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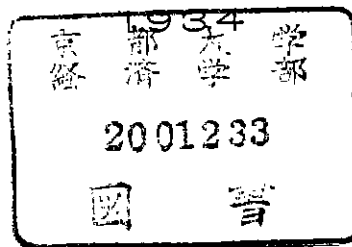
A CRITICAL ANALYSIS OF BÖHM-BAWERK'S THEORY OF CAPITAL

(1)

In this article I wish to demonstrate that the factor of social powers, or, to be more specific, of social powers as extra-economic powers, must not be neglected in any explanation of economic phenomena if it is to be made plausible and consequent. To do this, I propose to examine the economic theory of Böhm-Bawerk, because it is he who decisively demonstrated how untenable is a power theory of economic phenomena.[1]

To begin with, I shall summarise the salient points of his theory as briefly as possible.

It is indisputable that social powers exercise a considerable influence on the determination of prices. But does the action of such powers operate within the economic law of prices? (By this he means to ask whether or not powers operate according to the economic law of prices). Or, do they operate against the same economic law? The action of powers operates within, not outside of, the economic law of prices. In fact, the action of powers operates in the realization of the economic law of prices.[2] This alike in the case of usury as of monopoly. Powers can cause such economic phenomena only according to the economic law of prices. In other words, powers exercise their influence only through the desires of the persons involved and the utility of economic factors. Let us examine this truth in some concrete example, say, in the case of the struggle over wages. If thorough competition goes on on the part of both industrial enterprisers and workers, the wages

1) Böhm-Bawerk, Macht oder ökonomisches Gesetz. Gesammelte Schriften, 1924, p. 224.
2) ib. p. 240–241.

will settle at the marginal productivity of labour.[3]   But
suppose that there is no competition, for instance, on the
part of the industrial enterprisers, the wages will be reduced,
due to the unity of action of the enterprisers.   The theory
of marginal value clearly shows where wages settle in such
a situation.   The wages are determined somewhere between
two margins, upper and lower ; one of them is the marginal
value of the labour for the workers themselves, the other
is the value for industrial enterprisers.   The former margin
is measured by toil and pain which will be got rid of when
the workers do not work, since, having no capital to work
with, they cannot produce anything by themselves; the
latter margin is the marginal productivity of labour com-
puted by the enterprisers.   Of course, one should consider
the possibility of the workers getting other employment,
which will have some influence in the determination of the
lower margin, when we treat each branch of industry
separately.   Where will the wages settle between these
upper and lower margins?   They will settle at the point
where industrial enterprisers will reap the greatest mo-
nopolistic profits.   Should they reduce the wages too far,
they would find it difficult to retain workers to work for
them.   But should they raise the wages, their profits will
be reduced in consequence.   There must be a point where
enterprisers can secure the maximum profit, and it is at
this point where the wages will settle.

Let us next consider the situation in which wages are
raised by the combined efforts of the workers[4].   Regarded
as a passing problem, the maximum wage margin is fixed
by the total productivity of the workers.   Such wages will
be the same as those which are fixed by the marginal pro-
ductivity of labour in a period of competition, plus the total
amount of interest thereon.   Further, such wages may
include the amount of monetary loss that may be incurred
through the waste of capital goods due to failure to hire

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3) ib. p. 251.   4) ib. p. 528 ff.

labourers. In reality, however, there will be no such a case when the upper margin "which is economically possible" is attained. As wages are raised, the enterprisers will vigorously resist the action of the workers, who in the end will be compelled to submit because of their lack of funds and there will be the danger of an inflow of workers from other industries and of strike-breakers. Thus, wages cannot rise to a point very far removed from the marginal productivity of labour. The power of strikes, which is well known to practical business men, cannot contradict or operate apart from the formula of the theory of marginal utility. On the contrary, it can operate only within and according to that formula. To what extent powers can influence the movement of economic phenomena can be clarified by a minute analysis of marginal utility[5]. So far about the temporary influence of powers on the course of social economy. But a more important question is what powers can accomplish in the long run. This is more important than the question of their temporary influence such as we have seen above.

Ricardo did not take up the question of the temporary fluctuation of prices. He dealt with only durable prices. Temporary movements concern the economic fate of social classes very little. What is truly important is that which is durable. No study has so far been made on the question as to what durable influence social powers have had on economy. The economic influence of powers has been in need of careful study ; so far no investigation has been made into the durable economic influence of powers. Thus, we are in a virgin field of investigation.[6]

(2)

What can powers accomplish in the long run? By way of answering this question, let us consider another question : Can wages high enough to absorb interest or part of the

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5) ib. p. 269.   6) ib. p. 270.

natural interest be maintained for a long period of time?
This question may take one of the two following forms:
when wages absorb only part of interest, and when wages
absorb the whole amount of interest.[7] For the convenience
of theoretical consideration, I shall take the case in which
only part of interest is absorbed. But the same principle
applies in the other case, in which the whole amount of
interest is absorbed.

When wages are raised to a point (the natural rate of
wages) which corresponds to " the natural rate of interest ",
savings will be affected and the supply of capital will be
thereby changed, although no decisive statement can be
made as to whether this supply will be reduced or not. On
the other hand, there are unmistakable effects on the part
of the demand for capital. If wages rise beyond the
marginal productivity of labour and the rate of interest in
consequence becomes cheaper, the process of production
will be prolonged and the number of workers employed
will be decreased. If wages rise, enterprisers will increase
their marginal productivity by making longer the period of
roundabout production in order to prevent losses, and this
is inevitably accomplished by a decrease in the number of
labourers employed.[8] " The empirical law of the surplus
productivity of round-about production which is more
capitalistic and requires more time " is bound to operate.
Hitherto, interest stood as an impediment against the
adoption of this round-about method of production, but its
force has been considerably reduced. Industrial enterprisers
eagerly attempt to prolong the process of production. But
so long as the subsistence fund of society (which actually
is capital) is fixed in amount, it will be impossible to feed
the same number of labourers and wait for the completion
of products during a longer period of time. Thus, when
the number of employees decreases, this new organisation
is bound to collapse. Labourers are divided into two

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7) ib. p. 278-279.   8) ib. p. 286, 279-280.

groups: those who receive high wages, and those having
no work, the latter being fed by the former. The interests
of enterprisers are reduced, unemployed labourers barely
keep body and soul together, and labourers having work
must support their unemployed brothers. No one is placed
by the interference of powers in a position which is more
advantageous than the natural situation in which there is
no such interference. Moreover, unemployed workers will
sooner or later seek work at lower wages,[9] and thus their
wages will be reduced. In short, the absorption of interest
by wages cannot endure. It is only in the following cases
that wages can be raised and maintained by powers: If
by the intervention of powers wages were lowered below
their natural condition, the wages, after having been raised
by the action of new powers to the natural point, will
necessarily endure. Again, if, after wages have been raised
by powers, new methods of production are discovered, the
wages will endure and can be maintained at that point
under such circumstances. But in neither of these cases
does the rise of wages become durable through the inter-
vention of powers. Powers only raise wages temporarily,
and economic conditions make them durable.[10] So far
we have dwelt only on monopolies created by the or-
ganisation of industrial enterprisers or labourers; but what
has been said is true also of the intervention of the State
power.[11]

I shall cut short the presentation of Böhm-Bawerk's
view regarding the relations between powers and economic
laws. But I shall now consider his arguments, which may
be summarised as follows:

When considered apart from the intervention of powers,
wages and interest have their respective natural amounts
in equilibrium, through the operation of economic laws
(regarding value, prices and distribution). Powers can affect

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9) ib. p. 280-282.   10) ib. p. 286-289, 293-294.
11) ib. p. 293.

them temporarily, but such a process follows motives of interest, and thus cannot be detached from the economic law of marginal utility. But this change is only temporary and cannot last. Thus, wages will sooner or later come down to their natural rate, even after they have been raised by the intervention of powers. In short, as regards durable actions, powers are impotent against economy.

Böhm-Bawerk denies that he has gone back to the theory of the " old natural law " in economic science. He claims that he does not ignore the influence of powers, that, on the contrary, he fully recognises the reality of intervention by powers. The fact that strikes have permanently raised wages in modern times and that the wages of organised labour have risen much higher than those of unorganised labour is not held to be a confutation of his arguments. He does not believe in the omnipotence of powers. He is convinced that the effects of powers manifest themselves through the medium of motives of interest, and consequently through the calculation of utility and according to economic laws.[12] But his primary concern is to point out the small part which powers can accomplish in the long run. This is a point to which I wish to call the attention of my readers. Again, the powers which are treated by Böhm-Bawerk are all economic powers or powers involved in the ownership of property. This can be inferred from the fact that monopolistic powers form the centre of his discussion. On the other hand, he recognises the existence of other powers, such as the powers of the State, that can act on economy. But thinking that there is no basic difference in the nature of these two sets of powers, he prefers to consider the former set only. But is the nature of these two sets of powers identical? This is the second point that challenges our special attention.

(3)

All attempts at raising or lowering wages through the

12) ib. p. 292--293.

intervention of powers or at eliminating interest are in the long run futile. This contention regarding the impotency of powers is really based on the conception of natural interest. What is then this natural interest or interest in equilibrium? I shall present as briefly as possible the essential points of Böhm-Bawerk's ideas on this matter.

As the period of round-about production increases in length, the greater value of products per unit is derived from productive goods. But there is a limit to the subsistence fund (for Böhm-Bawerk this means capital) which makes round-about production possible. Equilibrium is established when a given subsistence fund is used up for employing a given number of labourers from whom industrial enterprisers can secure the maximum amount of profit (and consequently financiers are given the highest possible rate of interest). For this reason, both wages and interest will remain stable when every one of the following factors is fixed: the amount of subsistence fund, the number of workers, and the scale of the surplus products of round-about production (Skala der Mehrerträgnisse) or the productivity function of productive goods. This truth is shown by the following example.

Let us suppose that the number of labourers in a given society is 10,000,000 and the amount of subsistence fund (or capital) is 15 billion gulden. Suppose further that this total capital is apportioned among 1,500,000 industrial enterprisers, each of whom will thus receive a sum of 10,000 gulden as his capital. Taking wages as 300 and the scale of the surplus products as follows, the number of employees and the size of profits will be as shown in the following table. Supposing that capital is used in different stages of production, the capital of 10,000 gulden, which is used from the beginning of a given period of time, will function as if it were a capital of 20,000 gulden. If capital is increased step by step during a period of time, part of it will be used during the entire period, while the last addition to the capital will be used for a period zero. When the

average is taken of all the capital, it will be found that the capital was used only for one-half of the period. If the capital of each industry is utilized with the maximum efficiency, 10,000 gulden will be capable of employing labourers who would otherwise require 20,000 gulden.[13]

1 (wage)=300				
Period of production t	Value of products of year's labour p	Annual profit per labourer p-1	No. of employees A	Annual profit per 10,000 Z
1	350	50	66.66	33.33
2	450	150	33.33	50.00
3	530	230	26.22	51.11
4	580	280	16.66	46.66
5	620	320	13.33	42.66
6	650	350	11.11	38.85
7	670	370	9.52	35.22
8	685	385	8.33	32.08
9	695	395	7.40	29.25
10	700	400	6.66	26.66

1=600			1=500		
p-1	A	Z	p-1	A	Z
−250	33.33	(—)	−150	40	(—)
−150	16.66	(—)	−50	20	(—)
−70	11.11	(—)	30	13.33	4.00
−20	8.33	(—)	80	10	8.00
20	6.66	1.33	120	8	9.60
50	5.55	2.77	150	6.66	10.00
70	4.76	3.33	170	5.71	9.70
85	4.16	3.54	185	5	9.25
95	3.70	3.51	195	4.44	8.66
100	3.33	3.33	200	4	8.00

If wages are 300, the most profitable method will be to carry on round-about production for three years at the

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13) Böhm-Bawerk, Positive Theorie des Kapitals, 4th ed. 1921. S. 451.

profit rate of 51 per cent. But since labour is 22.22 per industry, it will be more than 33,000,000 for 1,500,000 industrial undertakings, and in consequence, there will be a shortage of labour supply, and wages will purposely be raised. Supposing wages are raised to 600, the best advantage will be secured with eight years of round-about production and 3.54 per cent of profit rate. But in this case demand for labour per industrial enterpriser will be 4.16 and the total labour demand will be 6,250,000, and wages will fall because of excess in labour supply. Suppose again that wages have reached 500. Then, the most advantageous production will be secured with six years of round-about production and 10 per cent of profit rate. In this case, labour demand per industrial enterpriser will be 6.66 and the total labour demand will be 10,000,000, which will be just the same as the actual labour supply, and thus an equilibrium will be maintained. Both interest and wages will settle at that point. These explanations will clarify Böhm-Bawerk's contention regarding the intervention of powers in the long run.

If the method of production (and consequently the scale of surplus products), the quantity of capital as subsistence fund, and the number of labourers are given as in the preceding table, interest will be 10 per cent and wages, 500. If wages are raised to 600 so as to lower this natural interest, the period of round-about production will be prolonged, labour demand will be reduced to 6,250,000, and wages will fall due to the pressure of unemployment. This movement will stop when wages have go back to 500 again. Thus, whether or not Böhm-Bawerk's argument regarding the impotency of powers to alter economy in the long run is tenable depends on the question whether or not his theory of natural interest is tenable.

Wicksell realizes that 10 per cent is the equilibrium rate of interest in the above example provided neither enterprisers nor labourers are organised for the protection of their own interests and there is free competition among

them[14]. But Lindberg goes still further.[15] It is unthinkable that 10 per cent is the rate at which interest settles. Some of the industrial enterprisers are bound to extend the period of their production to 10 years and reduce wages to 300, in order to realise a profit of 26.66 per cent. This will settle the marginal supply price for labour at 300. There is no reason why wages should settle at 500. The above example will be followed by other enterprisers and will result in the following : 10 years of round-about production, wages of 300 and the interest rate of 26.66. But let us consider why these factors are unable to settle at any other point.

As the entire number of labourers are employed in equilibrium, the number of labourers in each industrial undertaking will be 6.66. And, inasmuch as the number of each industrial undertaking is given, it is possible to deduce the period of round-about production as well as the level of wages. Twice the amount of capital divided by the number of labourers will be the product of wages multiplied by the number of the period of round-about production. This product divided by the period of production will be the size of wages. Taking the size of wages as the basis of calculation, the rate of interest for different periods of production may be measured as follows (assuming that the entire number of labourers are employed and the total capital is used) :[16]

When wages are higher than 300, the rate of profit will be smaller than 26.66, which is the rate for wages at 300, provided the entire working force is employed. Wages will eventually be reduced to 300 by industrial enterprisers. For this reason, 500, which is regarded as the " natural wages " by Böhm-Bawerk, is in reality not so. There is

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14) K. Wicksell, Ueber Wert, Kapital und Rente, p. 104.

15) Jak. Kr. Lindberg, Die Kapitalzintheorie, Zeitschrift für National-ökonomie, IV, 4, p. 505.

16) Lindberg, ib. p. 506–507., van Dorp, Löhne u. Kapitalzins, Zeit-schrift für Nationalökonomie, IV, 2, p. 265.

Period of Production (Years) t	Products of a Year's Labour p	Annual Wages l	Profit Per Labourer p-l	Rates of Profit z
1	350	3000	—	—
2	450	1500	—	—
3	530	1000	—	—
4	580	750	—	—
5	620	600	20	1.33
6	650	500	150	10.00
7	670	428 4/7	241 3/7	16.10
8	685	375	310	20.66
9	695	333 1/3	361 1/3	24.33
10	700	300	400	26.66

no equilibrium when the period of production is 6 years, the rate of interest is 10 per cent and wages are 500. Fluctuations may easily arise in such a case. However, 500 is the highest point attainable by wages under these circumstances. And, so long as industrial enterprisers seek as high profits as possible, wages will go down to 300, and there will be no obstacle capable of preventing this fall. It is in this sense that Böhm-Bawerk's analysis of capital and labour markets is considered to be a theory of minimum wages (the iron law of wages). Such, indeed, is Lindberg's view.

(4)

In my own opinion, the equilibrium points of Böhm-Bawerk, Wicksell, Lindberg and Dorp cannot be regarded as real equilibrium points. Neither wages nor interest can settle at such points. In markets having the conditions mentioned by Böhm-Bawerk, neither wages nor interest can settle. In other words, no equilibrium is possible. New conditions must be added in order that an equilibrium may be formed. I shall first set out the negative part of my contention.

Lindberg has already pointed out that no equilibrium is possible in the situation given by Böhm-Bawerk, in which

interest is 10 per cent and wages are 500. If some of the enterprisers attempt to lower wages below 500, say to 300, nothing can prevent them from doing so. In this situation, so long as the entire capital and labour of society are taken, when the marginal buyers of labour reduce the demand price of labour or demand wages to that point, they can buy labour at this reduced price. In the transaction of enjoyable goods, marginal buyers cannot reduce demand prices at their own will, because buyers who have been excluded from the transaction, extramarginal buyers, will come forward and exclude marginal buyers. In the present case, however, there are no extramarginal buyers (since the quantity of capital is given and limited), and for this reason marginal buyers can reduce demand prices without incurring loss to themselves. In other words, there is no assurance that enterprisers who are the purchasers of labour will not reduce wages below 500 in their mutual competition to buy labour as cheap as possible. This being so, there is no assurance that wages will settle at 500, nor any proof that 500 is the natural point. The six-year period of production and 10 per cent interest are conditions obtainable only when wages are assumed to be 500. But these figures easily change inasmuch as wages do not ramain stationary at 500.

Can we then say, as Lindberg does, that wages will settle at 300 and the rate of interest at 26.66? Lindberg gives an affirmative answer to this question, but his proof does not seem to be sufficient. His argument may be summarised as follows:

One of the industrial enterprisers, say A, may raise wages to 310 and carry on round-about production for 9 years and employ 7.1 labourers. In this case, the rate of profit for him will be 27.3. So far, the results are all right. But another, say B, will imitate him and raise wages to 320, thereby taking part of A's labourers away from him. In order to recover this lost portion of his labourers, A will raise wages to 330, and this will result in the reduction of

interest rate to 24.1. All this will ultimately mean a return to the original conditions, namely, 10 years of round-about production and 26.66 interest.[17] This return is inevitable.

I cannot agree with the above contention. I do not believe that 10 years of round-about production and interest of 26.66 will remain settled. Such conditions, indeed, may be created but they will not be allowed to continue because further attempts will be made to reduce the period of round-about production and to raise wages. Nor does it seem possible that once raised, wages will return to their original position easily. In the case of B given in the above example, it is doubtful whether he can return without resistance to 10-year period of production and wages of 300, although doubtless he is not content with the low interest rate of 24.1. On the contrary, will not the reduction of wages result in the loss of a part of the labourers employed and in the suspension of the use of capital which he has already invested? At any rate, there is no settled point when wages are 300, and there will be a constant shifting from one condition to another.

In short, no equilibrium is attainable under the conditions given. Does this mean, then, that in capital and labour markets the formation of natural rates of wages and interest is impossible? I do not think so. It is because of the lack of one indispensable condition which is always operating in actual markets so that equilibrium rates are always firmed, though only approximately—this condition being the relation of social powers. It is the action of these that determines wages and does not permit wages to fall beyond a certain point. Let us take the preceding cases to show how this condition works in the formation of equilibrium.

According to Böhm-Bawerk, equilibrium is formed when the period of round-about production is 6 years, wages are 500 and interest is 10 per cent. Wages at 500

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17) Lindberg, ib. p. 505.

are regarded as natural wages. But it is possible, as has been already shown, that enterprisers can easily cut down wages to 300 if they wish to do so. If 500 is to be natural wages, it is necessary that none of the enterprisers be capable of reducing wages at his own arbitrary will. Under such circumstances only can equilibrium be attained. It is only the intervention of social powers that makes the deviation of wages from such a point very difficult.

In my opinion, the state of technique has an important bearing in determining the coefficients of production. But this extra-economic factor does not directly determine them. On the contrary, it acts together with economic factors such as the prices of productive goods and the prices of products. In other words, technique, which is an extra-economic condition, determines production coefficients according to various conditions of the price system. In this sense, although coefficients of production can be considered as the function of the prices of productive goods, it is the extra-economic factor of technique that determines the form of this function. Similarly, although the supply quantity of labour is the function of the prices of products, the period of round-about production, and other economic phenomena, the fact remains that it is the extra-economic condition of social powers that determines the form of the supply function of labour itself, as well as the form which means the manner in which the coefficients move according to the conditions of various economic quantities. The position which technique occupies as regards coefficients of production is occupied by power relations as regards supply functions of labour. These two do not appear as variables in the system of equations of general equilibrium, but they determine the forms of functions themselves.

Suppose, then, the supply functions of labour are so formed that the supply price (supply wage) is 500 at the quantity supplied of 10.000.000. Under these circumstances, the maximum profit can be secured if the period of round-about production is 6 years. For this reason, there will be

no attempt made either to raise wages by shortening the period, or to lower wages in order to prolong the period to 10 years. Thus, there is formed an equilibrium. It should be noted that this equilibrium is possible first because the supply function of labour is so formed and further because capital at an advantageous period of round-about production is just sufficient to absorb the whole quantity of labour. So long as supply prices of labour are determined by social powers and not by the amount of capital employed or the period of round-about production, there cannot be any presupposed harmony between the amount of capital and the quantity of labour. Fortunately, an equilibrium is formed also in this circumstance, because the quotient (which is derived by dividing the amount of capital by the wages multiplied by the length of round-about production)—in other words, the relations which the amount of capital bears to the length of roundabout production multiplied by wages—corresponds to the quantity of labour.

The foregoing account has clarified the following : when the amount of capital (and capital of each enterprise), of labour, and the scale of the surplus productivity of round-about production are given beforehand, the equilibrium can not be established thereby; because it is impossible to think that wages follow the *Gesetz der Preiseinheit* without the fact that the labour supply function is determined by power relation. According to my analysis, the formation of an equilibrium takes the following course. Suppose, first, that the scale of surplus productivity of labour is given ; and secondly, that the labour supply function is also given. An equilibrium will be formed under such circumstances, when the amounts of labour needed, that is, the

quotient $\dfrac{\text{amount of capital}}{\text{wage} \times \text{length of the period of function}}$ is the same

as the existing amount of labour. There is no pre-established harmony between the amount of capital and other economic quantities so that an equilibrium will be attainable

whatever amount of capital is given. The amount of capital given is, in principle, irrelevant.

Böhm-Bawerk gives an example in which wages are 300. We have already seen that under these circumstances wages do not settle at 300, though it may happen temporarily, that the period of round-about production becomes 10 years and the rate of interest attains 26.66. Under these circumstances, enterprisers will not cease making endeavours to change the period of round-about production until it becomes three years and the rate of interest, 51.00 per cent. But then demand for labour will be 22.22 per enterpriser and 3,300 for all enterprisers; and the consequent shortage of labour will result in attempts at raising wages. But, so long as power relations intervene, there will be some limit to the rise of labour wages. If we ignore the possibility of such rise of wages, we can say that an equilibrium will be formed when capital has been reduced to three-tenths of its present amount through partial destruction or consumption. Inasmuch as free competition is presupposed, the settlement of the period of round-about production at 10 years and that of the rate of interest at 26.66 will be a possibility but not an inevitability, as Lindberg states. Such settlement will become inevitable only when the combination of enterprisers is presupposed. Thus, there is much truth in Wicksell's contention.

(5)

Whereas Böhm-Bawerk used an empirical test of investigation (empirisches Herumprobieren) in considering the determination of the rate of interest, Wicksell adopted an algebraic test and has given it a more precise expression. I shall re-state my contention in regard to Wicksell's formula[18]

The annual wages of each labourer are represented by l, the rate of interest (and therefore the rate of profit) by

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18) K. Wicksell, Ueber Wert, Kapital u. Rente, 1893, p. 96 seq.

z and the period of round-about production (years) by t. Supposing capital is invested with the progress of production, interest will be one half of the product of capital multiplied by the rate of interest and the period of production, rather than the whole amount of that mathematical product. In consequence, the value of finished products of each labourer will be equal to the size of capital (or t1) multiplied by one-half of the interest of whole period plus capital. Thus, equation (1) is obtained. Now, we divide both sides of equation (1) by t. The average annual production per labourer is represented by s/t, and is represented by p. Thus, equation (2) is secured.

$$s = t.\, 1\left(1 + \frac{z.\,t}{2}\right) \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

$$p = 1\left(1 + \frac{z.\,t}{2}\right) \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (2)$$

Now, suppose that a labourer can also act as an enterpriser and can borrow capital as he wishes. By supposition s and p are known functions of t. Supposing that the rate of interest is given and represented by z, we shall determine t in such a way as to make 1 maximum. In differentiating the sides of equation (2) we treat 1 as if it were a constant, because dl$=$0 when 1 is maximum. Thus, equation (3) is secured. The values of t and 1 are derived from equations (3) and (2).

$$\frac{dp}{dt} = \frac{1.\,z}{2} \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (3)$$

Suppose wages are fixed and that enterprisers or capitalists try to secure the maximum profit. In this case, we shall treat 1 as we did z.

$$\frac{dp}{dt} = \frac{1.\,z}{2}$$

Supposing that the total amount of capital and that of labourers are given. We shall indicate them by K and A respectively. In an equilibrium formed under such a con-

dition, the relations of K, A, 1 and t may be expressed as follows :

$$K = \frac{A.\, t.\, 1}{2} \quad \cdots \cdots \cdots \cdots \cdots \quad (4)$$

By combining equation (4) with (2) and (3), we get equation (5) in which l, t and z are represented by K and A.

$$p = 1 + t\frac{dp}{dt} \quad \cdots \cdots \cdots \cdots \quad (5)$$

Equation (6) is obtained by inserting in equation (4) the value of 1 derived from equation (5).

$$K = \frac{A}{2}(tp - t^2)\frac{dp}{dt} \quad \cdots \cdots \cdots \cdots \quad (6)$$

Inasmuch as p and $\frac{dp}{dt}$ are the known functions of t, the only unknown quantity contained in equation (6) is t. This equation can be solved in reference to t. If we know K, A and t, we shall be able to derive 1 and z also. These are the rate of interest, wages and the period of round-about production in equilibrium.

How can an equilibrium be formed in this case? Or, in other words, how is equation (6) soluble in reference to t? It is because equation (3) is presupposed. But in equation (3) 1 (representing wages) is presupposed and 1 is also presupposed to be a fixed amount or 1 is treated as maximum under the condition that the rate of interest z is definite. In contemporary industrial organisation, however, it is practically impossible for labourers to become enterprisers so that there exist no circumstances under which wages at a fixed interest rate can be made maximum. Even supposing that financiers act as enterprisers, under the conditions given by Böhm-Bawerk, they are not in a position to accept wages as fixed rates. Rather the enterprisers are placed in a position of changing 1 while changing t at the same time correspondingly. For this reason, equation (3) is impossible of formation. How, then, is an

equilibrium established in actual economy? In my opinion, there should be a power equation showing that supply wages (or labour supply functions) are essentially determined by the relation of social powers. This equation would show that the wages can not be determined as the enterprisers will, but their rate is a definite one in accordance with the definite quantity of labour supplied; and such a rate of wages being presupposed, the period of production can be determined to make the interest rate maximum. The equation (2) will be taken in. But then we shall have a less number of unknown quantities than equations. But if K representing the amount of capital be taken as an unknown quantity, the two will become equal in number. True, inasmuch as p is a quantity of value, its quantity will be affected by the change of K and, in consequence, of a change in the total amount of production. But this difficulty can be also removed if p is regarded as the known function of both K and t.

The equations given below, (1') and (2'), indicate the function of productivity (products) and the function of powers (determination of wages by powers). If other equation (3'), (4') and (5') are formed, unknown quantities in each of them can be determined.

$$p = f_1(t, K) \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (1')$$

$$A = f_2(l, p) \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (2')$$

$$p = 1\left(1 + \frac{zt}{2}\right) \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (3')$$

$$\frac{dp}{dt} = \frac{l.z}{2} \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (4')$$

$$K = \frac{A.t.l}{2} \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot \quad (5')$$

If the quantity of labour is given, the sizes of p, z, t, l and K in equilibrium will be determined unequivocally. In other words, the equation (4') can not exist in the absence of the power equation (2'), and in consequence there will be no equilibrium. In this sense, unless power relations

are given, neither the amount of interest nor of wages can
be determined.   Powers are at least in this case, not a
factor which alters economic quantities but a factor which
makes the determination of economic quantities possible.

The equations (3) or (4') $\left(\dfrac{dp}{dt} = \dfrac{z.1}{2} \right)$ can be formed
without introducing the factor of power, therefore, when
one branch of industry only is taken into considera-
tion.   Limiting our consideration to this one branch only,
we can say that an enterpriser will have to raise wages as
high as possible, if he hopes to retain his labourers against
the attempts of enterprisers in other branches of industry
to get his labourers away from him.   Thus, it is impossible
for enterprisers to reduce wages arbitrarily, say from 500
to 300.   In other words, individual buyers of labour are
unable to control the price of labour by themselves but the
situation is entirely different when the industry of society
as a whole is considered, for in this case labour can be
transacted at a reduced price.   This is inevitable so long as
no thought is given to the control of labour supply through
the resistance of powers.   Now, it is clear from the very
nature of the question under consideration that, if we are
to clarify the basic circumstances that determine interest
and wages, our investigation cannot be limited to some
one branch of industry only.   There is no doubt that both
Böhm-Bawerk and Wicksell take industry as a whole as
the object of their examination.   Therefore, my study also
will be unrestricted in this respect.

(6)

I have clarified the nature of natural interest and natural
wages as advocated by both Böhm-Bawerk and Wicksell.   I
shall take into consideration these two economic factors as
explained above in examining the views of Böhm-Bawerk
on the influence of powers on economy in the long run.
True, I have already given my basic criticism and side-view
of his ideas and have demonstrated that it was impossible

to determine either natural interest or wages without the
intervention of powers. But I shall now take up Böhm-
Bawerk's more concrete contention : whether or not labourers
can reduce interest rate and raise their wages by means of
their powers.

According to Böhm-Bawerk, labourers could succeed in
raising wages to 600 by means of their powers, and that
the whole of capital and the whole of labour could be
happily employed, the period of round-about production
would be 5 years and interest rate would be 1.33 per cent.
But enterprisers, seeking greatest profits, will undoubtedly
choose a less number of round-about production, say, 8
years. This means that each enterpriser will employ 4.16
of labour instead of 6.66 of labour. There will be an
excessive supply of labour, and wages will be bound to fall.
Thus, wages and interest will settle at their natural level.
I object to the foregoing contention of Böhm-Bawerk. If
wages are determined by powers, it is apparent that no
equilibrium will be formed with any given amounts of
labour and capital. The same may be said of the common-
sense view that wages are determined merely by custom
and that real wages do not easily fluctuate. For the forma-
tion of an equilibrium the amount of capital must be always
considered to be an irrational quantity. In this case wages
of 600 will not constitute equilibrium wages when the
amount of capital is so much as above mentioned. But the
accumulation of capital will go on. When the accumula-
tion of capital progresses to the point where its amount
will bear the proportion of $\frac{6.66}{4.16}$ to the existing amount of
capital, 600 will become the equilibrium wage.

When the assumption is made that wages are deter-
mined by powers, and the amounts of capital and labour
are as above mentioned, then 500 may be rightly regarded
as the equilibrium wage ; but no one can say that wages
can not be raised further by the social relations of powers.
So long as it is admitted that wages are influenced by

powers, it should be also admitted that other conditions, especially the amount of capital, for instance, will sooner or later correspond to it. In other words, it must be admitted that the accumulation of capital sooner or later will absorb the surplus labour.

Moreover, in reality the speed of this adaptation is accelerated. A prolongation of the period of round-about production necessitates an increase in capital goods. But this is not sufficiently clear from Böhm-Bawerk's data, which fail to show the fixed capital which is needed for production. Nor does he specify any definite period of completion of production in his data. In practice, however, finished products must be turned out annually even when the period of round-about production is prolonged. Because of this necessity, the prolongation of the period of production requires the rapid provision of a far greater amount of capital goods. This tendency is intensified by the fact that the longer the period of round-about production, the greater will be the amount of fixed capital. The increase of the period of round-about production, which results from the rise of wages and the depreciation of interest rate, necessitates the accumulation of capital; perhaps the rise of the prices of capital goods causes a rise of interest rate and a reduction of the period of round-about production, through the rise of price of labour; meanwhile the time will come when all labourers will be employed at 600 wages. All this is entirely ignored by Böhm-Bawerk.

The foregoing views inevitably lead to the conclusion that, should the powers of labourers increase indefinitely, they would come to a point where they could eliminate interest. When wages are 700, the period of round-about production will inevitably become 10 years, and interest will become 0.1, and the amount of labour employed will be 1.86. But these figures indicate that no equilibrium is possible. Unless the amount of capital is increased to a figure equal to the present amount multiplied by 2.3, the entire amount of labour will not be absorbed. This proves

the impossibility of wages rising by one bound to a point where interest can be eliminated, although, on the other hand, it is possible for such a position to be attained gradually and ultimately.

Let us see what are Böhm-Bawerk's ideas on this point. His views may be summarised as follows:

Supposing that interest drops indefinitely until it reaches zero, the supply of capital will decrease as savings for the purpose of deriving interest thereon will be decreased. An important change will take place on the part of demand for capital. When interest has disappeared, enterprisers will eagerly prolong the period of round-about production. Under such circumstances, there would be no hindrance to the prolongation of the period of production, because it was interest that previously constituted the obstacle. But it is obviously impossible to support a given amount of labour by a given amount of capital (subsistence fund) during so prolonged a period of production. It will be found necessary to reduce the period of production to a point where it is possible to support labour. The surplus of labour supply will inevitably bring about a fall in wages and incidentally raise the rate of interest. Interest will come into being because of the fact that, despite the need of a large amount of capital due to the prolongation of the period of production for many years, the supply (or the supply of subsistence fund) is limited, and certain enterprisers will pay interest for their needed capital.[19]

I shall now make a critical analysis of his views. It is not true to say that the disappearance of interest will bring about the indefinite prolongation of the period of round-about production. The amount of additional products will steadily decrease as the process of prolongation of the period of production goes on. When the period of production is 10 years and the value of products of annual labour is 700, the value of the products will no longer show any increase,

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19) Böhm-Bawerk, op. cit., pp. 279-283.

even when the period is prolonged, say for another year.
For this reason, no attempt can be made to prolong the
period of round-about production beyond 10 years under
the given circumstances. True, it is possible that there
may be not sufficient capital to employ the entire labour
when the period of production is prolonged to 10 years.
But we have also seen that this scarcity can be got over
through the accumulation of capital. Thus, so long as the
problem is regarded as that of the temporary action of
powers, it is impossible to do away with interest. However,
when consideration is given to the action of powers in the
long run as well as to the period during which capital is
increased, it is possible to eliminate interest by powers.

(7)

So far I have used, as a matter of course, the definitions
of round-about production and the scale of surplus products
as given by Böhm-Bawerk. I shall now proceed to examine
the nature of round-about production as well as that of
subsistence fund.

Böhm-Bawerk's ideas on the period of round-about pro-
duction may be stated in a nutshell as follows:

The period of round-about production may be described
as the average period between the investment of the origi-
nal productive goods and the completion of the finished
goods, and not the absolute length of time between them.
Even supposing that the process of production progresses
uninterruptedly, it should be noted that different original
productive goods will be put into use at different times.
For example, some will be put into use three years before,
and others one year before, and still others immediately
before, they are turned into finished goods. The average
of all of these different times multiplied by their respective
quantities will be the average period which is often ex-
pressed by another phrase, namely, "the average waiting
period". It is supposed that the further this period is pro-
longed, the greater will be the productivity of productive

goods, so long as the method of prolongation is properly chosen. The concept of the period of round-about production is primarily applied to individual productive goods, but it is also extended to national economy as well. When the products of labour in one year are consumed as enjoyable goods in the same year, there will be no intermediate products that have entered one period from the previous period. Thus, there will be production without capital. The greater the amount of unfinished goods that have entered one period from the previous period and the further removed the previous period is, the more round-about production there will be. In other words, one may say that the greater the participation of unfinished goods in production, the more capitalistic production there will be.[20]

The concept of round-about production can also be held as regards future plans of production as well as past production. but I believe there is no need to dwell on this point here.[21]

According to Böhm-Bawerk, the longer the period of round-about production, the greater will be the productivity of labour. Moreover, he regards the length of the period of round-about production as identical with that of capital goods (unfinished products) used per labour unit. What is then the relationship between the magnitude of capital goods and the period of production? A study of this question should proceed from an analysis of capital as subsistence fund.

I shall not analyse here the idea that capital as capital goods or unfinished goods and capital as subsistence fund are not identical. I shall look upon capital as subsistence fund, supposing that by means of this fund round-about production is carried on at various periods. It is clear that subsistence fund must be used for living during the period

20) Böhm-Bawerk, Positive Theorie des Kapitals, 4th ed., p. 117–121, L. v. Birck, Moderne Scholastik, Weltwirtschaftliches Archiv, XXIV, p. 214.

21) Martin Hill, Period of Production and Industrial Fluctuation, Economic Journal, Dec. 1933, p. 600.

of round-about production since enjoyable goods can not be produced until the end of this period. Moreover, capital is not invested in its whole amount at the beginning of production but is added piecemeal at the same pace throughout the whole period. If this be so, what is the relationship between the amount of the original or commencement capital (Anfangsfonds) needed for round-about production and the length of the period of production? Böhm-Bawerk answers this question as follows:

How much subsistence fund is necessary for round-about production for a single year? Supposing that j represents the subsistence fund needed for a year's living and s represents the given subsistence fund, we can say that s must be equal to j. Taking one year as each stage of production, the amount needed for two years of round-about production will be $s = 1\frac{1}{2} j$. Let us see how this equation is obtained. The total amount of demand for the first year is in the form of finished goods and the total amount of demand for the second year is given in the form of unfinished goods (products of one years production). The unfinished goods will become finished goods at the end of the second year. And thus production can be continued. Similarly, for round-about production of three years, the following will be needed: the first year's annual demand of finished goods represented by j; two-thirds of the unfinished goods demanded for the second year; one-third of the unfinished goods demanded for the third year. Thus, we can get the following formula: $s = 1j + \frac{2}{3}j + \frac{1}{3}j = 2j$. Similarly, we can compute the figures for the commencement fund of the production of four and five years. It will be found to be equal to the amount of demand for a period which is one-half of the period of production plus half a year. Thus, if n represents the period of round-about production, we get the following equation: $s = j\left(\frac{n+1}{2}\right)$. If each stage of the process of production is half a year, the commencement fund will be equal to the demand of a period which is

one-half of the period of production plus one-fourth. Again, if a month is taken as each stage of production, the commencement fund will be the demand of a period which is one half of the period of production plus half a month.[22]

The commencement fund or the basic subsistence fund which is necessary for the continual carrying out of the process of round-about production is also described by such words as *Vermögensvorrat, Subsistenzvorschuss, Vermögensstock*, etc.

Further, we know that capital or subsistence fund is not necessarily in the form of finished goods; usually it takes the form of various unfinished goods, instead of being restricted to the form of finished ones. In consequence, it is identical with the property fund (Vermögensstock) of national economy. For this reason, transfer from production of some definite period to that of a longer period makes necessary the transformation of the content of capital goods. This will be possible by making some parts of unfinished goods go to lower stages (nearer stages to finished goods), transforming them into new additional capital goods. This will require a reduction of the output of enjoyable goods, on one hand, and the lapse of a certain period of time until the production of finished goods in the new and longer period is achieved. The time required will be of a considerable length when fixed capital is concerned.

Different periods of production will result in different ratios of the various concrete forms of goods which capital or subsistence fund assumes. For instance, let us express the quantity of goods by taking as our unit the labour used in their production. Let us suppose the quantity of labour employed from year to year to be $6\frac{2}{3}$ (as given by Böhm-Bawerk). No matter what may be the period of production, the quantity of finished goods will be $6\frac{2}{3}$ so long as the economy is in a static state. If the annual addition of

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22) Böhm-Bawerk, Positive Theorie, 4th ed., vol. I, p, 399; vol. II, p. 347–348.

labour is $6\frac{3}{4}$, the figures for each stage of production will be expressed by the following formula: $\frac{3}{4}$ ($\because \frac{3}{4} \times 10 = 6\frac{3}{4}$). The following will be unfinished products at successive stages: $\frac{3}{4} + \frac{4}{3} + \frac{6}{3} + \frac{8}{3} + \frac{10}{3} + \ldots + \frac{18}{3} = 30$. The amount of products at the last stage of production or of finished goods will be equal to $\frac{18}{3}$ plus $\frac{3}{4}$, the former being the amount of unfinished products in the last stage of productive industry. Similarly, when the quantity of labour is $6\frac{3}{4}$, the amount of subsistence fund necessary to carry out the round-about production of the respective periods will be as follows:

No. of period	1	2	3	4	5	6	7	8	9	10
Amount of finished goods	$6\frac{2}{3}$	,,	,,	,,	,,	,,	,,	,,	,,	,,
Amount of unfinished goods	0	$3\frac{1}{3}$	$6\frac{2}{3}$	10	$13\frac{1}{3}$	$16\frac{2}{3}$	20	$23\frac{1}{3}$	$26\frac{2}{3}$	30
Total subsistence fund (capital)	$6\frac{2}{3}$	10	$13\frac{1}{3}$	$16\frac{2}{3}$	20	$23\frac{1}{3}$	$26\frac{2}{3}$	30	$33\frac{1}{3}$	$36\frac{2}{3}$

The foregoing table indicates that, although the total amount of the demand for finished products each year is the same, the amount of capital and the quantity of unfinished goods vary considerably with the different periods of production. Birck's criticism of the foregoing quantities, I believe, is untenable. He criticises Böhm-Bawerk's formula in the following way:

The contention made by Böhm-Bawerk that, in the production of the ten-year period, only one-tenth of the total capital is in the form of finished, enjoyable goods and that the remaining nine-tenths is in the form of unfinished goods, is not true to fact. In the production of the ten-year period, two-elevenths, instead of one-tenth, of the total capital is in the last stage of the process of production.[23]

Birck's criticism misses the point inasmuch as Böhm-Bawerk himself clearly says the same thing in his basic explanation of round-about production. The point in question should be held as a natural conclusion from the conception of the successive (staffelweise) investment of capital.

I shall consider several points in connection with the

23) L. v. Birck, op. cit., p. 224.

relationship between the amount of finished goods and that of capital as commencement fund (,, Anfangsfond "). The first point is the speed of the process of production. In our previous discussion, we assumed a year as the unit of time during which the production process goes on from one stage to the next. By this assumption, goods at the beginning of a certain stage, say the tenth, or last stage, become finished goods during one year, and that those which were at the beginning of the ninth stage are passed on to the tenth stage. But let us now suppose that the interval, during which the production process goes on from one stage to another, is shortened and becomes, for example, half a year, which means that the speed of production is doubled. By this assumption, the production of finished goods will be doubled with the same amount of unfinished goods and, in consequence, with the same amount of subsistence fund (according to Böhm-Bawerk, the same amount of the commencement fund), when compared with the former. If the speed of the production process is taken as 1 (from one stage to another during one year, and one circulation of capital per year), in the case of 10 stages production, the amount of capital needed to produce 10 enjoyable goods will be 55 (the unit of measurement being labour). But if the speed is taken as 2 (from one stage to the next during half a year), for the production of 20 enjoyable goods (being twice the former amount), the same amount of capital will be sufficient. Similarly, when the speed of production, therefore the speed of the circulation of capital, is increased, the amount of capital needed for the production of the same amount of enjoyable goods will be correspondingly reduced. In other words, the amount of capital needed for the production of a definite amount of enjoyable goods and which is capable of employing a definite amount of labour will constantly be in inverse ratio, if other things are equal, to the speed of production or the speled of the circulation of capital.

Secondly, let us consider fixed capital. Previously we

treated fixed capital in the abstract. But let us now take
it into actual consideration. Suppose that there is fixed
capital, the amount of which is ten times that of the
unfinished goods which are annually consumed in each
stage of the production process. This means that the
period of the duration of fixed capital is 10 and one-tenth
of it is consumed in each period of production. Thus, the
amount of capital needed for production is ten times the
amount of the unfinished goods consumed in each period of
production. But this also means that the circulation of
fixed capital is very slow. Thus, the above statement is
contained in the assertion (as made above) that the speed
of the circulation of capital makes the necessary amount of
capital change in inverse ratio. We shall demonstrate this
truth by citing concrete examples. Let us take as our unit
the amount of labour which is added at each stage of the
production process. (If the total amount of labour is re-
presented by $6\frac{2}{3}$ as in the preceding discussion, this unit
will be one-tenth of that total amount and will be $\frac{2}{3}$). If
the period of production is represented by t, the total
amount of capital required will be $\frac{t+1}{2}$ t, where the quantity
t is in the form of enjoyable goods. But if the stages of
the production process are reduced into smaller units, so
that the number of stages or production periods becomes
very great, the total amount of capital will be $\frac{t}{2}$ t. The t
units will be in the form of enjoyable goods while the
remainder will be in the form of unfinished goods. For the
convenience of calculation, let us assume that the total
amount of capital is $\frac{t}{2}$ t. The capital which is in the
form of such unfinished goods will be what remains after
t is taken away from the total amount.

Suppose further that there is no fixed capital and that
the speed of production per year, that is the number of
times the production changes from one stage to another
during a year is v. The capital needed for the production

of s (representing the annual demand for goods) will be expressed by the following formula (and in consequence, all net products produced by the entire labour during this period and thus enjoyable goods during the same period):

· $k = \dfrac{t^2}{2v}$ (total amount of capital), $\dfrac{t(t-2)}{2 \cdot v}$ (amount of unfinished goods) $+ \dfrac{t}{v} = k$, $vt = s$ (annual demand).

Let us take fixed capital into our consideration. For the sake of convenience, we assume the speed of the production process to be one in the sense above described. Or in other words, we suppose that advance from the first stage of production to the second stage is made but once during a single period of production. Suppose further that the amount of unfinished goods consumed in a single stage during one period is one-mth of the fixed capital. How much capital will then be required for a year's demand for finished goods, this being represented by s? Of the capital, that which takes the form of finished goods is represented by t, while that which takes the form of unfinished goods is represented by $\dfrac{t(t-2)}{2}$. If the life of fixed capital is regarded as m, its total amount will be secured by multiplying the amount of unfinished goods by m. The product of this multiplication plus t will be the amount of total capital. This is shown by the following formula:

$$K = t + \frac{mt(t-2)}{2}$$

Now, to what extent do changes in the amount of m or the life of fixed capital affect the amount of total capital? In order to answer this question it is necessary to know the ratio between the capital consumed and the total capital. The quotient secured by dividing the former by the latter is expressed by the following formula: $m - \dfrac{2(m-1)}{t}$. Let us call this the co-efficient of the total capital. The total capital must always be equal to the product of the capital consumed multiplied by this coefficient.

$$K = \frac{t^2\left\{m - \frac{2(m-1)}{t}\right\}}{2v} \qquad \because \left\{t + \frac{mt(t-2)}{2}\right\} \div \frac{t^2}{2}.$$

$$= \frac{mt^2 - 2mt + 2t}{2} \times \frac{2}{t^2} = m - \frac{2(m-1)}{t}.$$

We shall now take up fixed capital and suppose that the speed of the process of production is more than 1. As has been already stated, the latter point implies that the labour applied to one stage in one period of production advances to further stages beyond, instead of being limited to the next stage only. The difference in the speed of the production process is the difference in the number of stages which are passed through during a period of production. The following formula gives K or the amount of capital required to produce s representing the annual demand for finished goods (in other words, the finished goods having the value of labour which is applied during the period). As has been stated, t stands for the number of stages, m for the life of fixed capital and v for the speed of production process.

$$K = \frac{t^2\left\{m - \frac{2(m-1)}{t}\right\}}{2 \cdot v}.$$

Let us explain the above formula by citing concrete examples. Suppose that there are ten stages in the process of production, corresponding to 10 years in Böhm-Bawerk's period of round-about production. The amount of labour a is used in each stage per half year. Thus, at the end of a half-year, enjoyable goods of 10a are derived from the last stage. During one year 2a labour is added to each stage and 20a amount of enjoyable goods is produced. The capital which is consumed in one production period and therefore existing in any time-point in the different stages (exclusive of fixed capital, which remains uncomsumed) is as follows: a in the first stage, 2a in the second stage, 3a in the third stage, and the total amount in all ten stages is 55a. Moreover, there is that part of fixed capital which is

not consumed in that period, its amount being $9-1$ times the amount which is consumed during a half-year, while production advances from one stage to another. The amounts of fixed capital are: 9a in the second stage, 18a in the third stage, and the total amount for all stages is 45a times 9 or 405a. Thus, the grand total of capital is 55a plus 405 or 460a. If 2a (which represents labour added in each stage in one period of production) is taken as the unit, the grand total of the capital will be found to be 230. This conclusion cannot be directly reached through the application of the former equation: $t=10$, $m=10$, $v-2$, because so long as the period of production is taken in sub-divided numbers, it is assumed that $\frac{t-1}{2}$ may be taken as $\frac{t}{2}$. If this assumption is excluded from our considera-tion, we can secure an equation that is given below. The total amount of capital consumable (total capital—fixed capital) is: $t\frac{t+1}{2}=\frac{t^2+t}{2}$.

Of that amount, the consumable capital goods (consumable intermediate products) are: $\frac{t^2+t}{2}-t=\frac{t^2-t}{2}$. There are total capital goods (intermediate goods) (including fixed capital) m times the above amount and the size of which is given in the following equation: $\frac{(t^2-t)\,m}{2}+t$. If the foregoing figures are added to t, the result will be K or the total amount of capital. Thus, the fixed coefficient of the total capital will be: $m-\frac{(2m-2)\,t}{t^2+t}$. The equation re-ferred to in the foregoing discussion is as follows:

$$K=\frac{(t^2+t)\left\{m-\frac{(2m-2)\,t}{t^2+t}\right\}}{2v}.$$

If t, m and v in the foregoing equation are converted into their respective values, namely, 10, 10, 2, the value of K will be found to be 230, as has been stated above.

The speed of the circulation of the total capital will be

equal to the quotient of division of v (which we considered in connection with t^2) by the foregoing fixed coefficient. Thus, v_0, the speed of the circulation of the total capital will be expressed as follows: $v_0 = \dfrac{v}{m - \dfrac{2(m-1)}{t}}$.

The total capital, which is represented by K, is secured by dividing $\dfrac{t^2}{2}$ representing capital consumed by v_0, which is the speed of the circulation of capital, as given in the following equation:

$$K = \frac{t^2}{2 v_0}.$$

I have concluded my discussion of the amount of capital needed for production.

(8)

I shall devote a section of my article to the criticisms made against Lindberg's arguments. As his treatise has been known to a limited circle of readers only, his work has been the object of but few criticisms. I shall take up first Alexander Mahr's criticism.

Mahr contends that a theory of minimum wages is a natural conclusion from Böhm-Bawerk's premises. He argues that Böhm-Bawerk himself did not reach such a conclusion because his study was based on an empirical „ Probieren “ and that he would have reached such a conclusion, had he used a mathematical method such as was used by Lindberg. I cannot agree with Mahr on this point. Böhm-Bawerk failed to reach the same conclusion as Lindberg, not because his method of investigation was confined to an empirical test, but because some of his premises were different from those of Lindberg. Böhm-Bawerk presupposes, although he does not expressly state so, that the law of indifference (Gesetz der Preiseinheit) governs the price of labour. Mahr goes farther, and if Böhm-Bawerk had done the same, he would have recognised that it was his

mistaken premises that brought about the failure of his
theory to correspond to actual experience. (By this I mean
that actual wages do not settle at the level of minimum
living wages.) Now, how did Böhm-Bawerk err in his
premises? He failed, according to Mahr, to take into con-
sideration the existence of capital which is tied up in
different branches of industry within national economy—
capital which is not free. In other words, he made the
fatal assumption that the total capital can freely and vol-
untarily change the period of production any time without
any loss to itself. In reality, however, it will be found that
shifting to a higher method or a longer period of production
can take place only gradually. As production reaches high
stages, the amount of products per head increases. There
will be no question to solve if the whole of the products
are consumed. But in reality, part of them is utilised for
production and thus capital or subsistence fund is thereby
increased. The faster the investment of additional capital
is made, the greater will be the prolongation of the period
of production. For this reason, contrary to the assumption
of both Böhm-Bawerk and Lindberg, enterprisers can not
change and determine the length of the period of produc-
tion at will, with the same given amount of capital. Lind-
berg also has a mistaken idea about the tendencies of wage
movements. The depreciation of wages resulting from the
prolongation of the period of production may be impeded
by the increase of capital; wages may either rise or fall
through the overcoming of the former action by the latter.
Which of these possibilities will actually happen cannot be
predicted.[24]

In short, Mahr does not reject Lindberg's conclusion
on theoretical grounds. He ascribes to the above circum-
stance the fact that minimum living wages are not realised
in actual life. On the one hand, the existence of fixed

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24) Alexander Mahr, Untersuchungen zur Zinstheorie, 1929, p. 17 et
seq.

capital (mostly employed in the form of fixed industrial
establishments) impedes the rapid prolongation of the period
of production ; while, on the other, such prolongation of the
period of production is accompanied only by an increase of
capital which, again, impedes the depreciation of wages.
The main issue is found to be in the latter rather than in
the former. But it will be a difficult task to explain from
this point of view why minimum living wages are not
realised in actual life, if one is to admit Lindberg's theore-
tical conclusions. If one should take Lindberg's position,
one could say that enterprisers will necessarily prolong the
period of production until wages reach their minimum
level. If the increase of capital is capable of impeding this
tendency, it is through the shortage of labour supply. But
during the past century, there has been an over-supply of
labour rather than a shortage of it. Thus, Mahr's conten-
tion is not fully substantiated.

I shall not refer here to Genechten's criticisms of
Lindberg's theory. As to the opinion of van Dorp, she has
independently reached the same conclusion as Lindberg,
namely that one must admit the inevitability of wages
falling to a minimum level so long as one recognises Böhm's
premises. She regards as logical Mahr's explanation that
such a minimum level of wages is not actually reached
because of various frictions.[25] In other words, she does not
deny Mahr's explanation that, although the amount of
capital increases, the prolongation of production does not
take place just as quickly, because the larger part of capital
is in a fixed state so that the depreciation of wages is
considerably obstructed. But she does not take into con-
sideration the following circumstances: (1) that the pro-
longation of the period of production takes place through
the destruction and loss of already invested capital so
that the prolongation of it is not very difficult ; (2) the

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25) E. C. van Dorp, Löhne u. Kapitalzins, Zeitschrift f. National-
ökonomie, Vol. IV no 2, p. 265.

following premise is already contained in the contention of Lindberg that a small number of enterprisers who use the increased capital can lower wages through the prolongation of the period of production (especially in the actual condition of unemployment).

Just as Mahr and van Dorp accept Lindberg's conclusion, so Birck also shows complete agreement and is of the opinion that Böhm-Bawerk did not really deny the iron law of wages as he professes.[26] All of these scholars accept Lindberg's contentions, but they admit that his conclusion does not correspond to reality. As I have already stated, I cannot accept Lindberg's conclusion; but supposing that his conclusion is right, it would not be very difficult to explain the actual state of wages. Lindberg's conclusion is based on the absence of resistance on the part of labourers. If there be resistance on the part of labourers through their social powers, it is only natural, I believe, that wages will not actually fall to a minimum living level. This will be true even when there is some measure of unemployment. Whether one accepts or rejects Lindberg's conclusion, it would be impossible for one to explain actual wages without recognising the action of social powers.

(9)

So far I have not yet made any detailed analysis of round-about production. I have used this term in the sense of either production of a long period or production with many stages, and considered the two meanings as identical and interchangeable. But in so doing I was only using the word in the meanings given to it by Böhm-Bawerk. But I feel that I must go thoroughly into the meaning of round-about production.

Experience in industrial technique teaches us that production having a large amount of unfinished products

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26) L. v. Birck, Moderne Scholastik, Weltwirtschaftliches Archiv, 1926, Vol. XXII p. 220.

(capital) per unit of labour usually is more advantageous technically than production having a small amount of un-finished products per unit of labour; and that consequently its products per unit of productive goods is greater. This truth may be stated as follows: the more capital-intensive the original productive goods (labour) are, the greater will be the technical or physical productivity. Supposing that other circumstances are equal (especially regarding con-ditions of the length of life of capital goods), the more numerous the stages of production process, the more capital-intensive it will be. Consequently, the more numerous the stages of production, the greater will be the productivity of productive goods. When round-about production (Umwegs-produktion) is taken in the sense of production with nu-merous stages, the greater the degree of round-abouts, the more advantageous production will be. But there is a point beyond which the foregoing truth will not obtain: when the degree of round-abouts is increased to a certain point, productivity will not be increased. This point is always determined by the condition of technique. But we may as well leave out this point in our present discussion.

We have identified round-about production with produc tion spread over numerous stages. But we cannot say that production with numerous stages necessarily means pro-duction over a long period. The process of automobile manufacturing, for instance, has been greatly reduced and it now takes only a few weeks to turn iron ore into automobiles. The same may be said of the manufactur-ing of various equipments (iron and steel manufacturing industry). This being so, the proposition I have just made may be accepted unqualifiedly. If the speed of transition from one stage to another is increased, the mere increase in the number of stages in the process of production will not necessarily mean an extension of the whole period of production; nay, in some cases, the whole period of pro-duction may be reduced in consequence. Thus, we cannot say that the more the stages of production, the longer will

be the period of production. So long as what concerns productivity is the number of stages in the production process, the length of the period of production need not be taken into consideration here. If round-about production is used in the sense of production with many stages, it should be deprived of its concomitant, namely, the prolongation of the period of production.

When we consider the speed of transition from one stage to another, or the speed of the process of production, it would be impossible to say that the increase of stages will augment proportionally the quantity of capital per unit of labour (the capital intensiveness). But it is not important for our present discussion to clarify this point.

After the foregoing preliminary discussion, I shall proceed to analyse the connection between round-about production and the organic composition of capital in Karl Marx. In this connection, I shall take into consideration Lindberg's ideas. According to him the idea of a period of production is unintelligible, but it is not permissible, for this reason, to ignore the true moment contained in this concept of Böhm-Bawerk's. He claims that the concept of the period of production should be replaced by the Marxian idea of the ratio between variable capital and constant capital. If this be done, the same conclusion will be reached as Böhm-Bawerk and Wicksell arrived at, inasmuch as the scale of productivity (Skala der Mehrerträgnisse), referred to above is presupposed.[27] In the case of round-about production of one-year period, there will be only variable capital or v and there will be no constant capital or c and $\frac{c}{v}$ will be zero. In round-about production of two-year period, v will be the same as c and $\frac{c}{v}$ will be 1. In round-about production of three-year period, 1v will correspond to 2c and $\frac{c}{v}$ will be 2. For this reason, the period of production or t will be the same as $\frac{c}{v}$ plus 1. Thus,

27) Lindberg, op. cit. p. 512-513.

the following Wicksell equations (1) (2) are replaced by those on the right (1') (2'):

$$p = f(t) \quad \cdots \cdots (1) \qquad p = f\left(\frac{c}{v}\right) \cdots \cdots (1')$$

$$p = 1\left(1 + \frac{z \cdot t}{2}\right) \cdot \quad (2) \qquad p = 1\left\{1 + \frac{z \cdot \left(\frac{c}{v} + 1\right)}{2}\right\} \cdot \cdot (2')$$

I have no objection to treating round-about production in the sense of production with many stages of process and consequently using a larger amount of unfinished products. Nor am I opposed to rejecting the element of the period of production from round-about production. But I cannot unqualifiedly accept the idea that t must be replaced by $\frac{c}{v} + 1$. It is true that in production of one-year period in Böhm-Bawerk's sense, constant capital or unfinished products is zero. But the statement that c equals v in production of two-year period is not correct when successively (staffelweise) progressing production is taken into consideration. On such an assumption, c is one-half of v in the course of two year's production. I have already explained this before. Similarly, in the case of production of three-year period, c is not twice v, but the two are equal. If each stage of production is one year, the total amount of capital will be $\frac{(t+1)t}{2}$ and the amount of variable capital will be t (as has already been explained). For this reason, the amount of constant capital will be as follows: $\frac{t(t+1)}{2} - t$ $= \frac{t^2 - t}{2}$. And the quotient obtained by dividing c by v will be $\frac{t-1}{2}$, as may be seen from the following equation: $\frac{c}{v} = \frac{\frac{t^2-t}{2}}{t} = \frac{t-1}{2}$. Aside from possible errors in the calculation of v : c, it seems that in the expression $\frac{c}{v}$ the total amount of capital does not appear to be a variable. This constitutes a difficulty in the study of the question of interest.

I shall now make my contention clearer. The element of the period of production should be removed from the concept of round-about production, the latter being taken in the meaning of production having many stages. Thus, if t represents the number of stages instead of the period of production, $\frac{tz}{2}$ in the equation, $p = 1\left(1 + \frac{t \cdot z}{2}\right)$ will give the amount of interest contained in the prices of annual products as a static element.[28] It is controlled not only by z or the interest rate but also by the amount of capital or $\frac{t \cdot 1}{2}$. If there is any fixed capital, we must multiply t by the above-stated fixed coefficient m and replace $\frac{1 \cdot t \cdot z}{2}$ by $\frac{m \cdot z \cdot 1 \cdot t}{2}$. But objection may perhaps be made to my codtention as follows: by removing the element of time from the study of economic equilibrium in which it was inserted for the first time by Böhm-Bawerk and Wicksell, you are making retrogress instead of progress. To this, I shall reply: we are dealing with a static question, and it is therefore quite natural that the time element should fall out (in the sense given by Streller, Carell). The element of time, however, should be taken into consideration in a further study of the problems of economic dynamics.

(10)

By taking t as stages in the process of production rather than the period of production, I shall once more examine the propositions I have made in order to ascertain to what extent they are valid. I have stated that there will be neither natural wages nor natural interest without the intervention of powers; and that the formulation of any economic equilibrium containing interest is unthinkable without the operation of powers as a determining factor.

The difference between capital which exists in the form

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28) Birck, op. cit. p. 202–206.

of enjoyable goods to be paid in advance for future labour
and capital which takes the form of unfinished products at
various stages, is found in the fact that the shifting from
one method of round-about production to another method
takes place immediately or only after a lapse of time. The
latter case indicates that production is progressing by some
definite method of round-about production, so that it is
impossible to change the stages, the method, or the period
of production immediately. But part of the labourers whose
living is maintained by capital in the form of enjoyable
goods which are annually produced (commencement fund)
will be directed to work other than the reproduction of
goods consumed; and this will bring about a change in the
contents of capital goods. When capital goods have been
increased the new method of production can be introduced
and realised. Let us consider, for instance, a case in which
the number of stages increases. Suppose that the stages of
of round-about production (represented by n) are increased
by four. The following process is most probable under
such circumstances. Any reduction in the amount of
finished goods which are annually produced during the
successive four years will be prevented. In order to do
this, no reduction should be made in the production of the
n–3th and lower stages during the first period, in which a
change in the stages of production begins. On the other
hand, curtailment is made in necessary parts of production
stages as follows: the n–4th stage in the first period, the
n–3th in the second period, the n–2th stage in the third,
and the n–1th stage in the fourth. At the same time, the
factors of production which are thus emancipated by this
curtailment are used for the production of unfinished goods
in newly added stages of production as well as those un-
finished goods hitherto existing and which are in need of
recreation. All this is based on the presumption that an
industrial enterpriser having necessary equipment and
facilities can change products to a certain extent. In other
words, it is assumed that he is able to change his product,

say A to B. Of course, this changing of products is not always made completely, and capital is either destroyed or lost according to the degree of variation in the change. This means that the cost of change in the stages of production is so much greater. Apart from this, there is no obstacle which in principle prevents changes in the stages of production, although such changes require a definite length of time. In the case of fixed capital which is to exist for some length of time, changes in the stages of production are conditioned by that length of time. It would be impossible to adopt a new method of production without incurring a partial destruction of capital, until the end of the economic life of the existing fixed capital is reached. How long such change of production method takes depends upon various circumstances: (1) it is influenced by the gestation period in the production of capital goods; (2) it is determined by the quantity of capital goods to be added in adopting the new method and by the quantity of labour which can be used in the production of such additional capitals so that the quotient of the former divided by the average of the latter will be the period in question. The amount of the latter will be determined by the quantity of labour which becomes unnecessary as a result of the adoption of the new method. The foregoing has been considered in connection with the increase of production stages, but the same may be said in connection with the decrease of production stages.

As to possible changes of the methods or of the number of stages of round-about production, it must be admitted that the proposition I have already advanced, namely, the formation of an equilibrium, is impossible without the intervention of powers. I believe that it is hardly necessary to dwell on this point in detail. But I shall take it up here briefly. According to Böhm-Bawerk, the figures for the period of round-about production, wages and interest rate respectively, under circumstances assumed by him, are as follows: 6 years, 500 and 10 per cent. But some industrial

enterprisers will necessarily attempt to increase the number of production stages and reduce wages, say to 300, in order to increase the rate of their profits. So long as the amount of capital is given and there is no demand for labour which is excluded from exchange, every industrialist is in a position to reduce wages, if he so desires. Suppose now that an industrial enterpriser named A desires to make such a wage reduction. The following will take place if a change of products is impossible in any stage of production, or, in other words, if there is no elasticity as to the variety of products: the production of six-year period or the old method will be continued during the first six years following the introduction of the new method or the prolongation of the period of production. Production is carried on in the first stage only in the first year, in the first second stages only in the second year and so forth by the new method through the ten-year period of production. No finished goods can be secured in any of the following years: the seventh, eighth and ninth years. The living of labourers during these years will be maintained by the savings made by the reduction of wages to 300. The financiers who live on interest will have to reduce their living expenses in consequence, but this is another question which we need not consider at present. At the end of the tenth year, products of a new period of round-about production can be secured. Capitalists will secure greater profits from these products. Other enterprisers will also do likewise, if they so desire.

The above situation occurs when elasticity in the variety of products does not exist at all. The process of changes in the method of production will be somewhat different when the elasticity in question exists in a certain degree. Let us take an extreme case in which the following will take place: production in the lower stages will be curtailed; it will become barely enough to pay reduced wages; some part of production in the lower stages will be applied to that in the higher stages and will be used for

the creation of capital goods in the newly added stages.
At the same time, the production in the higher stages (for
example from the seventh to the ninth) will also be changed
so that the finished products to be produced yearly will be
enough to pay 300 wages.   To what degree all this will be
possible will depend upon the degree of the elasticity of pro-
duction.   Changes in the period of production in actual life
occupy the middle ground between these two extreme cases.

Now, let us suppose that in this case the period of
production is prolonged and wages are reduced to 300.   If
other enterprisers do likewise, the period of production will
be 10 years generally and the rate of interest will become
26.67.   We have already seen that all this will be followed
by the contraction of the period of production and by the
rise of wages.   It is indeed very clear that no equilibrium
can be reached under such circumstances.   But this will
not be the case when wages are determined by the resistance
on the part of labourers.

I have explained that the formation of an equilibrium
is impossible when no power relations are presupposed;
that is, it is impossible without presupposing the supply
function of original productive goods as determined by
powers, even when capital or subsistence fund takes the
form of so-called national property, or in other words,
when subsistence fund takes the form of invested capital.
Moreover, for this conclusion, the following premises are
necessary: (1) wages are necessarily paid out of capital in
advance; (2) wages being passively determined, they are
not governed by the law of indifference (Gesetz der Pre-
iseinheit).   If these premises are admitted, my conclusion is
unchallengeable.

I have already explained the second premise, but I
shall add the following.   Let us suppose that there is no
resistance on the part of the suppliers of labour and that
the supply price of labour only reflects its demand price.
Under such circumstances, the following statements must be
admitted as true so long as the community's total demand

for labour corresponds to its total supply of labour.
Univocal equilibrium is unconceivable. Even when the
demand for labour equals the supply for labour at high
wages, these wages can be reduced at the arbitrary will
of some of the buyers of labour, because in this case there
is no extra-marginal buyer in a position to compete with
the marginal buyer of labour and just excluded from the
bargain. In other words, inasmuch as labour is demanded
only by the capital the amount of which is given, there
can be no more buyers of labour to compete with the
marginal enterprisers. Thus, the second premise is merely
a conclusion arising from the first one.

Böhm-Bawerk's explanation of the determination of the
rate of interest and his analysis of the capital market are
regarded by some scholars as a sort of wage fund theory.
This view is correct on the whole. But Böhm-Bawerk him-
self has elucidated the difference between his theory and
the classical wage fund doctrine. The first point of diffe-
rence between the two may be stated as follows[29]: in the
classical wages fund doctrine, the wage fund is regarded as
a given fixed amount, but in reality it is an amount which
is constantly changing. It is not the total amount of the
community's property nor is it the "circulating" part of
such property. On the contrary, it is a variable part of the
community's fund. It changes in amount according to the
rates of wages. Thus, it would be a vicious circle to
explain wages by means of a wage fund. The second point
of difference may be stated as follows: in the wage fund
doctrine the factor of the period of production is given no
consideration. But Böhm-Bawerk starts from the property
fund, which is accumulated in national economy. He
explains that some part of this fund is determined as wage
fund in some way. He also states that this national pro-
perty fund or the total amount of subsistence fund is
determined by saving (and also by the opposite action,

29) op. cit. p. 481.

namely, by its consumption), and that this saving is deter-
mined by the principle which assures the maximum satisfac-
tion in the distributing of the income for present as well
as for future use.[30]

However, both Böhm-Bawerk's theory and the classical
wage fund doctrine agree in their assumption that wages
are paid in advance. We can further say that these two
theories also agree with Karl Marx's theory of capital and
wages on the same point. All these theories are opposed
to the idea that wages are paid out of the prices of pro-
ducts. Wicksell recognises that his own theory and that
of Böhm-Bawerk differ from that of Léon Walras on the
same point. Wicksell criticises Walras as follows:

According to Walras, the suppliers of labour, like the
suppliers of any other means of production, maintain their
living by their own resources during the period of produc-
tion and they are paid for their work out of their sales of
products at the end of production. This view of Walras is
erroneous. Because Walras regarded only durable goods
(fixed capital goods) as capital, he was unable to explain how
the rate of interest is determined.[31] (I cannot go into detail
on this point of Wicksell's criticism). Let us now consider
the main argument raised by Wicksell. In my opinion, the
idea that wages are paid in advance should be upheld; it
cannot be rejected even from the standpoint of the theory
of synchronisation of production processes. If the idea of
the advance payment of wages is adopted, a considerable
revision or alteration must be made in the contents of the
theory of imputation. At least all attempts at explaining
wages by means of imputation or marginal productivity
should be scrupulously reexamined.

The idea of synchronisation of production processes
teaches us the following: Waiting is necessary before
capital is accumulated, invested and results in products.
But all this process is dynamic instead of static. The

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30) op. cit. p. 475-477.   31) Wicksell, op. cit. p. 142.

capital invested is constantly making the function of pro-
duction in a static condition. Successive processes of pro-
duction are continued in the same way and on the same
scale so that productive goods are incessantly added to each
of these stages and products therefrom are produced at the
same time in each stage. All this may be likened to the
incessant flowing of water in and out of a water reservoir.[32]
For this reason, however round-about production may be, it
is in a way, a process which is simultaneously successive,
continuous and regular (simultan sukzessiver, kontinuier-
licher und regelmässiger Stufenprozess). All the processes
of production are synchronised.[33] But can one conclude
from this circumstance that wages are paid out of products,
not in advance out of capital?

However continuously and simultaneously all the pro-
cesses of production may be carried on so that the applica-
tion of labour and the forthcoming of products are
synchronised, products which are produced by labourers to
whom wages are paid are completed at the end of a certain
period of time. Thus, wages are actually paid before the
products are sold, and for this reason wages cannot be paid
out of the sales of products. Superficially viewed, wages
appear to be paid out of the constantly inflowing prices of
products because in actual accounts the prices of products
created by previous labour flow in simultaneously with the
payment of wages. But the real relation of things is clearly
shown when capital is first invested or when production is
suddenly expanded and products corresponding to the in-
crease of labour are not yet finished. Such must be the
actual case. In reality, some part of capital returns to its
money form from its commodity form by the constant sale
of goods and it is continuously used for the payment of
wages. If a greater amount of wages than hitherto has
been paid is paid out of the prices of products, it means

32)   J. B. Clark, Distribution of Wealth, p. 130.
33)   Birck, op. cit. p. 202.

that a greater amount of wages is paid out of the newly accumulated capital. For this reason, it is impossible to deny that wages are paid in advance out of capital, even when all processes of production are synchronised. Although capital may be constantly accumulating, wages will be paid in advance from a definite amount of capital at some definite point in time, and its amount will be controlled by the amount of capital.

For instance, even Schumpeter, who considers the prices of productive goods as being paid out of the prices of products according to their marginal productivity, states that labourers do not loan labour, nor do land owners loan the use of their land to industrial enterprisers. He also denies that unfinished products are loaned by an industrial enterpriser to any other enterpriser. Labourers will have no means of livelihood if they should loan labour. Therein lies the function of money as capital. This view will ultimately lead to the conclusion that wages are paid out of capital.[34]

Dorp's view on this point is noteworthy. The productivity theory of wages may or may not be possible of mathematical demonstration, but it can not be maintained from the mere point of the order of time. According to this theory, the value of labour is derived from the value of finished products at the end of the production process, but with only a few exceptions, finished products are turned out after wages have been actually paid. For this reason, the value of labour is still unknown at the time of the payment of wages. This is also ascertained from a theoretical point of view. Productivity cannot be a basis of imputation. The value of products depends upon the income of their buyers, and therefore on wages, so that wages can not depend on the value of products. If the wages are to be regarded as dependent on the value of products, the

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34) Schumpeter, Entwicklung, 1st ed. p. 200, 2ed ed. p. 141.

theory would result in a vicious circle.[35] Dorp further argues as follows:

According to the theory of marginal productivity, capital, labour and land are all means of production and for them interest, wages and rents are paid. But capital, in the form of capital goods, does not yield interest. On the other hand, capital as subsistence fund (which yields interest) is not a factor of production, and therefore no one can reasonably say that entire products are distributed among the factors of production.

I have already dwelt on the two elements of Böhm-Bawerk's theory of interest, namely, the conception of agio and a sort of wage fund theory. Disagreement may exist about the possibility of harmonizing the two; many may attach importance to the second point, treating it as indicative of how both wages and interest are really determined. This view is supported by Wicksell and such other scholars as Landry, Akermann, Taussig, Schpiethoff.[36]

In my opinion, the recognition of the advance payment of wages (and to some extent of rents also), i.e. that wages are paid out of capital, has considerable influence on the theory of distribution. To assert that labour and other means of production have prices which are determined only by their productivity is possible in an economy in which there is no advance payment of wages. The idea of general equilibrium of the Walrasian school will correspond to economy having no advance payment of wages as stated above, saying nothing about the assumption of the absence of the interference of powers on economy. But the matter will be entirely different once the assumption of the advance payment of wages is admitted. Wages will no longer be determined by the productivity of labour, but by the relations of the following factors: a method of production which is most advantageous to enterprisers, amount of labour

35) E. C. van Dorp, Agio oder Loknfonds, Archiv f. Sozialwissnschaft u. Sozialpolitik, Vol. LXVI no. 2.p. 313.

36) van Dorp, op. cit. p. 317.

and that of capital, leaving out of consideration the question of the interference of powers. The theory of marginal productivity asserts that the prices of original productive goods are determined by marginal productivity and that the former, in turn, absorb the total prices of all products. But the very fact that wages are not determined by marginal productivity overturns this theory from the very bottom. According to the imputation theory of wages, the value of products is attributable entirely to productive goods, but the truth is that an increase in the value of products, however great, is unable to influence the price of labour, because the latter is influenced by the amount of capital, that is by circumstances which are largely independent of the value of products.

Böhm-Bawerk and Wicksell take the same stand as Karl Marx in that they both include in their respective systems of economic theory the assumption that the prices of productive goods are paid in advance. I have already indicated the close connection between the idea of round-about stages in production and Marx's conception of the organic composition of capital. But there is this difference between them and Marx: whereas in the case of Marx, profit is determined essentially by surplus value and indirectly by the amount of variable capital, Böhm-Bawerk is convinced that profit is determined by the size of productivity which is the function of the period of round-about production. At any rate, both completely agree in that they recognise the advance payment of wages. They differ in opinion regarding the nature of productivity. In my opinion, further investigation will be necessary regarding the determination of of productivity.

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