The Impatience Theory of Interest

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# THE IMPATIENCE THEORY OF INTEREST

In the December number of the REVIEW, Professor Seager criticises my "Impatience Theory of Interest" for its failure, as he thinks,[1] to take account of the element of productivity or the "technique" of production.

Professor Seager's criticism came to me as a great surprise and seems very *mal à propos;* for what Professor Seager calls the "productivity" or "technique" element, so far from being lacking in my theory, is one of its cardinal features and the one the treatment of which I flattered myself was most original! The fact is that my chief reason in writing the *Rate of Interest* at all arose from the belief that Böhm-Bawerk and others had failed to discover the true way in which the "technique of production" enters into the determination of the rate of interest. Believing the "technical" link in previous explanations unsound, and realizing as keenly as Professor Seager does the absolute necessity of such a link, I set myself the task of finding it. In the desirability of this I emphatically agree with Böhm-Bawerk.[2]

The other features of my interest theory—those which Professor Seager has examined and found correct—are the parts for which I was chiefly indebted to Böhm-Bawerk and John Rae. These were restated according to my own concepts, definitions, and modes of thought, but were, nevertheless, their theory more truly than mine.

Professor Seager has depended too much on my short and inadequate statement of the theory in the *Elementary Principles of Economics.*[3] Nowhere in his article does he refer specifically to any passage in the *Rate of Interest* relating to my treatment of the productivity theory.

[1] "The Impatience Theory of Interest," AMERICAN ECONOMIC REVIEW, December, 1912, p. 849; see also p. 834 (last paragraph); p. 836 (last of middle paragraph); p. 837, l. 20.

[2] "The statement of how the productivity of capital works into and together with the other two grounds of the higher valuation of present goods, I consider one of the most difficult points in the theory of interest, and, at the same time, the one which must decide the fate of that theory." (*The Positive Theory of Capital,* p. 277.)

[3] "The re-presentation of Professor Irving Fisher's 'Impatience Theory of Interest,' in his *Elementary Principles of Economics* is significant for several reasons. . . . The formidable array of rigid mathematical proofs with which it was accompanied in his *Rate of Interest* could not but be awe-inspir-

Possibly Professor Seager would have been justified in criticising my elementary textbook *as a textbook* for the fact that I almost (not quite) omitted the "productivity" or "technique" feature. But he seems to have estopped himself from the right to make even this criticism; for at the beginning of his article he apparently agrees that I ought not to introduce controversial matter into a textbook, and there is nothing in the theory of interest so controversial as the element relating to the "productivity" of capital.

Having pleaded "not guilty" to the charge of neglecting the "productivity" or "technique" element, my next task is to prove my innocence. A cursory examination will show that the "productivity feature" is elaborately treated in my *Rate of Interest* in chapters 8, 9, 10, and 13 (to say nothing of the mathematical appendix to chapter 8). I endeavored in the text of the book itself to state and restate this principle in its many different phases which are not always recognized as organically related to each other, and, so far as possible, to put it forth as an amplification or correction of the inadequate statements in Böhm-Bawerk's theory, as well as in the theories of Henry George, John Rae, Adolphe Landry, and others. In concluding chapter 2, in which I criticised the ordinary productivity theories, as well as in concluding chapter 4, which is devoted to a criticism of Böhm-Bawerk's theory, so far as it relates to productivity, I explained to the reader that later in the book I would rebuild the "technical" feature which, in the theories of others, I sought to destroy. This was done in chapters 8 to 10. A few passages from these chapters are quoted in the footnote below.[4]

ing, even when not convincing, to economists less accustomed to the use of mathematical symbols and modes of expression. To the extent that the latest formulation is clothed in a language that all may follow and understand, its merits and demerits stand out the more clearly and unmistakably. While this simplifies the task of the critic, the fact that a thinker of Fisher's acuteness adheres to his explanation shows criticism to be still important." ("The Impatience Theory of Interest," AMERICAN ECONOMIC REVIEW, December, 1912, p. 834.)

⁴ For example, in chapter 8, devoted particularly to the productivity element, after stating my own conclusions on the subject, I said (*Rate of Interest*, p. 159): *"We have introduced a new magnitude into our discussion; namely, the rate of return on sacrifice,* and especially the particular value of this rate of return called the MARGINAL rate of return on sacrifice. This marginal rate of return on sacrifice comes close to being a 'natural rate of interest.' *By means of it we are enabled to admit into our theory the*

These quotations are sufficient to prove that productivity has not been neglected in my treatment of the theory of interest. Many more passages might be cited. In fact, out of 208 pages of my book (exclusive of the appendices and the chapters on the relation of interest to money), devoted to explaining and defending my own theory of interest, about 80 pages, or two fifths, are devoted to the feature which Professor Seager would seem to think I have omitted altogether!

Besides these 80 pages of text, about 20 pages of the mathematical appendices are devoted to the so-called productivity feature, ending with the statement:

The geometrical method enables us to form a mental picture, clearer than would otherwise be possible, of the various factors at work, and especially of the manner in which the objective or "technical" conditions . . . co-operate with the subjective conditions which influence the rate of interest. It was, in fact, only through the geometrical representation that the writer was first enabled to grasp the significance of the "effective range of choice" in its general bearings.

I emphasize the last passage in view of what Professor Seager says of mathematics. It was through mathematics that I saw the nature and importance of productivity in relation to interest.

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elements of truth contained in some of the claims of the productivity theories, the cost theories, and Böhm-Bawerk's theory of the technique of production."

I then proceeded to show how this element of productivity, as I had incorporated it into my theory of interest, was related to the "productivity" or "technique" element in other theories. (*Rate of Interest*, pp. 159-166.)

I then stated (*Rate of Interest*, pp. 163-166): "Thus *the elements of truth which were found in the productivity theory, in the cost-theory and in Böhm-Bawerk's technique-of-production theory, all find a place under the head of the choice among optional uses of capital.*

. . . "To a person who has never tried to connect them, many of the theories of the authors just compared seem to have no vital relation. But they are seen to be connected as soon as we look at them in the light of the concept of an income-stream. *The problems of choosing when to cut a forest, of what length to make a production period, to what degree of intensiveness to cultivate land, or how far to improve a piece of land, are all problems of choosing the best out of innumerable possible income-streams.* In each problem the rival income-streams present differences as to size, shape, composition, or probability,—especially shape."

Again I specifically stated (*Rate of Interest*, p. 186):

"But while the slowness of Nature is a sufficient cause for interest, her productivity is an additional cause."

Other pertinent quotations might be given (*e.g., Rate of Interest*, pp. 186; 187; 192; 193; 194; 196; 240; 241; 242; 251).

There is a principle of mathematics that a problem is deter-minate only when the number of independent determining con-ditions are equal to the number of unknown quantities to be de-termined—a principle greatly emphasized by Marshall, Cournot, Walras, and Pareto. Whatever sins of commission are open to the mathematical economist, the particular sin of omission (such as overlooking one of the necessary conditions determining the rate of interest) is scarcely open to him at all. Counting the number of equations and comparing this with the number of unknown quantities thus affords a valuable check on one's work. Many economists, for lack of such a check, have done precisely what Professor Seager accuses me of doing, *viz.*, omitting the technical feature altogether; but I know of none of mathematical proclivi-ties who have done so.

I shall not take space here to state, much less to justify, my rendering of the "technique" element. My book, as I have said, was written expressly for that purpose, and to it I must refer the reader. On page 150 are stated the six conditions which, according to my findings, determine the rate of interest. The chief one which relates to "productivity" is number four, and this is, on pages 150 to 156, expressed in three distinct forms, the third of which is discussed at length on pages 156-158; and its relation to the productivity feature of other writers is shown on pages 159-167. On page 221, the results of the three successive approximations are stated in tabular form. There the fourth or productivity condition is most briefly stated as follows:

The individual selects from the eligible list (of prospective income-streams varying in distribution, in time and otherwise) the income-stream which has in present estimation, whether truly or falsely, the maximum present value. If the alternatives are numerous and vary continuously from each other, this condition is equivalent to the con-dition that the marginal rate of estimated return on sacrifice shall equal the rate of interest.

I regret that this reply to Professor Seager has had to take the form of references and citations, but I cannot find, in his article, many direct and important issues to join. The chief ex-ception seems to be the following: Professor Seager apparently believes that a general increase in the physical productivity of capital would raise the rate of interest, while I, on the other hand, believe it would lower it. He objects to my illustration of the orchard since, to him, land is not capital, and so, if I

understand him, has no interest. He points out that other, or, as he would say, true capital is, unlike the orchard, reproducible by labor and says:[5] "Time being allowed for an adjustment to the new conditions, the values of the produced means to further production will be brought into conformity to the expense of producing them. Since there is nothing in the assumption that the productivity of all instruments is doubled that involves any serious change in the expense of producing the instrument, the productivity theorist certainly *would* claim that under these conditions there must be, if not a doubling, certainly a very substantial increase in the rate of interest."

But the increased productivity of capital will entail a decreased price, or value per unit, of the products of that capital. And in addition there may be an increase in the expense of producing the capital—if, for instance, it is reproducible only under the laws of diminishing returns or increasing costs. Evidently it does not follow that the net return on capital-value will be permanently increased.[6] In short, the expenses of production, on the one hand, and the price of the product of the capital multiplied by the increased product itself, on the other hand, will tend to adjust themselves to each other and to the rate of interest. But this rate of interest, according to my philosophy, instead of being permanently raised, will be ultimately lowered; for to double the productivity of capital will mean ultimately a much larger income to society·than before, and this larger income tends to lower the rates of impatience of those who own it. So long as the rate of interest does not fall to correspond with the lower rates of impatience, there will continue to be profit in producing the productive capital until adjustment is attained—whether by decrease in the price of the products or by increase in the cost of the capital, or both, does not matter. In any case this adjustment must be by lowering and not by raising the rate of interest; for the rate of interest cannot be raised if the rates of impatience are not raised, and the rates of impatience cannot be

[5] "The Impatience Theory of Interest," AMERICAN ECONOMIC REVIEW, December, 1912, p. 847.

[6] I understand that Professor Seager does not confine his claim (that doubling the productivity of capital would increase the rate of interest) to the period during which the doubling occurs; for he himself provides: "time being allowed for adjustments to the new conditions." In my *Rate of Interest* I devote a chapter to Invention, in which I endeavor to show that, during this transition period, the rate of interest does tend to rise *but not afterwards*.

raised if, as is assumed, the income stream is increased in size without being altered in other respects.

In short, to double the productivity of existing capital is virtually to double existing capital itself. It tends to reduce the rate of interest on much the same principle as an increase in the supply of capital tends to reduce the rate of interest. The cost of producing the capital has no important effect except to set a limit to this virtual increase in capital. Moreover, the lower the cost the less limited the increase and the greater the ultimate effect in reducing the rate of interest.

There is another direct issue[7] between Professor Seager and me, but one which, it seems to me, is trifling. It relates to the actual limitations which prevent high rates of preference (such as those experienced by patrons of pawnshops) from being reduced by borrowing to equality with the market rate of interest on ordinary loans. I had maintained that the chief limitation was the difficulty of providing adequate security. That is, those who cannot provide the necessary security cannot borrow enough to reduce their high rates of preference to equality with the rate of interest, but Professor Seager says:[8] "Is it not clear that the *chief* limitation is due, rather, to the small prospective incomes— aggregate incomes—of those who are most eager for present gratifications? Will Fisher maintain that the drunkard proposed for illustration has enough borrowing power to bring his impatience rate down, say, to five per cent?" Now it may be that the confirmed drunkard supposed by Professor Seager (as well as some other exceptional cases such as insane persons, idiots, and those about to commit suicide) might be unable to reduce his high rate of preference to equality with the rate of interest even if he could pledge his entire future prospects and give adequate security for payment to his creditors; but such cases are, I believe, so exceptional that they do not destroy the truth of my remark that the *chief* (not the *only*) limitation is in lack of security. In fact, I would venture the opinion that ninety-nine men and women out of one hundred of the class that patronizes the pawnshops would absolutely refuse to pledge *all* their future income in return for present ready cash, even if the market rate of interest at which they could get loans was one

[7] American Economic Review, Dec., 1912, pp. 840-841.
[8] *Ibid.*, p. 840.

per cent, assuming that they had to give adequate security and fully realized that as a consequence of the loan they would be confronted by starvation within a week, month, or year.

As to the minor objections in Professor Seager's article, most of them are corollaries of his main contention, and fall to the ground with it. Suffice it, therefore, to say that Professor Seager is almost as much mistaken as to my views on these subsidiary questions as he is on the main question of my "neglect" of the productivity element.

Thus: I did not dissociate my discussion completely "from any account of the production of wealth." I did not assume, except temporarily in the "first approximation," that "income-streams, like mountain brooks, gush spontaneously from nature's hillsides"; and this was temporarily assumed, precisely as physicists temporarily assume a vacuum in studying falling bodies or, to take a better analogy, precisely as, in treating supply and demand, we first assume a fixed supply before introducing the supply schedule or supply curve. In the "second approximation" and the "third approximation" this assumption gives place to the more complicated conditions of the actual world. These complications are, for the most part, omitted (as too difficult and controversial) from the *Elementary Principles of Economics*, which Professor Seager has taken as the basis of his criticisms.

Again my strictures on the ordinary "productivity theories" are not dependent on "the putting forward of 'land' as typical of all forms of capital"[9] or the particular definition of capital which I have used, but are, for the most part, merely a resumé of the strictures of Böhm-Bawerk whose definition of capital excludes land. I did not omit consideration of the case of "freely reproducible tools and machines."[10] Nor did I neglect the possibility of negative interest in terms of any commodity or money which cannot be kept without loss,[11] although it appears to be true that I nowhere mentioned, as perhaps I should have done, the particular losses, which Professor Seager mentions,[12] from hoarding money—trouble, expense and risk. I quite agree with

[9] AMERICAN ECONOMIC REVIEW, December, 1912, p. 844.
[10] *Ibid.*, p. 846.
[11] See *Rate of Interest*, p. 84. This passage is substantially the same as that in my "Appreciation and Interest," *Publications of the American Economic Association*, vol. XI, no. 1 (Aug., 1896), p. 32, which, I think, is one of the earliest statements of the possibility of negative interest.
[12] AMERICAN ECONOMIC REVIEW, December, 1912, p. 838.

Professor Seager not only that negative interest is conceivable, but that the cessation of production would reduce and might reverse interest, just as Professor Seager says. The reason for this, according to my philosophy, is that future income would be lessened so that the income stream would be of a "descending" type. While I did not go so far as to suppose negative interest to result from the absence of production, I did suppose a case (that of shipwrecked sailors on a desert island with no supplies or real income available except hardtack)[13] in which interest would be zero.

I think Professor Seager must also have misunderstood Böhm-Bawerk's fifty pages of reply to my criticisms on his theory. These pages of Böhm-Bawerk should of themselves have made it clear that the issue between Böhm-Bawerk and me is not as to the *importance* of a technical element but as to its character. I hope later in the "Quarterly Journal of Economics" to reply to Böhm-Bawerk's criticism of my theory and to his rebuttal of my criticism of his theory.

Were there space, I should like to take up Professor Seager's own views on interest and to examine his position on "productivity." In his article he lays himself open to the charge of regarding all productivity theories as alike sound in principle. This may not, however, be his intention. But I cannot refrain from wondering why, if he does believe, as I think everyone who has read Böhm-Bawerk should believe, that the ordinary or, as Böhm-Bawerk calls them, the "naïve" productivity theories as well as some more involved productivity theories are snares and delusions, he should have reproved me for warning the undergraduate against these snares and delusions.

Before ending this reply, I wish to reciprocate Professor Seager's kindly compliments. I am even inclined to imagine excuses for the mistakes he has made, for which, in some degree, I feel that I have myself to blame. I ought, I doubt not, to have put forward the productivity element more prominently and with less avoidance of the term "productivity." I remember consciously avoiding this term so far as possible lest the reader should associate my theory too much with the many false theories of productivity.

In closing I feel impelled to say that no other book of mine has taken so much intellectual labor as *The Rate of Interest*,

[13] *Rate of Interest*, p. 181.

especially as regards the so-called "productivity" feature, and if, as I confidently believe, my rendering of this difficult element is sound, though not simple, I am naturally anxious that it may be properly understood to the end that it may be generally accepted.

<div align="right">IRVING FISHER.</div>

## Comment

Professor Fisher's reply to my review of his interest theory illustrates how difficult it is for an economist accustomed to one method of treating an intricate problem fully to enter into an entirely different method. In my thinking about the explanation of interest, the productivity aspect has seemed the most obvious as well as the most important. To Professor Fisher's mind it appears so difficult and illusive that, after having, as he now tells us, written one book chiefly to show its true place in an explanation, he found himself compelled "almost (not quite)" to omit it altogether from his treatment of the phenomenon in a second book attempting a more elementary presentation! The passages which he quotes from his *Rate of Interest* undoubtedly convict me of exaggeration in charging him with ignoring altogether the productivity aspect in his larger book. I cannot but feel, however, that these very passages and the chapters from which they are taken justify my more important contention that his treatment is "incomplete and inadequate." A methodology which causes an author to drop out an essential link when he tries to restate his theory in elementary form seems to me to be almost self-condemned. A careful re-reading of the chapters to which he refers strengthens my impression that his plan of treatment confuses rather than illuminates this phase of the subject.

But, as any reader of my article will observe, my view that Fisher fails to ascribe its proper place to productivity among the causes of interest was less an independent criticism than a conclusion from the detailed strictures on specific links in his reasoning which preceded it. I must confess that his answers to these strictures do not seem to me very convincing. Thus, his argument in support of the view that a general increase in the productivity of capital will lower, not raise, the rate of interest, seems to me to afford a demonstration, not of the truth of his contention but of the validity of my criticism that he fails to apprehend clearly the way in which productivity and time discount operate in the determina-