to views about the rate of interest (*General Theory*, pp. 169 and 173).

others, and will cause many holders to sell out to some extent. The greater the dispersion of opinion and the less confidently are opinions held, the greater the movement of bond prices in response to a given change in the quantity of money.

We have assumed that expectations of profit are constant. With lower interest rates the frontiers between bills and shares and bonds and shares are no longer in equilibrium at the old rate, and there is a sympathetic movement in the price of shares, governed by similar considerations to those which influence the movement of bond prices. Thus, an increase in the quantity of money lowers the whole complex of interest rates.

We may now look at the same situation the other way up and inquire what has happened to the increment of money which has been created. At any moment some money is in course of travelling round the active circulation—from income-earner to shopkeeper, from shopkeeper to producer, from producer to income-earner and so back again. Some is in the financial circuit, passing between buyers and sellers of paper assets. Some is lodged in what we may call a 'short hoard' either because its owner, who has recently made some savings, is shortly going to spend it in buying securities, or because its owner (who may be an entrepreneur) has some large-scale purchase of goods shortly to make. These short hoards may reasonably be classed as part of the active circulation. Some money is lodged, at any moment, in 'long hoards' because it has come into the hands of owners who choose to hold a part of their wealth in the form of money. Some is in 'bear hoards' whose owners are waiting for a fall in bond and share prices to go back into the market.

Some bears, and some owners of wealth with a high preference for capital-certainty, hold bills rather than money. But it is natural to assume that, in the main, money is preferred to bills for long hoards because dealing in bills is a specialized business, for which many owners of long hoards have no inclination, and because it is not practicable in small sums. The advantage of money over bills for bear hoards is that it makes it possible to switch back into securities in less than three months, if that seems desirable, without the cost and the capital risk of switching into and out of bills.

Short hoards, long hoards and bear hoards correspond to convenience, precaution and speculation, mentioned by Keynes as motives for holding money.[1]

Now, the fall in interest rates which has occurred may slow down the active circulation somewhat. Money may idle a little longer in short hoards—the motive for economizing balances is less[2]—but this effect will be slight, for the velocity of active circulation is fixed by fairly rigid habits. Thus, when there is an increase in money relative to national income, most of the new money cannot find a lodgement unless long or bear hoards are increased.[3]

The yields of all paper assets have fallen, and this in itself may lead some owners of wealth to prefer money. But the main effect is that the rise in the price of bonds and shares has enhanced the fear of a fall in their value in the future, and so set a bearish movement on foot. Money, we have supposed, is usually preferred to bills for bear hoarding; if, however, some of the bears prefer bills, the bill rate is reduced all the more, and there is a further movement over the bill frontier into money.

Thus, the result of increasing the quantity of money is to lower the short rate and to pull the long rate below its expected value to the point where the combined effect of these two movements increases hoards by the amount of the increase in the quantity of money.[4] (If the fall in interest rates induces an increase in national income, of course, part of the new money is required for active circulation, and the interest rates will not fall so far.)

A fall in national income relative to the stock of money (abstracting from a consequent change in expectations) has effects

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[1] *General Theory*, pp. 195–6. It is, of course, impossible to draw a hard and fast line between them. Convenience shades into precaution, and precaution would not give rise to a demand for money unless there was an element of speculation present. Cf. Fellner, op. cit., p. 147.

[2] Mr. Kalecki (op. cit., p. 32) suggests that it is only the short rate which is relevant here. But surely this is a mistake. If an individual (or a firm) decides to economize balances in order to enjoy interest he is just as likely to put the money into bonds as bills. See also Kaldor, loc. cit., p. 14.

[3] Mr. Kaldor seems to deny that hoarding ever occurs (op. cit., p. 13, note), but on closer examination his argument appears to be purely verbal, as he calls deposits money only if they are in active circulation.

[4] If the above is correct, it is misleading to say that the short rate is determined by demand and supply of money while the long rate is determined by the expected future short rate, for one of the main determinants of the demand for money is expectations about the course of the long rate itself.

similar to the above. A reduction in the quantity of money or rise in national income has the converse effects.

To summarize: given the state of expectations, the long and short rates of interest both fall as the quantity of money increases relatively to national income. The fall in the short rate is steeper than the fall in the long,[1] so that the gap between the two increases with the quantity of money. The less the uncertainty (the more confident and unanimous the market that a departure of the rate of interest from its average value will quickly be reversed), the smaller is the response of the rates of interest to changes in the quantity of money, and the smaller is the gap between the two rates. In the limit, if the market confidently believes that it knows that from to-morrow the rate of interest will be at its past average value, the long and the short rate will be equal to that value to-day. (In this case liquidity preference in Keynes' sense is absolute.)

So far we have been discussing the situation at a moment of time, with given expectations, but time marches on. We have supposed that expectations of the future interest rates depend upon past experience. When the bond rate is below its past average, expectations tend to be revised as time goes by, and the demand for money tends gradually to fall, but this is a slow process, and before it has had time to produce any effect all sorts of changes occur. Thus, uncertainty is kept alive by the chances of history.

It has been objected against this theory that it leaves the rate of interest hanging by its own boot straps.[2] But there is no escape

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[1] Unless uncertainty is so great that expectations about the future price of bonds have no influence at all upon the long rate.

[2] Both Mr. Hicks (*Value and Capital*, op. cit., p. 164) and Mr. Kaldor (p. 12) display a lively horror of boot straps, but it is not clear how they propose to escape from them. The view that the long rate can be determined solely from expectations about the short rate is untenable. It is true, in a world in which expectations are definite and unanimous, that when we know to-day's bond rate and to-day's bill rate, we can reckon what change in the price of bonds is expected over the life of the bills. Then, looking into a further future, we can assume that the bill rate then expected to rule is known, and that by then the expected price of bonds is expected to obtain. Then we can reckon the expected change in bond prices over the further future, and so on to Kingdom Come. Then the whole pattern of expectations could be described in terms of the expected short rates alone. But all this means is that rational expectations must be self-consistent. It certainly does not detach the rate of interest from dependence on its boot straps for, in such a world, the only reason for a difference between

from the fact that the price to-day of any long-lived object with low carrying costs is strongly influenced by expectations about what its price will be in the future. If the rate of interest is hanging by its boot straps, so is the price of Picasso's paintings.

We have very little knowledge of the influences shaping expectations. Past experience is no doubt the major element in expectations, but experience, as far as one can judge, is compounded in the market with a variety of theories and superstitions and the whole amalgam is played upon from day to day by the influences (including the last bank chairman's speech) which make up what Keynes called 'the state of the news'. Any theory that is widely believed tends to verify itself, so that there is a large element of 'thinking makes it so' in the determination of interest rates.[1] This is all the more true when short-term speculation is prevalent.

A speculator has not the same attitude as an owner of wealth to liquidity, income-uncertainty or capital-uncertainty. He is concerned with making money by forestalling changes in prices from day to day by 'anticipating what average opinion expects the average opinion to be'.[2] So long as the great bulk of transactions is made by owners of wealth and dealers in credit, the

continued from page 257]

short and long rates is the expectation of a change in the long rate. Indeed, one might say that there the short rate is simply an expression of expectations about bond prices. Moreover, the conception of expectations without uncertainty plunges us into philosophical difficulties (see above).

Professor Robertson (op. cit., p. 25) appears to hold (though he states positively only what he does *not* hold) that the long rate is determined partly by the 'real forces' and partly by beliefs about how the real forces are going to behave in the future. But, if so, with these beliefs he has admitted a Trojan horse full of expectations and liquidity preference into the citadel of the real forces.

In Mr. Kalecki's system expectations about the long rate, based on past experience, are a separate determinant of to-day's rate, and the system here set out is broadly the same as his (except for the point made above, p. 250, note) and owes a great deal to it.

My chief debt is to some pregnant hints to be found in Mr. Harrod's *Dynamic Economics*, see especially p. 62.

[1] This gives the 'real forces' one more card of entry (cf. above, p. 5). If it is widely believed that, for example, an increase in the rate of investment raises the rate of interest, then the appearance of any symptom which is taken to indicate that investment is going to increase will have a tendency to raise interest rates.

[2] *General Theory*, p. 156. In reality, of course, there can be no quite clear-cut demarcation between speculators and owners of wealth who take a view about future prices, and the two classes shade into each other at the edges.

speculator has to guess how they will behave. The effect of speculation is then to speed up the movement of to-day's prices towards expected future prices. But, as soon as speculators become an important influence in the market, their business is to speculate on each other's behaviour. The market then becomes unstable, and falls into the condition described by Keynes under that misleading chapter-heading, 'The State of Long-Term Expectations'.[1] The operations of the speculators cast a thick fog over future prospects for the owners of wealth, increase uncertainty all round and so raise the general level of interest rates.

They also create a fog for the economist describing the capital market, which very much reduces the cogency of the above type of analysis, and totally deprives it of utility as a source of tips.

An Increase in the Rate of Investment

Abstracting from speculation (for if we do not, there is little to be said) we will now examine the effects of an increase in the rate of investment (say induced by an improvement in prospective profits) which increases national income but does not go far enough to hit full employment and create inflationary conditions. If the banking system follows the policy of meeting the needs of trade, interest rates are held constant. To make the story interesting we will assume that the quantity of money is not altered.

Investment plans must be made before any actual outlay takes place. If entrepreneurs proceed by issuing shares before they begin to place orders for new capital goods, and hold money in short hoards for the time being, there is an increase in demand for money relatively to the supply and an increase in supply of shares relatively to demand, and the interest rates rise before the actual investment begins.[2] It is more natural to suppose, however, that entrepreneurs take bank advances as required and retire them by the issue of shares after the investment has been under way for some time.

Possible cases offer an endless variety of patterns. To simplify, we will assume that investment remains steady at the new higher rate during the period that we are discussing, that all investment is financed in the same way, and that it is financed by taking

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[1] *General Theory*, chapter 12.

[2] See Keynes, 'Alternative Theories of the Rate of Interest', *Economic Journal*, June 1937.

overdrafts which are repaid by issuing securities at a certain interval after they have been drawn upon. With these assumptions, while the investment continues there is a certain volume of bank advances outstanding at any moment, and the supply of securities keeps pace with the addition to wealth due to saving, after an initial wobble, which may go either way according as the issue of securities begins before or after the pattern of saving has become adjusted to the new rate of investment.

We will abstract from the gradual effect of a rise in the proportions of shares to total wealth, and consider only the immediate influences upon interest rates coming from the change in the rate of investment.

Let us compare a date in Period II, when the multiplier has run its course and national income has settled at the level appropriate to the new higher rate of investment, with a date in Period I, when investment was being carried out at the old rate.

There is now a larger national income, and a larger demand for money in active circulation, including a swollen demand for short hoards, corresponding to the higher level at which saving is running.[1] Entrepreneurs have taken bank advances, and the banks sold out bills, so that the short rate has risen. Bond rates, as usual, have risen in sympathy.

The rise in interest rates puts a brake on the rise in demand for money by increasing the velocity of active circulation; at the same time it has drawn money out of bear and long hoards. The rates of interest have risen to the point where equilibrium is restored at the frontiers around money.

What has happened to shares? The same cause which induces the increase in investment—a rise in prospective profits—gives rise to better and more confident expectations of future dividends. For the time being, at least, the optimism which started investment off appears justified, for profits are in fact ruling higher while investment goes on. The price of shares has therefore risen at least sufficiently to keep yields at the level corresponding to the rate on bonds. (If we allow speculators out of the cage where we are keeping them assumed away, the price of shares may rise to any extent, and the normal relationship between bond and share

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[1] Professor Fellner (op. cit., p. 149) suggests that hoards held by entrepreneurs fall as general confidence increases. If this effect were to predominate, the rates of interest would normally fall as investment increases.

yields may be reversed.) If this were all, share yields would move sympathetically with the bond rate; that is to say, they would be raised slightly by the increase in demand for money. But there is a further effect. With greater confidence in future profits, credit is improved and the risk attached to shares is felt to be reduced. Different shares will be differently affected. On the very 'good' ones, for which the risk premium is in any case small, the yield will have risen in sympathy with bonds; on others, particularly those whose firms are taking the biggest part in the industrial boom, it will have fallen. Lumping all shares together, their yield, on balance, is most likely to be reduced.

Our interest rates now stand thus, at a date in Period II compared to Period I: The short rate is higher. Bond rates are higher (but not by much) and share rates are likely to be lower.

The yield on existing paper assets has a strong influence on the cost of new borrowing. Concerns which borrow at near the gilt-edged rate will find borrowing a little dearer and may be inclined to defer investment plans (though it is more likely that in the general atmosphere of optimism, they will take the rise in their stride). Industrialists in the main find borrowing easier. The improved prospect of profit counts twice over—once in promoting investment at a given cost of borrowing and once in lowering the cost of borrowing.[1]

Keynes himself makes this point,[2] but the habit of thinking in terms of *the* rate of interest led him to overlook the fact that the most relevant interest rate is likely to be falling when investment is increasing, and to make the quite unnecessary concession to classical ideas that the movement in interest rates which accompanies a boom sets a drag upon the increase in investment.

AN INCREASE IN THRIFTINESS

We may now consider the much debated question of the effect of thriftiness on the rate of interest.[3] Our discussion of the 'real forces' implied that, in a very broad sense and a very long run, a high state of thriftiness relative to investment opportunities

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[1] This argument has not much force in the case of a large established firm, for which there need not be any close connection between the timing of borrowing and of investment, but there is much investment which cannot be undertaken until finance for it has been secured.

[2] *General Theory*, p. 158.　　　　[3] Cf. Robertson, op. cit., pp. 18 *et seq.*

helps to keep interest rates low. In so far as it does so, accumulation of real capital may be greater than it would have been if interest rates had been higher, though not necessarily greater than it would have been if thriftiness had been less. In what follows we are not concerned with such long-run considerations, but with examining the impact of an increase in thriftiness upon interest rates in a very short and in a medium run.

Let us suppose that the thriftiness of our community has increased, which shows itself in the first instance in a reduction in the rate of outlay for consumption goods by some section of the public. We will first consider how the situation would develop *if* planned investment were unaffected, and then re-examine the influence of what has happened upon investment plans. It simplifies exposition if we postulate that the rate of planned investment is zero, but this means only that sentences such as 'the stock of capital is unchanged' are substituted for 'the stock of capital is the same as it would have been if this had not happened', and so forth. We must divide time up into periods, not necessarily of the same length. Period I is the time before the change occurred. In Period II consumption is lower than in Period I by the amount of the designed increase of saving, but nothing else has had time to alter. Stocks have piled up in the shops. If we value the stocks at full retail prices, including the retailers' profit, we may say that national income is unchanged. At the end of Period II *ex-post* saving has occurred equal to the undesigned rise in stocks. In Period III (which is likely to be longer than II) retailers reduce purchases, the fall in national income works its way through the system, and there will be a secondary decline in consumption on top of the first. Stocks have to be reduced to the level appropriate to the new rate of consumption, so that there will be an extra fall in income and fall in employment while the redundant stocks of Period I and the undesigned accumulation of Period II are worked off. In Period IV disinvestment in stocks has come to an end, there is a recovery of employment relatively to Period III and we settle down to a new position of short-period equilibrium with a lower level of consumption appropriate to the now higher thriftiness and the unchanged rate of investment.

How have the rates of interest been behaving? Let us place ourselves at the point of time where Period II ends. We find members of the public with an increment of wealth compared to

their position in Period I. There are a great many possible consequences in the financial sphere. Let us pick out two simple cases:

1. The savers are holding short hoards, equal to their increment of wealth, which they have not yet placed in securities.

2. They have already purchased bonds.

Retailers have acquired real assets to the value of the undesigned increase in stocks. Part of this value is represented by profits which they have failed to realize. According to the convention we have adopted of calling the national income constant, the missing profits must be regarded as savings which the retailers have, willy-nilly, invested in stocks. The rest of the value of stocks represents outgoings which they would normally have paid out of receipts, and for which they now require finance. This division of the value of the stocks into two parts complicates the argument. At first we will abstract from it by assuming that the retailers finance the whole value of the stocks in the same way. Methods of finance vary greatly according to the way business is conducted. Again we may pick out a few simple cases from amongst all the possibilities:

(a) The retailers have run down cash balances.

(b) They have taken bank advances.

(c) They have sold bonds which they were formerly holding.

Combining (1) with (a), cash released from retailers' balances matches the increase in cash held by savers, and nothing alters. Combining (2) with (c), the retailers sell bonds equivalent to those that the savers buy, and again nothing alters. Combining (1) with (c), the savers hoard money and the retailers sell bonds. The demand for money has increased, which raises interest rates in the converse of the manner described above. Besides this, the demand for bonds has fallen, which tends to increase the gap between long and short rates. Combining (2) with (a), the savers have bought bonds and the retailers have parted with money. The rates of interest fall, and the gap between them tends to narrow.

In case (b) the banks have made advances and, since the quantity of money is assumed constant, they have sold out bills. This raises the short rate of interest, and the long rate tends to rise in sympathy. If we combine this with case (1) (savers holding money), the increase in demand for money reinforces the rise in

interest rates. If we combine it with (2) (savers holding bonds), the increase in demand for bonds tends to counteract it.

In so far as the various types of case occur together they tend to offset each others' effects upon the interest rates.

Slight differences are introduced if we take account of the retailers' missing profits. Suppose that their savings in Period I exceeded the missing profits, and that their personal expenditure is the same in Period II as in Period I; then, in the case which combines (1) and (a), the absorption of cash by savers is equal to the full value of the undesigned accumulation of stocks, while the release of cash by retailers which finances them is short of the full value by the amount of the missing profits. There is thus a net increase in demand for money, and the interest rates rise. And so on.

But the argument has grown tedious. Its upshot is that in Period II the effect upon interest rates is not likely to be large, and, in so far as there is an effect, it may go either way.

Let us now jump over the turbid eddies of Period III and place ourselves at a point of time some way along in Period IV, when things have settled down.

Still assuming, provisionally, that planned investment is unchanged at zero, we have a national income lower than that in Period I by the reduced consumption of the first group of savers *plus* the reduction brought about by the secondary decline in incomes and employment in accordance with the multiplier. A smaller amount of money is required in active circulation than in Period I. Bank advances have been paid off and (assuming a constant quantity of money) the short rate of interest is lower than in Period I. No net investment has taken place; therefore there has been zero *ex-post* saving over the period as a whole (neglecting the effect of disinvestment in stocks and working capital owing to the fall in the level of output), so that the total of outstanding assets and the total of privately owned wealth are unchanged. Abstracting from any change in expectations about the long rate of interest owing to the experiences of the transition period, there has been a fall in the bond rate, in sympathy with the short rate. The consumption trades are doing badly compared to Period I, and shares are likely to be adversely affected. On the very 'good' ones the yield may move in sympathy with the fall in bond and short rates, but many will suffer from a rise in

riskiness, owing to poor prospects of profit in the consumption trades. Thus our picture is: a lower short rate in Period IV compared to I, a slightly lower bond and best share rate, and a higher yield of shares in general.

This pattern of interest rates does not look very encouraging to investment, and it seems that our provisional assumption of a constant rate of investment must be revised in the downward direction because of the surplus capacity and low profits in the consumption trades and the high cost of industrial borrowing.

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A NOTE ON BANK RATE

THE new monetary policy is acclaimed as a return to orthodoxy. Orthodoxy means the acceptance of ideas not fully understood, and there is an extraordinary divergence of opinion amongst the upholders of orthodoxy as to what it is that they uphold. It seems worth while, therefore, to return to the fountain head, to examine the theory as it was originally set forth and to inquire how far it remains appropriate in present-day conditions.

The *locus classicus* for the theory of bank-rate policy is the Cunliffe Report of 1918 (Cmd. 9182). The account it gives of the currency system before 1914 is as follows: 'When the balance of trade was unfavourable and the exchanges were adverse, it became profitable to export gold'. If the outflow of gold was considered dangerous, 'the Bank raised its rate of discount. The raising of the discount rate had the immediate effect of retaining money here which would otherwise have been remitted abroad and of attracting remittances from abroad to take advantage of the higher rate, thus checking the outflow of gold and even reversing the stream.'

So far the argument is based upon empirical experience. Bankers had discovered that the mechanism worked. But this part of the doctrine, which is the best established, is the least appropriate to our present situation. A rise in bank rate attracted remittances when there were no impediments to exchange transactions, and when there was no expectation in anyone's mind of an alteration in the exchange rates. Nowadays, in so far as capital movements are not controlled they are influenced by speculative expectations, and the secure and calm convictions of operators in the decade before 1914 no longer exist. Bank-rate policy will now work in the orthodox way only if financiers and traders believe that it will prevent a devaluation of sterling, and the opposite belief, that a rise in bank rate indicates a coming crisis, is at least as likely to prevail. Thus, the modern version of the orthodox doctrine is based on the ground that it will turn

out to be correct if everyone believes in it, in spite of any evidence to the contrary.

This part of the argument concerns only the immediate reaction to a rise in bank rate. The Report proceeds: 'If the adverse condition of the exchanges was due not merely to seasonal fluctuations, but to circumstances tending to create a permanently adverse trade balance, it is obvious that the procedure above described would not have been sufficient. It would have resulted in the creation of a volume of short-dated indebtedness to foreign countries which would have been in the end disastrous to our credit and the position of London as the financial centre of the world.' Here there seems to be a certain confusion. The problem is not that a large inflow of remittances would be undesirable (though this was no doubt true) but that a once-and-for-all rise in bank rate could not attract an indefinite stream of remittances. There was only a certain amount of short funds ready to move in response to a given difference between the rates obtainable in London and elsewhere and a continuously *rising* difference would be required to maintain a given flow of remittances over a long period.

But however that may be, the main argument stands. The rise in bank rate must produce further consequences if it is to have more than a purely temporary effect: 'But the raising of the Bank's discount rate and the steps taken to make it effective in the market necessarily led to a general rise of interest rates and a restriction of credit. New enterprises were therefore postponed and the demand for constructional materials and other capital goods was lessened. The consequent slackening of employment also diminished the demand for consumable goods, while holders of stocks of commodities carried largely with borrowed money, being confronted with an increase in interest charges, if not with actual difficulty in renewing loans, and with the prospect of falling prices, tended to press their goods on a weak market. The result was a decline in general prices in the home market which, by checking imports and stimulating exports, corrected the adverse trade balance which was the primary cause of the difficulty.'

This argument has not the same empirical backing as the description of the first phase of the operation of bank-rate policy. It is the interpretation put by economists upon events rather than the emanation of the experience of generations of bankers.

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Moreover, it is not altogether clear. Three phases of reaction seem to be boiled into one. First there is the shock effect of a rise in the cost of borrowing upon the holding of stocks. Unloading of stocks causes a temporary fall in prices (and check to demand for imports) which may give a temporary relief to the balance of payments, but clearly cannot restore a continuing equilibrium.

The second phase follows when investment plans are revised downwards. The Cunliffe Committee rely on a combination of a rise in the long-term rate of interest (induced by the rise in bank rate) and a restriction of credit to curtail investment. Since their day the effect of interest rates on investment has been much debated, and nowadays it is usually argued that a rise in interest in itself has little effect; the main emphasis is on the availability of credit.

Once this is conceded, the claim that bank-rate policy is a delicate impersonal instrument which frees us from reliance on 'commissars' who take a view about national investment requirements, reduces to the claim that the judgment of bankers is the best guide to what schemes of investment should be encouraged and what curtailed. But since the bankers themselves receive instructions from the government the whole distinction between orthodox monetary policy and unorthodox interventionism wears very thin.

Whether the mechanism is conceived to work mainly because a rise in interest rates reduces the desire to invest, or because a reduction in the supply of finance reduces ability to invest, the rest of the argument follows: There is unemployment in constructional industries and what we have since learned to call the multiplier reduces employment in consumption-good industries also. Thus, there is a reduction in national income, a consequent fall in import demands and a decline in prices (which may be favourable to exports) in so far as conditions of supply are less than perfectly elastic. In this phase, the continued equilibrium requires continued unemployment. The Cunliffe Committee was quite clear (though their language is euphemistic) that bank-rate policy can work only by creating unemployment and they fail to show any reason to expect the correction to the balance of trade to be maintained unless unemployment continues. Their remedy for unbalance is the fall in prices which accompanies a fall in

investment, and it follows that, if employment were restored to its former level, the deficit in the balance of trade would reappear.

It is necessary, therefore, to carry the argument through to a third phase, when unemployment has driven down money-wage rates (in the home country relatively to the world level) so as to increase the balance of trade at any given level of employment sufficiently to allow employment to recover. When wages have fallen to a level which gives a competitive advantage to home against foreign goods adequate to restore the balance without unemployment, the bank-rate policy has finally done its work. (It did not, of course, occur to the Cunliffe Committee to inquire whether any such level of wages exists, or what would be the standard of life when it was reached.)

As a theoretical construction, the argument, with the emendations suggested above, seems coherent, and since before 1914 the gold standard system did, in fact, operate successfully, at least from a British point of view, it might be argued that the theory can claim to be rooted in experience. But was it in fact so?

Look back to the first sentence quoted. The Committee take as typical of a situation in which gold is flowing out of London the case of an unfavourable balance of trade, by which they clearly mean a deficit on income account. But gold movements do not react to the balance on income account but to a discrepancy between the balance on income account and the movement of capital. In an atmosphere of political security and unquestioned faith in exchange rates, movements of hot money can be neglected and the flow of capital is dominated by new lending. Now, when Great Britain was a major source of finance for overseas development and also a major source of production of capital goods, excess exports and excess lending went hand in hand (in a world slump exports and lending fell together) so that the discrepancies which the gold-standard mechanism had to correct were probably never large, and certainly never reached the proportions of a modern balance of payments crisis. Moreover, throughout the period to which the orthodox theory is supposed to apply, the British balance on income account was consistently favourable. An outflow of gold did not indicate a deficit but merely a tendency to excessive lending. Thus the task which the bank-rate policy actually had to perform was not to redress an excess of imports by

creating unemployment, but to prevent the outflow of capital from exceeding the surplus on income account.

The orthodox theory, as presented in the Cunliffe Report, cannot claim any support from history. On the contrary, when we recollect that their recommendations were, in fact, carried out in 1925, the appeal to orthodoxy appears rather as a plea to forget the lessons of experience.

FULL EMPLOYMENT AND INFLATION

FORMERLY economic theory drew a very flattering picture of the private-enterprise system. It was depicted as a beautiful machine with delicately-balanced interacting parts and with a self-righting mechanism that ensured that it kept itself in balance. Full employment of labour was regarded as a normal state of affairs and stability in the value of money taken for granted. Equilibrium in international trade only required the abolition of tariffs and the maintenance of the gold standard. Any departure of actual developments from the ideal equilibrium was regarded as due to frictions which the operation of the machine would overcome for itself, or were attributed to the stupid interference of governments which were often foolish enough to depart from the strict rule of *laisser-faire*.

All this was shattered by the experience in the inter-war period of massive unemployment and chronic crises. A new theory was formulated by Keynes in place of the discredited orthodoxy. He showed that there is, in fact, no self-righting mechanism in a *laisser-faire* system. Periodic crises and chronic stagnation are quite natural and to be expected in an unregulated system, and the maintenance of full employment requires a strong and active government policy.

In formulating the theory of employment, Keynes uncovered another problem. His argument showed that unemployment is not just an accidental blemish in a private-enterprise system—it has a function. The function of unemployment in the *laisser-faire* system is to preserve the value of money.

The main determinant of the purchasing power of money over goods and services of all kinds is its purchasing power over the labour that produces them—in other words, the general price level depends upon the level of money-wage rates relatively to he productivity of labour. But the price level itself influences the level of money wages. Starting from any given position, a rise in prices raises the cost of living and reduces real wages, which strengthens the demand of workers for higher money wages and

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The basis of a lecture delivered at the University of Rennes in March 1958.

weakens the resistance of employers against granting them. This is the famous vicious spiral which gives an inherent instability to the value of money in a private-enterprise system. A rise in the general price level, however it starts, is liable to feed on itself through the mechanism of the vicious spiral. In a country for which international trade is important, rising prices relatively to the world level cause unemployment, partly directly by reducing the volume of exports, and encouraging imports of goods rival to to home products, and partly by causing the monetary authorities to restrict credit and raise interest rates in order to check an outflow of gold or a weakening of the exchange rate.

Keynes showed that if the nations threw off this harsh discipline each could pursue its own policy to achieve and maintain full employment, thus saving much waste and misery. But he showed that the mechanism for restraining prices would be destroyed in the process. With continuous full employment it was only to be expected that the vicious spiral would become chronic.

The theoretical prediction has been very clearly fulfilled since the war. A run of twelve years without a major slump is a unique experience for the capitalist world. In Great Britain recorded unemployment has not been as much as 2 per cent since 1947, and has been as low as 1·1 per cent. Those of us who used to advocate a full-employment policy before the war were much too pessimistic. We used to regard 3 per cent as a desirable objective. Living in the inter-war period when 17 per cent was normal, 3 per cent seemed a distant ideal. The present generation is living in a different world, and those who lived through the old days never cease to marvel and to rejoice. But at the same time, as we feared, the high level of employment has been accompanied by a continuous fall in the value of money. In Great Britain consumer-good prices have been rising ever since 1946 at an average rate of 4 per cent per year. This is quite mild by French standards, but still it is not negligible.

There has been a good deal of controversy as to whether the rise in prices is due to the 'pull' of demand or the 'push' of costs. This seems to me to be rather an unreal argument, for the two factors interact with each other. A high level of demand, given money-wage rates, is associated with high prices, but if money-wage rates are held constant, a rise in the level of demand cannot cause a continuous rise of prices. The rise of prices brings itself

to an end by reducing the purchasing power of the mass of consumers. A rise of prices, associated with rising activity, however, is a potent cause of rising money-wage rates. The workers are provided with the powerful arguments that the cost of living has gone up and that profits are high. The resistance of employers is weak because in a buoyant market it is easy to recover a rise of costs by raising prices. Thus, the pull of demand itself sets up the push of costs. On the other hand, slack demand is no guarantee against rising costs. For instance, Denmark has gone through all these years of prosperity with 10 per cent of unemployment and has suffered from the vicious spiral no less than other European countries.

A rise of prices may set in from external causes; in particular, from a depreciation of the exchange rate. But in this case also a continuous rise of prices could not follow unless it led to rising wage rates, and though the main argument for raising wages in such a case is the rise in the cost of living due to the rise in price of imported goods, claims are more likely to be successful if the level of demand is high. Thus, high and stable employment is undoubtedly a cause, as things are nowadays, of high and rising prices.

There is no need to emphasize that a falling value of money is a great nuisance. So much so, indeed, that some people who do not remember the old days, or who remember and do not care, hanker for some unemployment again. Perhaps they are going to have their wish before long. It may be that the new problem, of how to run a full-employment economy without inflation, will soon be overshadowed by the old one, of how to prevent a slump. But this will not solve the problem. It is more like curing a disease by killing the patient.

The basic problem of combining full employment with a stable value of money can best be seen by considering the conditions necessary for the ideal operation of a private-enterprise economy—what I have called the economic Golden Age.

Imagine an economy with continuous full employment, output per head rising with technical progress, the rate of saving and of investment just sufficient to provide the growth in productive capacity required, a constant rate of profit on capital and a constant share of wages in the value of output. Money-wage rates rise at the same pace as output per head, while prices remain

constant, so that real wages rise in step with productivity. There is no need to require that the rise in output per head, due to technical progress and capital accumulation, should be uniform throughout the economy. The general level of prices is constant if there is a uniform rise of money-wage rates equal to the average rise in productivity. Then the prices of goods produced by the most technically progressive industries should fall and the products of those with less than average progress, or services which are not susceptible to mechanization, will rise in price.

Since the pattern of prices is then changing as time goes by, there is necessarily some ambiguity in the meaning of constant prices. To define our ideal precisely we should have to go into the question of choosing the appropriate index number. But there are many large obstacles in the way to the ideal which would have to be overcome before it would be worth while to tackle the difficulties of detail.

The first major difficulty is the constant share of wages. How if the workers do not accept their existing share as being right and just? From the point of view of the political labour movement, the whole point of wage-bargaining is to improve the workers' share in the product of industry, and they cannot be expected suddenly to abandon the struggle. It is of no use to argue that raising wages merely raises prices and does the workers no good. As a matter of practical experience this is not the case. Raising wages, certainly, does not easily reduce the share of profits, but as the vicious spiral revolves both wages and profits gain at the expense of rentier incomes. It is true that *most* of the gain in money wages is lost in rising prices, but some sediment remains. Moreover, if money-wage rates were not pushed up, it is very likely that the share of wages would fall. In the conditions of imperfect competition which prevail in modern times, prices do not easily come down. As costs fall (which would occur under the influence of technical progress, if money-wage rates did not rise) there is likely to be an upward drift of profit margins and an increase in advertising and selling costs, rather than a downward drift in the cost of living, so that if they did not try to grab their share of rising productivity through higher money-wage rates, the workers might not receive it at all. Thus, it is hypocritical to preach to the workers that wage claims do them no good.

A more subtle argument is that by doing themselves some good immediately, the workers do the whole economy, and therefore themselves, harm in the long run. A larger share of wages means a large share of consumption, and this may be at the expense of investment and therefore at the expense of future productivity. This tends to come about because the inflationary pressure of excess demand is met by credit restriction, postponement of public investment and deflection of labour and scarce materials from long-term development. In the long run, it may be argued, the workers will suffer from a slower development of industry, and it is short-sighted of them to grasp a present advantage at the expense of the future.

But it is not easy to establish this line of argument. Who decides what is the right rate of investment and what form the development will take? There is no democratic machinery by which the views of the workers can be taken on these questions. Is it reasonable to appeal to them to undergo abstinence and entrust their employers blindly with the disposition of the consequent saving?

This, however, is a secondary difficulty. The main point is that the workers do not feel that it is their business to undergo abstinence. If the capitalist game is played according to the rules, the sacrifice should be borne by profits. So long as dividends are being paid and property incomes are being consumed, and particularly so long as a comfortable or luxurious standard of life is enjoyed by their recipients, the workers will naturally reject the suggestion that it is they who should tighten their belts in order to make the economy flourish.

The question of wages has its roots in these deep political problems. Indeed, with most problems nowadays the economic answers are only political questions.

A great deal depends upon the general political atmosphere in each situation. In Holland, for instance, it seems that the labour movement has accepted the idea of a constant share of wages in proceeds. Every year the increase in national income is worked out and a rise in wage rates calculated so as to maintain the over-all share of wages constant.

But even the wise and sober Dutch have suffered from the vicious spiral to some extent. And an over-all wage policy cannot prevent particular problems from presenting difficulties. An

awkward, and by no means uncommon, case is a sharp deterioration in the terms of trade such as comes about when the home country's exchange rate is devalued or when there is a rise in the world prices of the goods which it imports. Economists protest that the rise in home prices which follows ought not to be allowed to lead to a rise in wages. There has been a real economic loss to the country, they argue, and real-wage rates have got to fall. It is not only vain but harmful for the workers to try to avoid their share of the loss.

There are two reasons why the economists' argument cannot be honestly recommended to the workers. First, where foodstuffs are imported a deterioration in the terms of trade bears most hardly on the lowest incomes. If money wages are not raised the workers carry more than a proportionate share of the national burden. Second, the economists' argument brings up once more the major question of the share of wages in proceeds. If the workers are asked to carry a proportionate part of the national burden it implies that the pre-established share was fair and right. If the workers have never accepted this proposition they cannot be expected to accept the argument that follows from it.

Another source of trouble lies in the relation between wages of different groups of workers. At any particular moment the pattern of wage rates as between different occupations and different regions is largely a matter of historical accident and there are always a number of anomalies and discrepancies which ought to be corrected. This is most markedly seen when an economy has come suddenly into a state of full employment after a long period of stagnation. In the depression, unemployment is not evenly spread, and unemployment is likely to be particularly heavy and wages low in a number of trades, particularly coal-mining, which will find themselves with an acute scarcity of labour when general full employment is achieved. Violent re-arrangement of the pattern of relative-wage rates is then called for, and the unsettling of the wage structure may itself give rise to a long round of the vicious spiral.

Even when the main pattern of relative wages is more or less acceptable, the mere fact that wage bargains are made in turn, one industry after another, tends to keep the spiral going, for if it was slowed down at any moment those workers who have most recently had a rise in money-wage rates would be left with a

permanent advantage, and those whose turn was later in the series would suffer a permanent loss. This problem has been partly overcome in some countries; for instance, Sweden, where a periodical review of all wages simultaneously is undertaken. Such a system can be more easily introduced in a country where there is a simple and highly centralized trade-union system. In Great Britain the trade-union movement, like most of our institutions, is a tangled natural growth which obstinately resists being combed and clipped into any neat arrangement.

Finally, even when trade unions have accepted a policy of restraint, there is a tendency for wage rates to rise through the competition of employers for hands. When demand is buoyant and future prospects bright, each business wants to expand, and a high over-all demand for labour is likely to generate acute shortages of particular types of labour; for these workers a process of competitive bidding sets in—wages above the agreed rate being offered, or various inducements such as working overtime and resting during normal hours. This pressure of demand at particular points is itself enough to set up a vicious spiral and the problem of 'black wages' has become notorious in the countries which have tried to enforce a national wages policy.

To overcome the excess demand for particular types of labour by restriction of over-all demand would be impossible without causing a good deal of general unemployment. Unfortunately, effective-demand policy is always a case of 'enough is too much'.

Even if all these difficulties could be cleared out of the way and an ideally correct wage policy were put into effect, it still would not completely solve the problem of maintaining the value of money. Prices do not depend only on costs but also on the policy of businesses. To achieve over-all stability, as I mentioned earlier, it is necessary that prices should be falling where output per head rises at more than the over-all average rate. Those goods must fall which enjoy the greatest benefit from technical progress, and goods as a whole must fall relatively to services, in which technical progress has little scope to operate. By and large, this does happen. It is only necessary to consider the contrast between the cost of services, relatively to commodities, in the U.S.A., Europe and Asia. But there is no reason to suppose that it will happen to just the right extent. If competition is not strong enough to bring down prices that ought to be falling with costs,

not only are the workers as a whole cheated of the rise in real wages that they should be enjoying, but the economy is liable to fall into stagnation through lack of sufficient purchasing power to take advantage of the potential incrcase in productivity.

The trade unions are not an alien element in capitalism but an absolutely necessary part of its mechanism. Trade union pressure which counters monopolistic tendencies and keeps profit margins in check is necessary in order to make it possible for profits to be realized. A strong labour movement is required to rescue capitalism from its 'internal contradictions'. But if it is strong enough to do so, it is liable to be too strong, and to make a chronic vicious spiral.

This is the dilemma which twelve years of high employment has revealed. Some observers draw the conclusion that full employment with a stable value of money is unattainable, and that the only possible policy is to keep a sufficient margin of unemployment to discipline the unions, and a sufficiently slack market to make employers anxious to avoid raising costs. They would be content with a mild rate of progress in real production in order to enjoy the benefit of a stable or rising value of money. Those who support this kind of view are generally of the most respectable and conservative kind, but they seem to me to be making propaganda for Communism. They seem to agree with the Marxists that capitalism cannot preserve employment and that it has reached the stage of being a fetter upon progress.

For my own part, I am not so pessimistic. I do not think that the experience of the last twelve years really bears this interpretation, for we have not yet seen full employment in fully peaceful conditions. A great part of our troubles has arisen from the fact that there has been a very high level of activity in unproductive employment—in what is euphemistically called defence.

If military expenditure had gone into productive investment, there would have been no greater inflationary pressure immediately and very soon there would have been a flow of production to damp the inflation. In Great Britain, for instance, military expenditure has been running at a higher rate than net industrial investment. There is plenty of modernization that is required in British industry and plenty of unexploited inventions. It seems fair to say that if the rate of capital accumulation were higher the

rise in productivity would be proportionately or more than proportionately higher. The vicious spiral has been troublesome with a 4 per cent per annum rise in production. With a rise of 6 per cent the problems would become manageable, for there would be room enough both to satisfy the demand for a rising standard of life without requiring a drastic rise in the share of wages in proceeds and to leave room for relative changes in wage rates to be made without upsetting the average.

It seems to me that the question of whether it is possible to have full employment without a falling value of money cannot be answered until we know whether it is possible to have full employment without the cold war.

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