Mr. Ricardo and the Moderns

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SAMUEL HOLLANDER

INTRODUCTION

The origin of this paper was a conversation between the authors, which took place when Hollander (S) was visiting Hicks (J) at Oxford. It may be summarized as follows.

S: I am sorry to see from your recent book[1] that, like so many others,[2] you think that Ricardo had what you call a fixwage theory. That is to say, not only did he affirm that in stationary equilibrium (long-run equilibrium) the real wage, or commodity wage, is equal to a fixed level of subsistence—there is no doubt about that—but you make him say that wages are approximately at subsistence level all the time. You construct a model in which the real wage is constant but employment is variable; and you label it Ricardian. But I find many passages[3] in which Ricardo allows that an increase in capital will raise real wages; that is quite inconsistent with your interpretation. All that is necessarily implied by the Malthusian law of population (which Ricardo certainly accepted) is that labor supply will increase when the real wage is above subsistence; only when the wage has come down to the subsistence level will labor supply cease to expand. Ricardo of course knew that in his day the population of Britain (and of other

1. John Hicks, *Capital and Time* (Oxford: Clarendon Press, 1973), p. 49.
2. Leading examples are (1) Nicholas Kaldor: "The rate of wages is determined by the supply price of labour that Ricardo assumed to be constant in terms of corn," from "Alternative Theories of Distribution," *Review of Economic Studies,* XXIII (1956), 83–100, reprinted in *Essays on Value and Distribution* (1960), p. 212; (2) Paul Samuelson: "Though Ricardo had many children, one often wonders whether he knew the biological facts of life, so content is he with the assumption that labor will *soon* adjust to its long-run horizontal wage at the subsistence level;" from "A Modern Treatment of the Ricardian Theory," this *Journal,* LXXIII (1959), p. 224, reprinted in *Collected Papers,* Vol. I, p. 415. These downright statements are echoed in the works of several later writers.
3. See Part II, below.

countries, such as the United States, in which he was interested) was in fact expanding. One should therefore conclude that he needed to believe that wages in those countries were above subsistence.

J: In spite of what I said, I have no closed mind on the matter; I am open to persuasion that the source of the fixwage theory is Lasalle, or Marx, or von Neumann, not Ricardo. I have myself allowed, in a later passage in that same book, that in Ricardo's view *"it should be possible . . . by steady increase in the demand for labour to keep wages running just a little ahead of subsistence. For though in the long run the supply of labour is elastic . . . it needs a little time to catch up."*[4] That is quite a step toward your view of Ricardo.

S: It seems to me that in the light of that you should have removed the former passage.

J: I did not see that there was an inconsistency. I remained of the opinion that fixwage was Ricardo's *formal* theory, though I certainly accepted that he modified it in application, as we all do with our formal theories. What led me to the fixwage interpretation was the famous arithmetical table in the *Essay on Profits.*[5] That table is based upon an assumed technical relation between capital invested and net product, capital invested implying labor invested; no such technical relation makes sense unless the real (commodity) wage is constant. That is why I thought that in his formal theory Ricardo must have assumed the real wage to be fixed.

S: So it was that table! I agree that in the construction of that table Ricardo assumed the real wage to be fixed; in fact, he says so. But he did not assume that it was constant at a subsistence level. He says that he *will assume that capital and labor "advance in the proper* [i.e., appropriate] *proportion so that the real wages of labour, continue uniformly the same."*[6] Real wages remain constant, because the capital-labor ratio proceeds suitably. This is a simplifying assumption, made for a particular expository purpose. There is no need to take it more seriously than we take the similar simplifying assumptions that are made (so often!) by modern economists. I stick to my view that Ricardo's general theory was quite different.

That was the substance of our conversation. It presented a challenge. If not fixwage, what was Ricardo's theory? Could one manage to construct a model, which rejected fixwage, but incorporated the rest of Ricardo's assumptions? If one could do that, it would surely

4. Hicks, *op. cit.,* p. 124.
5. David Ricardo, *Works,* P. Sraffa, ed. (Cambridge: Cambridge University Press, 1951), Vol. 4, p. 17.
6. *Ibid.,* p. 12.

throw light upon the issue. It would still be necessary to confront the resulting model with Ricardo's own statements, in order to find out whether one had in fact grasped his meaning. There were these two steps to be taken; we shall try to take them in the two parts of the following paper.

I. THE MODEL

1. *The general model.* We shall allow ourselves, in this Part to describe the model in terms that, admittedly, are not Ricardo's, but that we think will quickly make it more intelligible to the modern economist. (The translation into Ricardo's language, when we come to it in Part II, will not be difficult.) We shall thus, in Part I, assume that Product is homogeneous, and we shall use it as a standard of value, so that we can work, in the modern manner, in "real" terms. We further make the following assumptions:

(i) There is no *fixwage;* but labor supply (L) will increase or diminish according as actual wage (w) is greater or less than subsistence wage (w^*). One would naturally wish to assume that this effect operated only after a lag; but we found it best to proceed without this complication, leaving it to be considered later. This was a fortunate decision, illustrating, we shall see, a fundamental characteristic of Ricardian method.

(ii) There is a similar "subsistence level" for capital; thus if r is the rate of profit, capital will increase or diminish as r is greater or less than r^*. That is all that we need to specify about the "supply function" of capital.[1]

(iii) There are diminishing returns throughout.[2]

Now consider Figure I, in which w and L are coordinates. The state of the economy, at a particular time, is represented by a point on the diagram (w,L). The horizontal WE is the locus of $w = w^*$. HE is the locus of $r = r^*$; that is to say, for each L the ordinate on HE is the wage that is consistent with a rate of profit equal to r^*. (We shall have much more to say about the genesis of HE, but shall postpone that for the moment. Here we shall indicate merely that it would seem to follow, from the diminishing returns assumption, that HE will be a downward-sloping curve.)

1. It is unnecessary to raise the puzzling question whether it was on the effect on incentive to accumulate, or on the effect on ability to accumulate, that Ricardo relied, or mainly relied. He clearly held that all important savings come out of profits; that being so, each effect will work the same way. (It may be useful, however, to notice that the model would be substantially unaffected if r^* were zero).

2. We must assume this, in order to simulate Ricardo in our terms. For what corresponds, in Ricardo's terms, see below, p. 362.

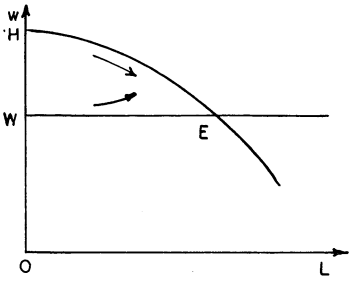

FIGURE I

H, we may take it, is above W, since there could otherwise be no capital-using production. Wherever the economy found itself initially, either capital or labor would tend to disappear. There must therefore exist a triangle HEW; it is from positions only within that triangle that both capital and labor will tend to increase.

Suppose that the economy starts from such a position, given arbitrarily. Since $w > w^*$, L must be increasing; so the path of the economy, starting from any such point, must proceed to the *right*. Capital also is increasing; but on whether capital is increasing faster or more slowly than labor nothing is said. So (it appears) w may be rising, or may be falling.

Can we nevertheless prove that there must be a convergence to the equilibrium E, where $w = w^*$ and $r = r^*$? It is at once apparent that, if we could prove that WE and HE (*floor* and *roof* we shall call them) are *barriers*, that job would be done. For at every step on the rightward path, the possible further positions would then be confined within a smaller triangle; the path must therefore converge upon the apex of all these triangles, which is the equilibrium E.

So far as the floor is concerned, it seems pretty clear that it is a barrier. For let us allow ourselves (for the moment) to suppose that a point on WE, to the left of E, has somehow or other been reached. At that point $w = w^*$, so L is constant; but $r > r^*$, so capital is increasing. An increase in capital with constant labor should surely lead to a rise in wages. So on the floor, wages should be rising, and it would seem that in the neighborhood of such a point wages should be rising. One must conclude that in the working out of the model a point on WE would not be reached; the path of the economy is *repelled* by the floor.

The case of the roof is more tricky. We can, however, deal with it in a similar way. We should now suppose that a point on the roof, between H and E, has somehow or other been reached. Since at that

point $r = r^*$, capital is stationary. But since $w > w^*$, L is rising. How is this additional labor to be accommodated without a rise in capital? Only, it would seem, in the same way, by a fall in wages.

However, here that does not settle the matter. For to show that from a point on HE the next step must be a fall in wages does not show that the path must stay within the triangle, since at that point the roof also slopes downward. One must show, if one is to show that the path must stay within the triangle, that the fall in wages along the path must be greater than the fall along the roof.

On the path, at a point on HE, capital is constant; on the roof, r is constant. So we must ask what would have to happen to capital if there were an (imaginary) movement to the right along the roof. If such a movement required the investment of more capital, constant capital would be insufficient to keep the economy on the roof. The path must then turn downward, inside the roof; so the roof, like the floor, will be a barrier. But if it is possible to move rightward along the roof while using less capital, the roof would not be a barrier. The path of the economy might then take a different form, which would have to be separately examined.

We shall show in what follows that empirical assumptions, one of which was made by Ricardo explicitly, and others that would surely have been accepted by him if they had been put to him, are probably sufficient to establish that this exception (as it would then prove to be) can be disregarded. There must then be a regular convergence to equilibrium.

It should be noticed, however, that it does not follow from this convergence that w must always be falling as L increases. It is entirely possible for a path such as ABC in Figure II to be followed. It will be followed if in the initial position (A) the wage is low but the rate of profit is high. There can then be sufficient accumulation to raise wages for a while, before the fall sets in.

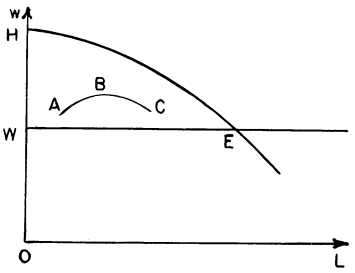

FIGURE II

The same holds, in principle, for profits. It is conceivable, if the labor response were very rapid (perhaps by immigration), that there might be a phase in which the rate of profit was rising. All that is necessary, if the initial position is one in which both labor and capital are increasing (so that $w > w^*$ and $r > r^*$) is that, sooner or later, there must be a fall in wages *and* a fall in the rate of profit, so as to bring each of them down to its equilibrium value. Either of them, however, may have a rising phase on the way.

What has been presented, so far, is no more than a sketch. It has several weak points, which will probably have been noticed by the reader. They clearly need to be reexamined. But it will be found that in the reexamination we can, for much of the way, keep quite close to Ricardo.

2. *The circulating capital model.* We follow in his footsteps if we begin, as he would surely have done,[3] with the simplest form of circulating capital model.

In this model there is no fixed capital; capital is just "advances to labor." The period of production is fixed. With the supply of land also fixed, production is a function of labor supply only. Thus, total product is $F(L)$, with $F'(L)$ positive and $F''(L)$ negative—diminishing returns throughout. The wage is the *discounted* marginal product of labor. Thus, $F'(L) = w\ (1 + r)$, where w is actual wage and r is actual rate of profit. Capital, here a pure wage-fund, is equal to the wage-bill; so capital $= wL$. Profit is rwL. Rent is $F(L) - L\,F'(L)$.

Here there is clearly no question that, if L is constant but capital (wL) is increasing, w must be rising. So it is certain that the floor is a barrier. The condition for the roof to be a barrier can be easily worked out.

As we have seen, the condition in general is that, for a rightward movement along the roof, capital must increase. But

$$wL = LF'(L)/(1 + r),$$

and along the roof r is constant; so $L\,F'(L)$ must increase as L increases. That is to say, the elasticity of the marginal product curve[4] must be greater than 1.

What can we say about this elasticity? This is not a case where it is useful to think, in the modern manner, in terms of elasticities of

3. For this is the procedure that he adopts in his chapter on "Value" (Ch. I of the *Principles*, P. Sraffa, ed. (Cambridge: Cambridge University Press, 1951).

4. Elasticity being measured in the Marshallian manner, with price (or whatever is analogous to price—here the marginal product) being treated as if it were the independent variable.

substitution. The constant elasticity of substitution assumption, in particular, does not fit Ricardo at all. He himself has told us that:[4]

> On the first settling of a country, in which there is an abundance of rich and fertile land, a very small proportion of which is required to be cultivated for the support of the actual population, or indeed can be cultivated with the capital which the population can command, there will be no rent.[5]

Now if, for small L, there is no rent, it would seem to follow that marginal product, over an initial stretch, equals average product.[6] So marginal product must be constant; the marginal product curve must be perfectly elastic. But, on the other hand, if there is any limit to the amount of labor that can be employed productively on the given land (and that there is such a limit is surely implied in any common-sense interpretation of diminishing returns), it follows that for a sufficiently large L, marginal product must fall to zero. The elasticity of the curve (whatever its slope) must then fall to zero. So if this is accepted, the curve must be perfectly elastic at one end and perfectly inelastic at the other. There must therefore (on the average) be a fall in elasticity as one goes along the curve.

If the fall is reasonably regular (and there seems to be no reason why it should not be), there must then be a point on the curve where elasticity equals unity. To the left of that point, the curve will be elastic, to the right, inelastic. We suggest that this is the form of curve that can be most useful for the interpretation of Ricardo.

The roof, it has been shown, is simply a reflection of the marginal product curve (in this circulating capital model). So it must have the same elasticity properties. Let us call M the point where elasticity is unity. The position of M is solely a matter of the shape of the curve (if the curve were a straight line, it would be the mid-point between the axes). But the position of E (on the roof) is a matter of the level of w^* (the subsistence level); and that, formally at least, is an entirely independent matter. Thus, if the subsistence level is high enough, E will lie to the left of M; the whole of the roof between H and E will then be a barrier. Only if the subsistence level is too low, so that E lies upon the inelastic part of the roof, will there be a "hole" in the barrier be-

5. *Principles* (Sraffa), p. 69.

6. But might there not be an increasing returns stretch (as commonly shown in modern textbooks) before the curve turned downward? It would make no substantial difference to the argument if there was; but did Ricardo believe there was? The question is rather intriguing. He had Smith and the division of labor behind him; but it is hard to see that he paid attention to it. There was, however, a passage in the first edition of the *Principles* (note on p. 100 in Sraffa) in which he contemplated the possibility of underpopulation—but not for the Smithian reason. If population is too small, people will not work hard enough—like the Irish! (See also letter to Trower, VII, 48–49.) One fears that he had been talking to "absentee landlords" in London clubs; it is just their point of view. It is just as well that the passage was suppressed.

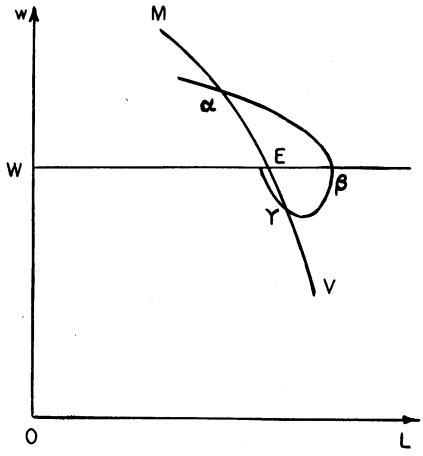

FIGURE III

tween M and E; it then becomes possible that the path may go through the roof. It is only in this latter case (if what has been said above on the properties of the curve is accepted) that an *exception* can arise.

3. *The exception.* Ricardo, we fully admit, did not notice the exception (and one may greatly doubt if he would have paid much attention to it if he had). Still, since we have noticed it, we had better attend to it.

Suppose that there is a hole in the roof (M lying to the left of E) and that the path goes through it. What happens? The answer is shown in Figure III. The locus of $r = r^*$, to the right of E, now becomes relevant; so it is shown, together with the relevant part of the roof, as MEV.

After the roof is passed (at α) $r < r^*$, so that capital (wL) is falling. But since at first $w > w^*$, L is rising. w must therefore be falling; indeed it must be falling quite fast. It is nevertheless impossible (on our assumptions) that the path should again intersect ME between M and E; for the kind of intersection that is possible between M and E is what occurred at α, and at any further intersection between M and E the relation between the slopes of path and roof would be the wrong way round. Thus, w will go on falling, but L will not cease to rise until $w = w^*$ is reached, at a point β, which we have now shown to lie to the right of E. At β we still have $r < r^*$, so capital is still falling; thus though L has now ceased to rise, w will still be falling. But at the next stage L will be falling, so the path begins to turn back towards

EV. And here, since L is falling, a second intersection is possible (γ); at γ capital will have ceased to fall, so w must be rising. The minimum of w is reached before γ. It can again be shown in the same way that there can be no further intersection of EV (at this round) between E and γ; so the path will intersect the vertical through E below E, and the floor to the left of E, as shown. Thus, there is a "cycle" about the equilibrium position.

It is not inevitable that the cycle should repeat. For though when the path "comes back," the "hole" is still open, the path, as explained, does not have to go through it. It can in fact be shown (but this does need some mathematics)[7] that there must, in the end but conceivably after several cycles, be a convergence to E.

That is pretty; but, as we have insisted, we make no pretence that it is of any importance.

4. *Fixed capital.* We turn to a matter that is of importance, indeed of great importance. We have begun, as Ricardo would have begun, with a circulating capital model; but Ricardo would not have stopped at that, nor should we.

Whatever the nature of the capital that is employed, a diagram of the type we have been using could in principle still be constructed; for L and w and w^* are all of them representable without any question of the nature of capital arising. Thus we can still use the diagram as a means of separating out the critical issues.

First of all, what is meant, in the general case, by the "position" (w,L)? As was shown, it is possible, in the circulating capital case, to deduce from given w and L both the quantity of capital and the rate of profit. For capital is wL; and the rate of profit is given by $F'(L) = w\ (1 + r)$. Thus all the characteristics of the economy that concern us can be deduced from w and L. When we generalize, these convenient deductions fail us. To know (w,L) no longer suffices to determine

7. It is fairly clear that whatever the supply functions of labor and capital may be (so long as they obey the restrictions with which we have been working) the slope of the path, being the ratio of dw/dt and dL/dt, must be a single-valued function of w and L. It follows that a path, beginning from any specified initial conditions, cannot intersect itself, since at the point of intersection the slope would have two values. That is nearly enough, considering Figure III, to show that there must be ultimate convergence, since successive circuits around E must get smaller and smaller. But it is not quite enough, since there remains the possibility that the path might converge, asymptotically, to a fixed circuit around E, never actually reaching E. But this also is ruled out, for a more subtle reason. If there were such a circuit, there would be a "forbidden zone" around E, which the path could not enter. But though E is a "singular point" of the path, at which both dw/dt and dL/dt are zero, so that dw/dL is indeterminate, it is clear that at any point indefinitely near to E the slope is determinate and is *real*, in the mathematical sense. So the path can approach indefinitely near to E. There is no "forbidden zone."

We owe this last point about the circuit to Nicholas Georgescu-Roegen, and the above way of treating it to Stefano Zamagni.

the characteristics of the economy. With given (w,L) the rate of profit might still be different insofar as the make-up of the initial capital was different; and on that, in the model, nothing is said.

It does not appear that Ricardo ever fully faced the issue; but if he had faced it, what could he have said? He would have had to distinguish between a capital structure that was appropriate (or optimal) with respect to the given w and L, and one that (perhaps because of its history) was inappropriate. That is to say, he would have had to distinguish (in Marshall's manner) between short-period and long-period equilibrium.

In formal theory, it is clear, he does not do that;[8] that was left for Marshall. If one does not do it, what remains? One can hardly get on without allowing oneself the assumption (the dangerous assumption!) that the capital structure is appropriate *all the time.* With that the model can still be saved. With a given structure of capital (the fixed production period of the circulating capital model is one such structure) it will still be true that, given w and L, r will be determined. With different structures, w and L being still given, r will vary. It would be reasonable to suppose (though the conditions for this to be true should of course be worked out) that there would be some structure for which r would be maximized. Suppose that this "optimum" structure were always selected. Then we should still have r determined when w and L are given; and the quantity of capital, which we should measure, as before, in "product"-equivalent, would also be determined.

So the model could stand, without (apparently) much amendment. The floor is clearly unaffected by the present generalization. The roof would now indicate the highest wage that could still be paid to each labor force L consistently with a rate of profit not less than r^*. If the wage were lower, with capital still "optimally" organized, the rate of profit could be higher.

Could one still conclude, in anything like the old way, that floor and roof would be barriers? The question, so far as the floor is concerned, is whether we would still be entitled to argue that an increase in capital must raise wages and lower the rate of profit, L remaining constant. A neoclassical economist would have had no doubts on the matter, but we are not being neoclassical. We are to mean by an increase in capital an increase in value of capital in terms of product, which is not what the neoclassics meant.[9] Modern economics has shown that the matter is not then quite so simple, but we should stray from our theme if we followed up those refinements here. So far as the

8. But see below (note 15 to Part II).

9. See John Hicks, "Capital Controversies, Ancient and Modern," *American Economic Review, Papers and Proceedings,* LXIV (May 1974), 307.

floor is concerned, we shall therefore take it that the barrier still holds.

We shall not expect, from what has already been said, that the roof will always be a barrier. But we can still conclude (from what was said above about the general model) that the issue reduces to asking whether more capital is necessarily required to employ more labor, the rate of profit remaining unchanged. One's prejudice says that it must be; it is nevertheless of some interest to find that we can carry over to the general model something analogous to the *exception* we have found.

Capital, still in the same sense, is a roundabout way of using labor; but it is also a roundabout way of using land. It would make good sense, and would accord with many known facts,[10] if the latter aspect were realistically quite as important. Thus when land is cheap, the use of natural resources in capital-intensive ways is a rational means of economizing in labor. It looks like substitution of capital for labor; but more fundamentally it is a substitution of land for labor by the use of capital. If this is so, the rise in rent, which occurs as a result of population pressure, could diminish the opportunity for profitable (and indeed for productive) investment of capital. (When "fossil fuels" become sufficiently scarce, man will have to give up his tractors, and "toil with spade again.") That could cause a "hole in the roof" even with generalized capital.

So much for the "optimal" or "long-period" interpretation, which (as will be shown) does appear to give us Ricardo's usual meaning. Of course, in the end it is not good enough. Given time, other things being equal, the structure of capital might become optimal; but at any particular moment (of history) there will not have been time to make the adjustments that are required. Capital is in the wrong form; only as existing equipment wears out, and is replaced, will the structure come right. That is what Ricardo, nearly always, omitted; so if we use our diagram as a means of interpreting him, we must remember that every point on the diagram—every position on the path—is a position of long-period equilibrium, in Marshall's sense. And this means that no way is shown by which the system gets from one point on the path to what follows it! The analysis is inherently static; but the static analysis is carried through consistently. We should think of the same device being used for labor as for capital. The population also has its structure (in particular, its age distribution); but in static analysis that also is in long-period equilibrium. At every point on the path the age

10. One thinks not only of our recent experience since the oil crisis of 1973, but also of the historical material presented by Paul David, *Technical Change, Innovation and Economic Growth* (London: Cambridge University Press, 1975).

distribution must be assumed to be appropriate; that is why, to the astonishment of modern commentators, population is so often supposed to respond *without lag.*

And that is why it was so lucky that we began by allowing ourselves to forget about lags. If we had brought them in from the start, we should have cut ourselves off from an appreciation of the static method of Ricardo.

The simplification that is involved in the static method is indeed drastic. It can be defended only as a first step, suitable perhaps for a very narrow range of problems, but more important as a basis from which further work could proceed. The second line of defence needs no elaboration. This was the first instance of a complicated economic argument, carried through with logical precision; it blazed a trail that all subsequent theory has followed. A word may be said, however, about the first.

Suppose that the theory was just meant as a very long-run theory. For a very long-run theory, the static method, even when carried to the lengths that Ricardo carried it, could be claimed to be not so very inappropriate. We have seen that it would leave it open to him to think of the world of his time (or the Britain of his time) as still in a growing phase, such as is represented by the stretch *AB* in our Figure II. Wages would be rising, in what looks like a neoclassical manner, as capital accumulated. But they would still have the shadow of diminishing returns hanging over them, though the point at which that developed into a serious constraint might be quite far away.

We shall now show that this was in fact Ricardo's viewpoint.

II. The Evidence

1. *"Money" wages and real wages.* We are now to start with the hypothesis that what Ricardo had in mind was something equivalent to what has been expressed, in the first part of this paper, by the *HEW* diagram—taking that, of course, in its simpler form, in which the subsistence level (w^*) is high enough for the *exception* not to occur. We would then expect him to think of his economy as being "now" in a position in which both capital and labor are increasing (for that was surely the position in which he conceived the Britain, or the America, of his time to be). In that position it must be the case, on his principles, that $r > r^*$ (so that capital could be increasing) and that $w > w^*$ (so that the supply of labor could be increasing). In the final equilibrium, which would ultimately be reached in the absence of technical progress, w would have to come *down* to w^*, and r to r^*.

Thus over the whole stretch between "now" and the stationary state, w (the commodity wage) and r (the rate of profit) would *both* have to fall. But this would not be inconsistent with the possibility that there might be stretches in which w was rising and r falling, or stretches in which r was rising and w falling; but w could not rise without r falling, and r could not rise without w falling. In the "large," however, on the average over the whole stretch between "now" and "equilibrium," both would have to fall.

It will be shown, in what follows, that this is precisely what, in substance, we find him saying. We must, however, beware that in one important respect his model is more complex than what we have been using. We have been taking it that "Product" is homogeneous; but Ricardo's "Product" is not homogeneous. It is composed of an agricultural segment, produced under diminishing returns, and a nonagricultural segment, produced under constant returns. Even so, it would have been possible for him to use as a standard of value a "basket" including both sorts of output; such a "basket," of course, would have been produced under diminishing returns. This is effectively what we have been doing but it is not what Ricardo does. His standard, which he calls "money," is representative of nonagricultural output; so we may think of him as taking nonagricultural output as his standard of value. Thus if agricultural prices rise relative to nonagricultural prices, while real wages remain the same (in the sense that command over the "basket" remains the same), Ricardo will say that "money" wages rise. And it is to the rise in "money" wages, in this sense, that he attributes the fall in the rate of profit. It is nevertheless the same phenomenon that is being described in his way as in ours.

2. *The main texts from the Principles.* Take first a passage that at first reading looks a bit mysterious, but that on our approach (and in the light of what has just been said) becomes crystal clear. It is the beginning of Chapter XXI, "Effects of Accumulation of Profits and Interest:"

> From the account which has been given of the profits of stock, it will appear, that no accumulation of capital will permanently lower profits, unless there be some permanent cause for the rise of [money] wages. If the funds for the maintenance of labour were doubled, trebled, or quadrupled, there would not long be any difficulty in procuring the requisite number of hands, to be employed by those funds; but owing to the increasing difficulty of making constant additions to the food of the country, funds of the same value would probably not maintain the same quantity of labour. If the necessaries of the workman could be constantly increased with the same facility, there could be no permanent alteration in the rate of profits or wages, to whatever amount capital might be accumulated.[1]

1. *Principles,* p. 289.

In this passage Ricardo is opposing Adam Smith, who had said in a passage that he quotes:

> The increase of stock which raises wages tends to lower profit. When the stocks of many rich merchants are turned into the same trade, their mutual competition tends to lower its profit; and when there is a like increase of stock in all the different trades carried on in the same society, the same competition must produce the same effect in all.[2]

Ricardo rejoins that the rise in wages, mentioned by Smith, is a temporary rise, which has nothing to do with the long-period tendencies with which he is (and Smith should have been) concerned; while "competition of capitals" can otherwise be interpreted only as lack of effective demand, and this (again in the long-period sense) he demolishes by an appeal to Say's law. Thus for all that Smith had said, there is no reason why the economy should not persist in a "steady state," with wages and profits remaining at their initial levels, *whatever these may have been.* (Not, it will be noticed, at subsistence levels, for this is an expanding economy.) But, says Ricardo, there is a reason why (in the absence of technical progress) this cannot happen. It is the downward slope of our *roof*—diminishing returns.

Now look back at the formal enunciation in Chapter V, the chapter "On Wages." He begins by defining the "natural price" of labor as that price which will "enable the labourers, one with another, to subsist and perpetuate their race, without either increase or diminution."[3] It is a price (we are immediately informed) that is not fixed in terms of "money" but will vary with "money" prices of "food, necessaries and conveniences" (that is to say, it is our w^*). In these terms, we are told, it is fixed, at least by "habits and customs."[4]

A sharp distinction is drawn between this subsistence wage and the actual wage, or "market price." But "however much the market price of labour may deviate from its natural price, it has, like commodities, a tendency to conform to it."[5] Perhaps it is just this word *tendency* that has caused the trouble we are trying to clear up.

A modern economist will often use the word very loosely. A system has a "tendency to equilibrium," so it may just as well be treated as being in equilibrium all the time. There is no reason why Ricardo should have been using it so loosely. The first meaning of the word *tendency* that is given in the *Oxford Dictionary* (with examples both

2. *Ibid.*
3. *Principles,* p. 93.
4. "It is not to be understood that the natural price of labour, estimated even in food and necessaries, is absolutely fixed and constant . . . . It essentially depends upon the habits and customs of the people" (*Principles,* pp. 96–97).
5. *Principles,* p. 94.

earlier and later than Ricardo) is "a constant disposition to move or act in some direction or towards some point, end or purpose." Surely it is this that is Ricardo's meaning. For he continues:

> Notwithstanding the tendency of wages to conform to their natural rate, their market rate may, in an improving society, for an indefinite period be constantly above it; for no sooner may the impulse, which an increased capital gives to a new demand for labour be obeyed, than another increase in capital may produce the same effect; and thus, if the increase in capital be gradual and constant, the demand for labour may give a constant stimulus to an increase of people.[6]

So the actual wage may exceed the subsistence wage "for an indefinite period;" and it is by no means inconceivable that the excess may increase:

> In different stages of society, the accumulation of capital, or of the means of employing labour, is more or less rapid, and must in all cases depend on the productive powers of labour. The productive powers of labour are generally greatest when there is an abundance of fertile land; at such periods accumulation is often so rapid, that labourers cannot be supplied with the same rapidity as capital.
>
> It has been calculated, that under favourable circumstances population may be doubled in twenty-five years; but under the same favourable circumstances, the whole capital of a country might possibly be doubled in a shorter period. In that case, wages during the whole period would have a tendency to rise, because the demand for labour would increase still faster than the supply.[7]

However, this is no more than a qualification; it corresponds to the AB stretch in Figure II above. For he continues:

> Although, then, it is probable that under the most favourable circumstances, the power of production is still greater than that of population, it will not long continue so; for the land being limited in quantity, and differing in quality, with every increased portion of capital employed on it, there will be a decreased rate of production, whilst the power of population continues always the same.[8]

Diminishing returns, he is saying, must in the end make themselves felt.

Now this is indeed one of the passages that easily cause trouble. When it is read in its context, it must be interpreted to mean that (as in Chapter XXI) a continued expansion, with w in excess of w^*, is not possible, for it is only if that excess wage is maintained that the "power of population" can "continue the same." For it is clear, in the rest of the chapter, that the consequence that is expected from population pressure is a fall in real wages (wages in terms of the "basket"). As he says himself, the laborer "will receive more money wages . . . but his

6. *Principles,* pp. 94–95.
7. *Principles,* p. 98.
8. *Ibid.*

corn wages will be reduced; and not only his command of corn, but his general condition will be deteriorated, by his finding it more difficult to maintain the market rate of wages above their natural rate."[9] In the former passage he is simply on his way to establishing this conclusion. He is not assuming a fixed wage; he is certainly not assuming a wage that is fixed at a subsistence level, which (in accordance with what he had already said) must check the "power of population;" he is showing that a fixed wage, at a level above subsistence, cannot in the end be carried through.

All this, however, has to be set out in terms of the Ricardian "money wage." The issue can best be explained in terms of the circulating capital model. Let w_m be the "money" wage-rate. Then, in the nonagricultural sector (in the equilibrium Ricardo always assumes) $w_m\ (1 + r)$ = a constant. In the agricultural sector

$$w_m(1 + r) = p_m F'(L),$$

where p_m is the price of agricultural output in terms of nonagricultural output, that is to say, in terms of "money." It follows from these two equations that $p_m F'(L)$ is constant, so that when the marginal product $F'(L)$ falls, p_m must rise. But if p_m rises, while w_m remains constant, real wages ("basket" wages) must fall, since a large part of the wage is spent on agricultural output. But, says Ricardo, they cannot fall to the extent that would be necessary. So "money" wages must rise:

> As population increases, . . . necessaries will be constantly rising in price, because more labour will be necessary to produce them. If, then, the money wage of labour should fall, whilst every commodity on which the wages of labour were expended rose, the labourer would be doubly affected, and would be soon totally deprived of subsistence. Instead, therefore, of the money wages of labour falling, they would rise; but they would not rise sufficiently to enable the labourer to purchase as many comforts and necessaries as he did before the rise in price of those commodities.[10]

Without the explanation that we have been giving, the first part of this passage could easily be read as implying that "money" wages are fixed at the "money" value of a subsistence basket of commodities—so that wages are adjusted on what we would now call a cost-of-living basis. But this is not what Ricardo means, as his last sentence makes clear. Real wages are *falling*.

"Money" wages are rising (the rate of profit is falling), and real wages are falling; why? It cannot be claimed that in this passage Ricardo gives a clear answer. He is just reading off these results from the model that is in his mind. But if he had been challenged to explain himself, what could he have said?

9. *Ibid.*, p. 102.
10. *Ibid.*, pp. 101–102.

Consider again the *HEW* diagram. If "money" wages remained unchanged, and therefore the rate of profit remained unchanged, the whole burden of the adjustment (due to the fall in the marginal product) would fall on labor. But with a fall in the real wage the rate of increase in the labor supply would slow up, while (since the rate of profit would be undiminished) the rate of increase of capital would be undiminished; there must therefore, as compared with the position we have just posited, be a tendency for wages to rise. It is what we called the "path being repelled by the floor." And similarly, if real wages ("basket" wages) remained unchanged, the rate of profit would fall, so that the increase of capital would be retarded, while the "power of population" would be unaffected. The path would be "repelled by the roof." These are in fact the reasons (within the Ricardian system, the quite logical reasons) why things must work out as he says.

3. *The "Notes on Malthus."* The interpretation just given of the "Wages" chapter is confirmed, and possibly a little deepened, by the comments that were made by Ricardo on Malthus's *Principles* (in 1820). Malthus, after quoting Ricardo's definition of the "natural price" of labor, says that in his view it is "a most unnatural price, because in a natural state of things, that is, without great impediments to the progress of wealth and population, such a price could not generally occur for hundreds of years."[11] Ricardo, in his note on this passage, determinedly sticks to his own terminology; but his reason for doing so is a desire for uniformity of terminology, as between the price of labor and the price of commodities. He does not dispute Malthus's view that the stationary state is remote.[12]

Nor does he dispute the convenience, for less "secular" purposes, of using a reference path in which there is a "uniform progress of capital and population," as Malthus calls it. It must, however, be clearly understood that (as he himself had stated in Chapter XXI of his *Principles* and as Malthus repeats) uniform progress does not mean "the same *rate* of progress permanently, which is impossible; but a uniform progress towards the greatest practicable amount, without temporary accelerations or retardations."[13] "I agree throughout this section with Mr. Malthus in principle," says Ricardo.[14]

4. *Fixed capital.* It is important to recognize that there is not very much about fixed capital in Ricardo's *Principles.* In view of the attention that is paid to fixed capital in the very first chapter "On

11. *Works,* Vol. II, p. 228.
12. *Ibid.*
13. *Ibid.,* p. 256.
14. *Ibid.,* p. 258.

Value" (a passage that has had an enormous impact on later economics), this may seem a surprising statement. Yet it is true. There is fixed capital there, and of course it also appears in the chapter on Machinery (added in the third edition) but in most of the rest of the work it is conspicuous by its absence.[15] It is so far absent that it is tempting to conjecture that the Ricardian system was first worked out in circulating capital terms (more or less as in our own circulating capital model), most of the book being written with that model in mind.[16] The first chapter of a book does not have to be the first that is written; in a theoretical work it is often the last.[17] Thus it would make sense to suppose that what we have from him on fixed capital are no more than the beginnings of a train of thought that is subsequent to the creation of the greater part of his system. The full rethinking, with full allowance for fixed capital, was never made.

Thus it is that the question which has been so important for later economists—what is the effect on the structure of production (or on the fixed capital-circulating capital ratio) when total capital increases *with labor supply constant*—was never seriously considered by Ricardo. What we described as the "path being repelled by the floor" is indeed, as has been shown, a part of Ricardo's theory; but it is not clear that he ever worked it out in any but circulating capital terms, where the effect is pure arithmetic. It is true that there are passages (added in the 1821 edition) which indicate a substitution of machinery for labor *along the path,* as the rate of profit falls and the "money" wage rises, or as Ricardo says, "labour rises": "The same cause that raises labour, does not raise the value of machines; and therefore, with every augmentation of capital, a greater proportion of it is employed on machinery."[18] But this is not much to go on. The extension into the field of fixed capital, considered at the end of the first part of this paper, should therefore be regarded as a "projection" of the Ricardian

15. There is just one other outstanding place where attention is paid to fixed capital, and even to the problems raised by its "nonmalleability." This is in the chapter on "Sudden Changes in the Channels of Trade," where he points out that "it is often impossible to divert the machinery which may have been erected for one manufacture to the purposes of another," while circulating capital (considered as wage-goods) is more easily diverted (p. 266). It should, however, be noticed that this very forward-looking passage appears in a chapter that is essentially a qualification to the main work; it has not been worked into the formal theory.

16. Notice (1) that the *Essay on Profits* (from which the whole story begins) uses a purely circulating capital; and (2) the central importance that is attached to the labor theory of value. The latter, as Ricardo explains it, is clearly the result of beginning from a model with no fixed capital and equal periods of production in all industries.

17. It appears that Ricardo was still at work on Chapter I as late as 14 October 1816 (see his letter of that date to James Mill, *Works,* VII, p. 82).

18. *Principles,* p. 395. (See also p. 41.) "The same cause that raises labour does not raise the value of machines" because machines are part of nonagricultural output.

theory; a projection which we have sufficient evidence to show that Ricardo contemplated, but which in substance he never made.

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