

# A (Qualified) Defense of Böhm-Bawerk's "Third Cause" of Interest

Robert P. Murphy\*

## INTRODUCTION

In the late nineteenth century, Eugen von Böhm-Bawerk's magisterial work (1959) on capital and interest provided the foundation upon which virtually all modern theories are built. In his first volume, *History and Critique of Interest Theories*, Böhm-Bawerk classified and (in his mind) refuted all previous explanations. Böhm-Bawerk thought a proper theory of interest must explain the apparent *undervaluation* of future goods. For example, if a machine is expected to yield annual rents of \$1,000 for ten years, why does it sell now for *less* than \$10,000? To answer this question was to provide a theory of interest, for only with such an undervaluation would it be possible for a capitalist to invest in machines (for example) and reap a flow of returns (over time) greater than his initial investment.

### *The naïve productivity theory*

With the task of the interest theorist so formulated,<sup>1</sup> Böhm-Bawerk found the existing doctrines of his time to be inadequate. In particular, Böhm-Bawerk criticized what he termed the "naïve productivity theory" of interest. The naïve productivity theory<sup>2</sup> explained the net return earned by an investor, by reference to the *productivity* of the capital goods in which he invests. For example, a farmer might purchase a tractor for \$8,000, even though it will last ten years and increase his profits by \$1,000 for each of those years. The twenty-five percent return on the investment would be due (according

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\* Ph.D. candidate, NYU. Contact at robert\_p\_murphy@yahoo.com. I wish to thank the Ludwig von Mises Institute for financial assistance.

<sup>1</sup> The specific problem was to explain, "Whence and why does the capitalist receive this endless and effortless flow of wealth?" (I, p. 1, italics removed).

<sup>2</sup> Actually, the "second variant" of naïve productivity theories, in Böhm-Bawerk's classification; see below.

to the naïve productivity theory) to the fact that tractors are productive; more can be produced with a tractor than without one.

Böhm-Bawerk considered this reasoning to be completely fallacious, for it conflated *physical* productivity with *value* productivity. Yes, the physical productivity of the tractor explains why more crops can be harvested with it than without. But the tractor's physical productivity does not (by itself) explain why the *value* placed on the tractor (i.e. its price of \$8,000) should be *lower* than the value placed on its future products (i.e. the marginal revenue of \$10,000). The net rate of interest (twenty-five percent in our example) does not correspond to the value of a capital good's services, but rather to the *ratio* of its value to the value of its services.

### *Böhm-Bawerk's agio theory*

After criticizing his predecessors, Böhm-Bawerk offered his own explanation (“agio theory”) in his second volume, *Positive Theory of Capital*. The “nub and kernel” of his theory was the insight that, “Present goods are, as a rule, worth more than future goods of equal quality and quantity” (II, p. 259). Böhm-Bawerk argued that the market's objective undervaluation of physically identical objects in the future was due to individuals' subjective undervaluations of these temporally distant goods.

To return to our earlier example: The price of a tractor represents an opportunity cost in *present* goods and services, and will only yield its returns in the future (over the course of a decade). If individuals subjectively value present goods and services more than future ones, then it naturally follows that the price of a tractor (\$8,000 in our example) will be lower than the total revenues (\$10,000) it is expected to generate. As such, an investment in tractors will yield a net financial return over time, and it is this appreciation in market value—as future income becomes transformed into more highly valued *present* income—that is the source of “originary interest.” All forms of interest, including contract interest on consumption loans, are manifestations of originary interest, and reflect a difference in intertemporal utilities (and a corresponding difference in intertemporal market prices).

Although elementary from a modern perspective, Böhm-Bawerk's explanation was the first to systematically apply the new insights of the marginal (and subjective) revolution (e.g. Menger 1871) to the problem of interest. However, as Fetter pointed out,<sup>3</sup> Böhm-Bawerk hadn't really *explained* interest; he had just formulated the problem in a more satisfactory manner. Yes, positive interest rates could be viewed as equivalent to a subjective premium placed on present goods, but *why* should such a premium exist at all?

### *Böhm-Bawerk's three causes*

To explain the existence of such a premium on present versus future goods, Böhm-Bawerk offered three main reasons. First, in general people expect to grow wealthier over time, and thus on that account (due to declining marginal rates of [*intra*temporal] substitution or what may be called a preference for "consumption smoothing" over time) value the marginal present good more highly than the marginal future good. Second, for various psychological reasons, in general people tend to systematically *discount* future satisfactions, and so even though a present and future good may offer the same instantaneous utility at the moment of consumption, the presently available good is valued more highly. And third, Böhm-Bawerk claimed that as a technological fact, more "roundabout" production processes were more *physically* productive, and so present goods (because they can be employed in processes that are more roundabout) possess a higher value (since it is always better to have more output than less). (II pp. 265-273)

### *Critics of the third cause*

Many economists have criticized Böhm-Bawerk's positive theory of interest,<sup>4</sup> and in particular his "third cause" (i.e. the alleged superior productivity of roundabout

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<sup>3</sup> That present goods are worth more than future goods of like kind and number "is but the fact which the interest theory is to explain logically. The proposition is not open to question: it is a novel, but unquestionably better, way of stating the nature of the problem. Explanations may differ after the nature of the problem is well agreed upon. Böhm-Bawerk shows...by devoting several hundred pages to setting forth his theory of interest, that he does not consider his work done when the proposition above quoted is stated" (Fetter p. 172).

processes). John Maynard Keynes thought the third ground was an arbitrary distinction, and pointed out that a “smelly” process would command a greater reward too (Keynes p. 215).

Frank Fetter leveled a much more damning charge, when he claimed (19\_\_ ) that Böhm-Bawerk’s third ground was susceptible to the critique of productivity explanations that Böhm-Bawerk himself had given in his first volume! Subsequent economists in the so-called Austrian School, most notably Ludwig von Mises (19\_\_ ) and Murray Rothbard (19\_\_ ), have expanded on Fetter’s claim that Böhm-Bawerk’s writings on interest were internally contradictory.

The father of modern neoclassical interest theory, Irving Fisher, attacked Böhm-Bawerk’s third ground as superfluous; even if true, Fisher claimed, such a technological fact would influence the premium on present goods entirely through Böhm-Bawerk’s first ground (i.e. the differences in wealth over time).

#### *A (qualified) defense of the third cause*

In this paper, I claim that the above criticisms of Böhm-Bawerk are unjustified. That is, I will show that (contrary to Keynes) Böhm-Bawerk’s emphasis on roundabout processes is quite useful in understanding the nature of capitalist production. I will then argue that (contrary to Fetter and the Austrians) Böhm-Bawerk’s emphasis on the higher productivity of roundabout processes, is not itself susceptible to his critique of the naïve productivity theories of interest. Finally, I will show that (contrary to Fisher) Böhm-Bawerk’s third ground represents a truly independent cause of interest, though this independence is really only manifest in dynamic settings.

Notwithstanding these arguments, my defense is only qualified; that is, I do not *endorse* the Böhm-Bawerkian theory of interest. Indeed, I have written elsewhere (Murphy \_\_ )

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<sup>4</sup> Economists have also pointed out tremendous (and in my opinion, fatal) difficulties with Böhm-Bawerk’s theory of capital, in particular his concept of the “average period of production.” But these criticisms, and Böhm-Bawerk’s replies, fall outside the scope of this essay.

that Böhm-Bawerk's entire approach is flawed. However, if one agrees—as at least Fetter and Fisher do, but I do not—with Böhm-Bawerk that positive interest rates represent a premium placed on present versus future goods, then Böhm-Bawerk's three grounds to explain this premium are quite natural.

## BÖHM-BAWERK'S CRITIQUE OF (NAÏ VE) PRODUCTIVITY THEORIES

In order to demonstrate that Böhm-Bawerk's own approach was not susceptible to his critique of (naï ve) productivity theories of interest, let us review his argument against them. Böhm-Bawerk first reiterates the phenomenon to be explained by the interest theorist:

The sum of the means of production (labor, capital, and services of land) employed in making a product has, as a rule, a lower exchange value than is possessed by that which is subsequently their finished product...

Now experience shows that the particular quota of the total product which falls to the share of capital, that is to say, the gross yield of capital, is normally of greater value than the capital expended in its acquisition. Therefore, an excess of value, a "surplus value," arises which remains in the hands of the owner of the capital, and constitutes his originary interest.

The theorist, then, who professes to explain interest must explain the emergence of surplus value. The problem, more exactly stated, can therefore be contained in the question, "Why is the gross return to capital regularly of greater value than the portions of capital, which are consumed in acquiring that return?" Or the question can be worded, "*Why is there a constant difference in value between the capital expended and its return?*" The *productivity theories* propose to *explain*, and say they do *explain*, this difference in value as a result of the *productive power of capital*. (I, p. 77, italics original)

Now, in order to determine whether "the productive power of capital" can explain the value surplus of originary interest, the concept must be defined. Earlier, Böhm-Bawerk had catalogued four different possible meanings for the related term, "the productivity of capital":

- 1] Capital has the capacity of serving to produce goods.
- 2] Capital has the power of serving to produce *more goods* than could be produced without it.
- 3] Capital has the power of serving to produce *greater value* than could be produced without it.
- 4] Capital has the power to produce *value greater than that which it possesses itself*. (I, p. 75)

To say “capital is productive” in the first sense merely means that it is related to production (rather than consumption); in this sense, the use of a grenade to knock down and gather coconuts would be “productive,” even though more coconuts could be gathered by one’s bare hands, without the use of such a “capital good.”

If we say that capital is productive in the second sense, we mean more physical output will occur when labor is aided with a (suitably chosen) capital good than without. For example, someone using a ladder can collect more coconuts than someone using labor alone, and thus the ladder would be considered productive in Böhm-Bawerk’s second sense.

In the third sense, we mean that capital is *value* productive because the subjective value placed on the output of labor and capital goods is greater than the subjective value placed on the output of labor alone. For example, if someone can gather 100 coconuts with a ladder and one hour of labor, while only 20 coconuts with an hour of unaided labor—and

if we assume that the person values 100 coconuts more highly than 20 coconuts<sup>5</sup>—then the ladder would be a capital good possessing value productivity.<sup>6</sup>

Finally, in the fourth sense, we mean that capital possesses *net* value productivity, that the value placed on the products of a capital good exceeds the value placed on the capital good itself. In our example, the ladder would only be “productive” in this fourth sense if the subjective value placed on the ladder were less than the subjective value placed on the additional 80 coconuts.<sup>7</sup>

Now for Böhm-Bawerk, a satisfactory productivity theory of interest must demonstrate that ‘capital is productive’ in the *fourth* sense (as defined above). Recall that Böhm-Bawerk requires the interest theorist to explain why the return to capital (whether in goods or funds) is of greater value than the initial value of the capital itself. Therefore, if the productivity theorist could only show, for example, that capital is productive in the third sense—i.e. if the theorist could only show that people would prefer to work with capital goods than without—then this demonstration would not, by itself, explain ordinary interest. To be sure, it would explain why capital goods are valued, but not why they should be valued less than their subsequent products.

### *The naïve productivity theories*

With the above distinctions in mind, Böhm-Bawerk defines *naïve productivity theories* of interest as those that posit the power of capital to generate a value surplus (which is

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<sup>5</sup> Strictly speaking, the person would need to value (100 coconuts + disutility of working with a ladder) more than (20 coconuts + disutility of working without a ladder) in order for the ladder to be productive in the third sense. If, for example, a particular ladder were very rickety and caused a great deal of anxiety for the user—more anxiety than the user would get from merely climbing a tree—then it is possible that this ladder would not possess value productivity, despite the (assumed) higher valuation of 100 versus 20 coconuts. I mention this only because it shows the difficulty of defining productivity in the *second* sense, since it is not clear what should be “subtracted” from the physical output of the ladder to compensate for its greater psychic toll. [CHECK THIS; I’M NOT SURE.]

<sup>6</sup> A simple criterion for the third sense is to ask whether the person would *use* a particular capital good, given the (free) option. If so, then the capital good must confer value on the output, and so must be productive in the third sense.

<sup>7</sup> We are here neglecting the possibility of marginal disutility from the use of ladders per se, discussed in footnote 4 above. [CHECK THIS.]

necessary for the existence of originary interest), without offering a satisfactory explanation as to the origin of this power:

There are productivity theories...which maintain that there is inherent in capital a straightforward capacity to produce value. And there are the theories...which, although they take their departure from the concept of physical productivity, nevertheless profess the belief that the phenomenon of surplus value is a necessary and inevitable corollary of that productivity. Both these types of theory have one point in common. That point is that without any intermediate or explanatory transition they leap from the assertion of a productive power to the conclusion of a surplus value. They simply state that capital is productive. Then they do, to be sure, tack on a description of its productive activity, though in this respect they are guilty of superficiality. But then they conclude very hastily by crediting the surplus value to the productivity which they have merely asserted to be present. I shall group these doctrines together under the name of the *naïve productivity theories*. (I, p. 79)

#### *Critique of the first variant of naïve productivity theories*

After grouping two different classes of theories under the same term, Böhm-Bawerk then critiques them separately.<sup>8</sup> The naïve theories falling in the first class simply assert that capital has the power to produce surplus value, and then cite this power to explain originary interest. Böhm-Bawerk points out that this type of explanation is circular:

If we run through the writings of the naïve productivity theorists, we shall find in them a great many proofs of physical productivity, but almost nothing that could be interpreted as an attempt to prove that there is a direct value-creating power inherent in capital. They assert it, but they do not take the trouble to prove it, beyond mentioning the fact that the productive employment of capital is regularly followed by a surplus of value and so implying that we have empirical proof of the power of capital to produce value...

Now how convincing is this empirical proof? Does the fact that the employment of capital is regularly followed by the appearance of surplus value actually furnish adequate proof that capital possesses a power to create value?

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<sup>8</sup> The reason for this somewhat confusing approach is that, according to Böhm-Bawerk, “most of the naïve productivity theorists are so sparing of words that it is easier to say what they *may have* thought than what they actually *did* think, and often we can only conjecture whether a given writer held the [first variant] or the other” (I, pp. 88-89, italics original)

Certainly not! No more than the regular rising of the barometer in the mountains after a summer snowfall proves that there is inherent in summer snow a power to cause a column of mercury to rise. That, incidentally, is a naïve theory which is often heard from the lips of the mountaineers. (I, pp. 89-90)

### *An excursus on value*

After pointing out the elementary weakness in the first variant of productivity theories, Böhm-Bawerk provides a more fundamental (and eloquent) criticism. He argues that an alleged power of capital to create value is at odds with (the still revolutionary<sup>9</sup>) subjective value theory:

Literally to ascribe to capital a power of producing value is to misunderstand the essential nature of value, and to misunderstand the essential nature of production completely. *Value* is not produced at all, and cannot be produced. We never produce anything but forms, shapes of materials, combinations of material, that is to say, things, goods. These goods can of course be *goods possessing value*, but they do not bring value with them ready made, as something inherent that results from production. They only *acquire* value from the wants and satisfactions of the economic world. Value has its source not in the past of goods, but in their future. It does not come out of the workshop where goods came into existence, but out of the wants which they will satisfy. Value cannot be forged like a hammer, nor woven like a piece of linen. If it could, our industries would be spared those frightful convulsions called crises, which have no other cause than that quantities of products, though manufactured to technical perfection, cannot achieve the value expected. The most that production can do is to create goods in the hope that, according to the anticipated relations of demand and supply, they will be of value. (I, pp. 90-91, italics original)

For Böhm-Bawerk, then, any legitimate productivity theory of interest would require an explanation of capital's ability to create physical goods that, when appraised by consumers, allowed for the creation of a value surplus (and hence ordinary interest).<sup>10</sup> In

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<sup>9</sup> [CITE Menger, Jevons, etc.]

<sup>10</sup> Of course, Böhm-Bawerk felt his *own* positive theory—which involved the greater physical productivity of “roundabout” processes—met this requirement. The grounds for his belief are explained below.

the wake of the subjectivist revolution, those “naï ve” theories that simply stipulated a power of capital to create value could be dismissed on purely methodological grounds.

*Critique of the second variant of naïve productivity theories*

After criticizing those theories that merely posited a power of capital to create surplus value, Böhm-Bawerk went on to the more formidable and important task, of refuting those (naï ve) theories that explained interest on the basis of the *physical* productivity of capital. Inasmuch as some critics (especially members of the Austrian school) used this very reasoning to attack Böhm-Bawerk’s own positive theory, it is appropriate to quote the critique at length:

Now let us turn to the second interpretation of which the naï ve productivity theory is capable. Here the productive power ascribed to capital is, in the first instance, to be understood as physical productivity only, that is to say, a capacity on the part of capital to furnish assistance which results in the production of more goods or of better goods than could be obtained without its help. But it is assumed as self-evident that the increased product, besides replacing the costs of capital expended, must include a surplus of value. Just how convincing is this interpretation?

I grant without ado that capital actually possesses the physical productivity ascribed to it, that is to say, that more goods can actually be produced with its help than without. I will also grant...that the greater amount of goods produced with the help of capital has higher value than the smaller amount of goods produced without it. But there is not one single feature in the whole set of circumstances to indicate that this greater amount of goods must be worth more *than the capital consumed in its production*. And that is the feature of the phenomenon of excess value which has to be explained.

To put it in terms of Roscher’s familiar illustration, I readily admit and understand that with the assistance of a boat and net one catches 30 fish a day, while without this capital one would have caught only 3. I readily admit and understand, furthermore, that the 30 fish are of higher value than the 3 were. But that the 30 fish must be worth more *than the pro rata portion of boat and net which is worn out in catching them* is an assumption which the conditions of the problem do not prepare us for, or even cause to appear tenable, to say nothing of making it obvious. If we did not know from experience that the value of the return to capital is regularly greater than the value of the substance of capital consumed, the naï ve productivity theory would not

furnish a single reason for regarding such a result as necessary. It might very well be quite otherwise. Why should not capital goods that yield a great return be highly valued on that very account and indeed, so highly that their capital value would be equal to the value of the abundance of goods which they yield? Why, for instance, should not a boat and net which, during the time that they last, help to procure an extra return of 2,700 fish be considered exactly equal in value to those 2,700 fish? But in that event, in spite of the physical productivity, there would be no excess value. (I, pp. 93-94, italics original)

Now that we have reviewed Böhm-Bawerk's celebrated critiques of the naïve productivity theories of interest, let us explore his own positive theory, in order to judge whether it too is susceptible to the above criticisms.

## BÖHM-BAWERK'S AGIO THEORY

The *Positive Theory of Capital* presents Böhm-Bawerk's solution to the problem of originary interest. After three sections (Volume II, Books I-III, pp. 1-258) on capital, Böhm-Bawerk (in Book IV, "Interest") offers the uncharacteristically blunt opening:

*Present goods are as a general rule worth more than future goods of equal quality and quantity.* That sentence is the nub and kernel of the theory of interest which I have to present. All threads of the explanation of phenomena of interest lead through it, and it constitutes the focal point...of all the tasks we have to perform in the way of examination into economic theory. Half of the explanation is devoted to demonstrating the truth of that sentence. The other half will then consist in showing how the fact that present goods exceed future goods in value constitutes the source from which, naturally and necessarily, emanate all the variegated forms in which the phenomenon of interest manifests itself. (II, p. 259, italics original)

For the modern reader, the "other half" of Böhm-Bawerk's explanation is straightforward enough. Both the neoclassical mainstream (descended from Irving Fisher) and Austrian dissenters (descended from Frank Fetter) view interest as equivalent to (or at least

generated by) a higher price of present versus future goods of comparable quality.<sup>11</sup> Furthermore, all major schools now fully subscribe to the subjective theory of value, and so the higher market value of present goods must be ultimately grounded in the fact that market participants (both producers and consumers) all *subjectively* value present goods more highly than comparable future goods (on the margin).

If we accept for the moment that present goods are worth more than future goods, the solution to the Böhm-Bawerkian interest problem is obvious: The reason a capital good's price is systematically lower than its expected future revenues is that the price represents a *present* opportunity cost while the revenues will not accrue until the *future*. This difference in valuation generates interest most clearly in a simple consumption loan: If people generally value present dollars more highly than future dollars, it is clear that even after all arbitrage opportunities have been competed away, a loan of \$100 today must be repaid by a greater amount (say \$110) next year. The difference in valuation (\$10 in this example) appears as a 'return' or 'dividend,' and is the prototypical example of interest.

A subjective premium on present goods would also explain "Roscher's familiar illustration," the case of the primitive fisherman: If we assume that the man values present fish more highly than future fish (i.e. if we assume that he would only trade present fish for a *greater* number of future fish), then it follows that a boat and net will appear to generate a fish 'surplus' over their life. Recall that Böhm-Bawerk had asked, "Why...should not a boat and net which, during the time that they last, help to procure an extra return of 2,700 fish be considered exactly equal in value to those 2,700 fish?" (I, p. 94). We see now that there is no paradox of undervaluation at all; the boat and net *are* considered as "exactly equal in value to those 2,700 fish," *when the 2,700 fish are still appraised as future goods*. The boat and net are, to the fisherman, means to future consumption goods. If the fisherman would not offer 2,700 fish right now for an IOU promising 2,700 fish next year, then it naturally follows that he would not offer 2,700 fish

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<sup>11</sup> Later on Böhm-Bawerk elaborates: "*Present goods have in general greater subjective value than future (and intermediate) goods of equal quantity and quality. And since results derived from the ascribing of subjective value determine objective exchange value, present goods have in general greater exchange value and a higher price than future (and intermediate) goods of the same kind and number*" (II, p. 265, italics original).

right now for a boat and net (even though they will yield 2,700 fish over time). So the lower valuation (in terms of fish) of the boat and net allows a ‘dividend’ of fish over time, which is another example of originary interest.

### *Böhm-Bawerk’s three causes*

Although Böhm-Bawerk’s “nub and kernel” may seem obvious to modern readers, his insights were quite revolutionary in treating the phenomenon of interest as an intertemporal exchange of real goods, and hence subject to the same methods of subjective marginal utility analysis as intratemporal exchanges. However, as Frank Fetter pointed out, the fact that present goods are worth more than future goods of like kind and number

is but the fact which the interest theory is to explain logically. The proposition is not open to question: it is a novel, but unquestionably better, way of stating the nature of the problem. Explanations may differ after the nature of the problem is well agreed upon. Böhm-Bawerk shows...by devoting several hundred pages to setting forth his theory of interest, that he does not consider his work done when the proposition above quoted is stated. (Fetter p. 172)

We now proceed to a summary of Böhm-Bawerk’s three causes for the higher valuation of present over future goods:

#### *First Cause: Declining Intratemporal Marginal Utility in the Future*

A *first* principal cause capable of producing a difference in value between present and future goods is inherent in the *difference between the relation of supply to demand as it exists at one point in time and that relation as it exists at another point in time*. Present goods derive their value, as we know, from the relation between the supply and demand *in the present*; future goods derive theirs from the same relation in that *future* period in which they will become available. If a person suffers in the present from appreciable lack of certain goods, or of goods in general, but has reason to hope to be more generously provided for at a future time, then that person will always place a higher value on a given quantity of immediately available goods than on the same quantity of future

goods. This situation occurs with very great frequency in our economic life. (II, pp. 265-266, italics original)

As a general rule, people expect to have larger incomes in the future, and on that account tend to value the marginal present dollar more highly than the marginal future dollar.<sup>12</sup>

*Second Cause: Systematic undervaluation of future utility*

We must now consider a *second* phenomenon of human experience—one that is heavily fraught with consequence. That is the fact that we feel less concerned about future sensations of joy and sorrow simply because they do lie in the future, and the lessening of our concern is in proportion to the remoteness of that future. Consequently we accord to goods which are intended to serve future ends a value which falls short of the true intensity of their future marginal utility. *We systematically undervalue our future wants and also the means which serve to satisfy them.* (II, p. 268, italics original)

Thus, even if conditions of supply and demand are equivalent between present and future, so that a good will yield the same marginal utility *at the moment of consumption* in both the present and the future, the systematic discount of future wants would render the *prospective* utility of the future good lower than the utility of the present good.

Böhm-Bawerk offered three “partial causes for the lesser valuation of future utility; (a) erroneous valuation by reason of fragmentary imagery of future wants; (b) lack of will power and (c) consideration of the uncertainty of life” (II, p. 271). We will offer the

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<sup>12</sup> Böhm-Bawerk does not need to even argue that the majority of people expect to have growing incomes, because of the asymmetry of time; present durable goods like money can serve future uses: “A clerk in an office...who is fifty years old and is earning sixty dollars a week must face the prospect that in ten or fifteen years he will have nothing of his own but a few hundred dollars a year from an annuity...For persons so situated it is obvious that a dollar spent in the present has less marginal utility than a dollar which will not become available and will not be spent until that future time in which they are less well provided for. It will seem, therefore, that for them a present dollar should be esteemed as having a value lower than that of a future dollar. And that would be the case if goods that *are on hand* in the present necessarily had *to be utilized* in the present. But they do not. Most goods are durable, especially money...hence they can be reserved for the service of the future” (II, p. 266, italics original).

following exposition of the third partial cause<sup>13</sup> to make Böhm-Bawerk's system more intelligible:

And finally there seems to me to be a third subsidiary cause [of the systematic discount on future utility] at work and that is *consideration of the brevity and uncertainty of human life*. For even though actual realization of future goods may be a practical certainty, there is still the possibility that I, as an individual, shall not be alive when it takes place. That makes the utility of those goods uncertain for me, and causes me...to make a deduction from their value in accordance with the degree of uncertainty. Let us assume a utility of 100 with respect to which there is one chance in two that I shall not live long enough to realize it. I certainly will not value it to be on a par with a present utility of 100, but probably only on a par with a present utility of 50.<sup>14</sup> And I am convinced that every one of us, if promised a birthday present of \$100,000 when he reached the age of 100, would be very willing to exchange this munificent but somewhat uncertain gift for a very small fractional part thereof in present goods. (II, p. 270, italics original)

*The (Notorious) Third Cause: Roundabout processes are more physically productive*

But there is a *third* main cause which exerts its influence in the same direction. It is built up on a fact which in a general way has been understood for a long time, but the essential nature of which has certainly been thoroughly misunderstood. And that fact, ensconced behind myriad errors, and going under the name of "productivity of capital," has customarily been dragged forth ever since the days of Lauderdale and Say to explain and justify interest....These facts may be boiled down to the following statement. *As a*

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<sup>13</sup> To avoid confusion, let us summarize Böhm-Bawerk's scheme: Interest is caused by a higher valuation of present over future goods; i.e. a good in the present will offer more utility than the same good not available until the future. There are three main reasons for this higher valuation, the second of which is the discount placed on future utility; i.e. even if a good offered a utility of 100 both in the present and in the future *at the moment of consumption*, the future utility of 100 would be perceived in the present as worth less than a utility of 100, and so on that account the present good would offer "more" utility. Now, there are three partial causes of this discount on future utility, the third of which is the brevity and uncertainty of human life; e.g. a good that will yield a utility of 100 in the future at the moment of consumption may never in fact be enjoyed because of a premature death, and so on that account the future good would not be viewed as equivalent to a *present* utility of 100.

<sup>14</sup> Notice that Böhm-Bawerk's treatment relies on a cardinal conception of utility. This is no different from the mainstream approach, however; Böhm-Bawerk's second cause is comparable to the slope of a Fisher indifference curve (which reflects the quantitative marginal rate of substitution between present and future units of real consumption or income) at a point on the 45-degree line from the origin [CHECK THIS], while Böhm-Bawerk's second cause is virtually equivalent to the discount factor (often denoted by  $\hat{a}$ ) applied to future utils, found in modern mathematical models.

*general rule, present goods are for technological reasons preferable means to the satisfaction of wants and for that reason they are a warranty of higher marginal utility than are future goods.*

It is an elementary fact of human experience that time consuming roundabout methods of production are more productive. That means that, given equal quantities of the means of production, the more time a method of production consumes, the greater will be the output it produces. (II, p. 273, italics original)

Böhm-Bawerk then offers a somewhat tedious example (thankfully accompanied by a chart):

Let us suppose, for instance, that in the year 1956, we control the disposal of a certain quantity of means of production, say, 30 days' or one month's labor. In terms of the foregoing statements we can make certain assumptions. We shall assume then, that if the month's labor is expended in its least productive form of momentary, hand-to-mouth production, it will turn out only 100 units of product. But if it is expended in a production process covering one year, it will turn out 200 units though of course not until the year 1957. Similarly in a two-year production period it will turn out 280 units for 1958, and so on in ascending progression. It could perhaps be 350 units for 1959, 400 units for 1960, 440 for 1961, 470 for 1962 and finally 500 units for 1963.

Now let us compare with that the amount of output procurable from the same quantity of means of production[,] namely one month's labor, on condition that it be not available until one year hence. One month's labor available in 1957 will obviously produce *nothing* for the year 1956; for 1957 it can be employed only in momentary production of the least remunerative kind and hence will bear fruit only to the extent of 100 units. For the year 1958 it is possible to apply it in a one-year production method that returns an output of 200 units; for 1959 a two-year production method is possible, with its yield of 280 units, and so on. {II, pp. 273-274)

PRODUCTION OF ONE MONTH'S LABOR								
(In Units)								
<i>Performed in...</i>	<i>...Will Produce In The Economic Period</i>							
	<i>1956</i>	<i>1957</i>	<i>1958</i>	<i>1959</i>	<i>1960</i>	<i>1961</i>	<i>1962</i>	<i>1963</i>
1956	100	200	280	350	400	440	470	500

1957	—	100	200	280	350	400	440	470
1958	—	—	100	200	280	350	400	440
1959	—	—	—	100	200	280	350	400

(adapted from II, p. 274)

Before proceeding, we should be clear on what these figures mean. A ‘unit’ of labor can be ‘invested’ in all sorts of processes which take varying lengths of time for completion. For example, a month of labor devoted to (directly) picking coconuts might yield 100 barrels. But suppose instead that the month of labor is invested in the construction of a durable pole with a sharpened end. Suppose further that, when the pole is combined with eleven months of additional labor, it wears out completely, but has helped yield a total of 1,300 barrels of coconuts. Finally, imagine that a year (i.e. 12 months) of labor could be used to construct a sturdy axe, which lasts for one year and in that time (combined with an additional year of labor) helps to yield 4,560 barrels of coconuts (from felled trees).

If such were the technological constraints faced by a Robinson Crusoe, he would calculate that one month of his labor in 1956 would yield 100 units of output in 1956, 200 units in 1957,<sup>15</sup> or 280 units in 1958.<sup>16</sup> If Böhm-Bawerk is correct in his empirical generalization, then Crusoe could always find a more “roundabout” production process in which a given investment of labor would be more *physically* productive. When labor (and the other “original factor” of natural resources or what is generically classified by some economists as “land”) is invested in a roundabout process, it is used not to achieve direct consumption ends, but to create capital goods—which in themselves may be quite

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<sup>15</sup> To arrive at this figure, Crusoe must isolate the contribution of the first month’s labor (which is used, not to gather coconuts, but to construct a pole). Had he simply idled away that first month, and then devoted the remaining eleven months to picking coconuts by hand, Crusoe would have accumulated (at the end of the year) 1,100 barrels. Since we have stipulated that eleven months of labor with a pole allows him to accumulate 1,300 barrels of coconuts, we calculate the marginal (physical) productivity of the pole—and thus the marginal (physical) productivity of the first month of labor devoted to its construction—as 200 barrels.

<sup>16</sup> To arrive at this figure, Crusoe might reason that the productivity of the axe is 3,360 barrels of coconuts (since he can accumulate 1,200 barrels in the second year without an axe, and 4,560 barrels with it). Given that the axe takes one year of labor to produce, Crusoe might further estimate that one month of labor invested in axe construction possesses a marginal physical productivity of  $3,360 / 12 = 280$  barrels of coconuts.

useless—that will later serve to satisfy consumption ends far more effectively.<sup>17</sup> Böhm-Bawerk’s third cause may be paraphrased by the claim: *As a general rule, there exist recipes for capital goods the physical productivity of which exceeds the sum of the physical productivities of the land and labor used in their construction.*

From this rule, it follows that present goods possess a technical superiority over future goods:

For the satisfaction of our 1956 wants, for instance, a month’s labor in 1957 or 1958 makes nothing available, while for 1956 it at least makes 100 units available. In the economic year of 1961 the contribution to the satisfaction of wants by a month’s labor done in 1958 amounts to 350 units, that of a month’s labor out of 1957 amount to 400 units, that of a 1956 month to 440 units. It therefore becomes apparent that no matter which temporal period is chosen as the standpoint from which to make a comparison, the older (present) quantity of means of production is technically superior to the quantitatively equal more recent (future) one. (II, p. 274)

But how do these alleged facts concerning physical productivity relate to originary interest? After all, as Böhm-Bawerk himself demonstrated, interest is a problem of value, not product.

Is this technological superiority matched by a superiority as to marginal utility and *value* as well? It most certainly is. For if the older means of production makes available a larger quantity of the means of satisfaction, regardless of the class of wants to which we are conceivably able or disposed to apply them, then they certainly must be of greater importance to our well-being! Oh yes, I am thoroughly well aware that a larger *quantity* of goods does not always necessarily have greater *value*. A bushel of grain in a year of famine can be worth more than two bushels after a copious harvest, and a pound sterling before the discovery of America had 10 times the value it now has in the middle of the

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<sup>17</sup> Of course, the more roundabout process must be *suitably chosen*. The fact that process Y takes longer (or, more accurately, involves a greater number of intermediate steps) than process X does not guarantee that Y will produce more than X. But what Böhm-Bawerk *does* claim is that *there always exists* some process Z that is more roundabout and more (physically) productive than a given process X. His claim is similar to the statement, “Consumers can buy faster computers if they are willing to pay more.” This claim is true, even though we can find examples of one computer that is both slower and more expensive than another model.

twentieth century.<sup>18</sup> But for one and the same person at one and the same point of time, the larger quantity always has the greater value. No matter what the absolute value of a bushel or of a pound may be, one thing is certain, and that is, that for me *two pounds or two bushels that I have today* are worth more than *one pound or one bushel that I have today*. (II, pp. 274-275)<sup>19</sup>

### *Summary*

We now have an understanding of Böhm-Bawerk's solution to the problem of originary interest: Present goods are, as a general rule, valued more highly than future goods. Claims to future goods (whether literal claims specified in contracts or technological 'claims' in the form of capital goods) thus appreciate in value as they ripen into present goods, and this appreciation is what economists classify as interest.

This fact of a premium, or agio, on present over future goods has three main causes. First, the marginal utility (at the moment of consumption) of goods tends to fall over time, due to (generally) increasing income and the durability of many types of goods. On this account, present goods tend to have a higher marginal utility than future goods.

In the second place, any given amount of utility tends to be systematically discounted in its present appraisal, in proportion to its remoteness in the future. Thus, even if we neglect the first cause, and suppose that an apple consumed now will yield the same (instantaneous) utility as an apple consumed next year, nonetheless the present *appraisal* of that future utility will make the present apple seem preferable.

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<sup>18</sup> This illustration, as well as the years chosen for the chart, were obviously updated by the editor of Böhm-Bawerk's works.

<sup>19</sup> Böhm-Bawerk continues: "And exactly the same thing applies when we compare in value a present and a future quantity of means of production. It may very well be that the 470 units of product that could be turned out by a 1957 month's labor for the year 1963 are worth less than the 350 units to be obtained from that same month's labor for the year 1960, and that those 350, despite their numerical inferiority are the most valuable that can be derived at all from a 1957 month's labor. But even then the 400 units that can be obtained for 1960 from a 1956 month's labor are still more valuable. And so the older (present) quantity of means of production maintains its superiority in this instance and in any other instances, no matter which variant of our example is chosen" (II, p. 275).

And finally, there is a third cause of the agio on present goods, namely the greater physical productivity of roundabout processes. Thus, even if we neglect the first cause by supposing that an apple will yield the same (instantaneous) utility now as it will next year, and even if we neglect the second cause by supposing that present utility is regarded on an equal footing as future utility, it would still be the case that a present apple is preferred to a future apple. This is because the present apple may be consumed now in order to ‘free up’ labor that would otherwise be devoted to a short production process (e.g. picking an apple off a tree), and which may now instead be devoted to a one-year production process with no loss in apple consumption.<sup>20</sup>

[DO WE RUN INTO TROUBLE WHEN WE CONSIDER THAT THE NATURAL RESOURCES MUST BE VALUED TOO?]

Now that we have summarized Böhm-Bawerk’s agio theory, we will deal with critics of his third cause of the higher valuation of present over future goods.

KEYNES: “ROUNDABOUTNESS” IS AN ARBITRARY FEATURE

An interesting critique of Böhm-Bawerk’s third cause comes from John Maynard Keynes in his celebrated *The General Theory of Employment, Interest, and Money* (Keynes \_\_\_). To understand the context of Keynes’ disagreement with Böhm-Bawerk, it will be useful to quote him at some length:

It is much preferable to speak of capital as having a yield over the course of its life in excess of its original cost, than as being *productive*. For the only reason why an asset offers a prospect of yielding during its life services having an aggregate value greater than its initial supply price is because it is *scarce*; and it is kept

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<sup>20</sup> This example assumes that apples may be stored costlessly, which is of course quite unrealistic. The point is that consumption goods available in the present allow for investment in roundabout production processes, while the absence of such consumption goods would require hand-to-mouth production (if only to avoid starvation). Thus, even though consumption goods cannot be directly employed in roundabout processes, in the Böhm-Bawerkian framework they too are valued more highly on account of the third cause.

scarce because of the competition of the rate of interest on money. If capital becomes less scarce, the excess yield will diminish, without its having become less productive—at least in the physical sense.

...

It is true that some lengthy or roundabout processes are physically efficient. But so are some short processes. Lengthy processes are not physically efficient because they are long. Some, probably most, lengthy processes would be physically very inefficient, for there are such things as spoiling or wasting with time. With a given labour force there is a definite limit to the quantity of labour embodied in roundabout processes which can be used to advantage....The ultimate quantity of *value* will not increase indefinitely, relatively to the quantity of labour employed, as the processes adopted become more and more roundabout, even if their physical efficiency is still increasing. Only if the desire to postpone consumption were strong enough to produce a situation in which full employment required a volume of investment so great as to involve a negative marginal efficiency of capital, would a process become advantageous merely because it was lengthy...

Moreover there are all sorts of reasons why various kinds of services and facilities are scarce and therefore expensive relatively to the quantity of labour involved. For example, smelly processes command a higher reward, because people will not undertake them otherwise. So do risky processes. But we do not devise a productivity theory of smelly or risky processes as such. In short, not all labour is accomplished in equally agreeable attendant circumstances; and conditions of equilibrium require that articles produced in less agreeable attendant circumstances (characterised by smelliness, risk or the lapse of time) must be kept sufficiently scarce to command a higher price. (Keynes p. 213-215)

Before proceeding to the heart of the matter, we should clarify a popular misconception. In Böhm-Bawerk's framework, a "roundabout" production process does *not* necessarily require more time than a direct production process. A roundabout process merely means that it devotes labor and land factors towards intermediate goals rather than the immediate goal of consumption. Now, in practice—and for the very reasons given by Keynes—a longer process will only be chosen if it is more productive, and naturally (following the logic explained in footnote 17 above) the most productive process of a given duration will be more roundabout than any shorter process. [CHECK THIS.] So although there is usually no harm in treating the terms *roundabout* and *longer* as

interchangeable, strictly speaking they are different (and this difference is relevant to the present dispute).<sup>21</sup>

Besides this slight inaccuracy, the fundamental problem with Keynes' critique is that his example of "smelly processes" is not at all analogous to Böhm-Bawerk's emphasis on roundabout processes. Keynes has pointed out one respect in which a "productivity of smelliness" theory would be similar to Böhm-Bawerk's theory: In equilibrium, the smellier the process, the more productive it is; just as in equilibrium, the more roundabout the process, the more productive it is. From this similarity Keynes concludes that Böhm-Bawerk's theory must be as arbitrary (not to mention ridiculous) as a theory based on the productivity of smelly processes.

But Böhm-Bawerk's claim concerning the higher productivity of roundabout processes is *not* (merely) an equilibrium argument. He argues that, as an empirical fact, when we consider any particular production process, there always exists a more roundabout process that is more physically productive. This is much stronger than the claim that, when we consider the processes *actually employed in equilibrium*, we find a positive correlation between the roundaboutness of a process and its physical output. To be truly analogous, Keynes would have to argue (as Böhm-Bawerk spends five chapters in his third volume arguing [Vol. III, Chapters IV]) that for any given production process, there always exists a more productive—and smellier—process.

Finally, we can defend the relevance of Böhm-Bawerk's third cause on a historical basis. When he wrote, there was a rich tradition of explaining interest by reference to the "productivity of capital." All sorts of illustrations were offered, purporting to demonstrate how the superior yield of labor when directed to capital goods created originary interest. In his critique of rival productivity theories, Böhm-Bawerk showed that the particular expositions of his predecessors were confused. But Böhm-Bawerk did not think their observations were *irrelevant* to a discussion of capital and interest; he

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<sup>21</sup> To illustrate the difference: It is possible for a roundabout process to be *shorter* than a direct process (and also more productive). For example, [FIND B-B'S EXAMPLE OF THIS].

quite understandably thought that they were incorporating crucial insights (concerning the *net* physical productivity of capital goods) into a flawed theoretical framework.<sup>22</sup>

Thus, even if it were true that on some level, Böhm-Bawerk's focus on roundabout processes as a "cause" of interest were arbitrary, this alone would not invalidate his approach. Economists must always construct somewhat arbitrary categories to highlight what they consider the essential features of the real world when offering explanations of economic phenomena. After all, Keynes would surely have no problem with the claim that 'labor hours are productive.' Yet clearly there are some processes with more labor that are *less* productive than other processes. And, even more fundamentally, there is really nothing productive about labor hours *per se*; a worker must rather use his time in an efficient manner before his labor will yield anything. Despite these facts, economists could still justifiably discuss the enhanced productivity of processes receiving a greater input of man-hours. In the same way, we can defend Böhm-Bawerk's emphasis on the superior productivity of roundabout processes.

#### FETTER: THE THIRD CAUSE SUSCEPTIBLE TO BÖHM-BAWERK'S OWN REFUTATION OF PRODUCTIVITY THEORIES

A much more fundamental critique of Böhm-Bawerk's emphasis on roundabout productivity comes from Frank Fetter (and is elaborated later on by economists in the Austrian School). As Austrian economist Murray Rothbard explains in his Introduction to a collection of Fetter's works:

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<sup>22</sup> In response to the objections of Fisher and others, who claimed that his third cause was redundant, Böhm-Bawerk said: "As I have repeatedly stated, the facts to which I refer in the deduction of my third reason basically coincide with the very facts on which the once commonly accepted productivity theory exclusively based its explanation of interest...I am particularly referring to the fact that utilization or employment of capital leads to higher productivity....In such a situation and in view of the notorious relationship so manifest in real life between the degree of capital productivity and the rate of interest obtainable for the use of capital, it is certainly not surprising if I concede to these facts a prominent place of their own in my explanation of the interest phenomenon" (III, p. 150).

In his 1902 review of Böhm-Bawerk...Fetter quite rightly pointed to the major textual contradiction in Böhm-Bawerk's theory of interest: Böhm-Bawerk's initial finding that interest stems from time preference for present over future goods is contradicted by his later claim that the greater productivity of roundabout production processes is what accounts for interest. (Rothbard in Fetter p. 7)

This claim is typical in the Austrian literature (CITES). The Austrians seek to save the “nub and kernel” of Böhm-Bawerk's theory by adopting a “pure time preference theory” (PTPT) of interest, which explains interest as due *solely* to considerations of time preference, rather than Böhm-Bawerk's “eclectic” focus on both subjective time preference and objective roundabout productivity (CITES). Considerations of the productivity of capital determine the *rents* afforded by the services of a capital good, and it is these rents that are discounted by time preference to determine the present value of a capital good. If the time preference is positive, then the present price of a capital good will be lower than the sum of its future rents, and hence ownership of it will yield a flow of ordinary interest. As Fetter eloquently explains:

Rent has to do with “production” or scarce and desirable uses of things. To the interest theorist this is in the nature, one might almost say, of an ultimate fact. The interest theory begins with the valuation of these different rents or incomes, distributed through different periods of time. The “productiveness” of a material agent is merely its quality of giving a scarce and desirable service to men. To explain this service of goods is the essence of the theory of rent. Given this and a prospective series of future services, however, the problem of interest arises, which is essentially that of explaining the valuation set on the future uses contained in goods. Interest thus expressing the exchange ratio of present and future services or uses is not and cannot be confined to any class of goods: it exists wherever there is a future service. It is not dependent on the roundaboutness of the process; for it exists where there is no process whatever, if there be merely a postponement of the use for the briefest period. A good interest theory must develop the fertile suggestion of Böhm-Bawerk that the interest problem is not one of product, but of the exchange of product,—a suggestion he has not himself heeded. It must give a simple and unified explanation of time value wherever it is manifest. It must set in their true relation the theory of rent as the income from the use of goods in any given period, and interest as the *agio* or discount on goods of whatever sort, when compared throughout successive periods. For such a theory the critical work of Böhm-Bawerk was an

indispensable condition; but, the more his positive theory is studied, the more evident it is that it has missed the goal. (Fetter p. 188)

### *Two meanings of time preference*

Ironically, the ostensible inconsistency in Böhm-Bawerk's theory is due to a basic confusion on the part of Fetter (and later Austrians). Contrary to Rothbard's claim, Böhm-Bawerk did not initially say that interest is due to time preference for present over future goods, and then later change his mind and say that interest was due to roundabout productivity. What Böhm-Bawerk claimed is that interest is due to an agio or premium on present versus future goods. *Then* Böhm-Bawerk sought to give reasons *why this premium should exist*. And the third of these reasons was the superior productivity of roundabout processes.

The confusion over Böhm-Bawerk's theory is perpetuated by the habit of Fetter and the Austrians of using *time preference* to mean two distinct things. Sense (i) of *time preference* (henceforth TP) corresponds to what Böhm-Bawerk meant when he said that present goods are worth more than future goods. That is, if an agent actually prefers a marginal present good over a marginal future good, we shall say that this agent possesses TP in sense (i). This is an endogenous concept (that may change with circumstances such as wealth), and can be represented by the slope of an indifference curve (with present and future real income as the two goods) on a Fisher diagram, or in modern models by the marginal rate of substitution between present and future consumption.

Sense (ii) of TP corresponds to Böhm-Bawerk's *second reason* for a higher valuation of present goods; it refers to the discounting of future utility because of its remoteness in time. This is usually considered an exogenous concept (that holds true regardless of changes in circumstances), and can be represented in mathematical economics by the subjective discount factor on future utils (usually denoted by  $\hat{a}$ ).

Now, if we use TP in sense (i), then Böhm-Bawerk would agree with advocates of the PTPT: Interest is indeed solely due to time preference. But if we use TP in sense (ii), then Böhm-Bawerk would *not* endorse the PTPT, since he believes there are at least two other possible causes of interest. That is, if TP means the discount of future utility, then Böhm-Bawerk would say that TP is unnecessary for interest: Even if a utility of 100 available next year is evaluated on a par with a present utility of 100, a present dollar might still be preferred to a future dollar by someone who expects to grow wealthier over time. In other words, Böhm-Bawerk would say that this person values present goods more than future goods because of differing marginal utilities of goods in the different time periods.

### *An analogy with labor*

To illustrate the confusion that has resulted from the dual meaning attached by Fetter and the Austrians to *time preference*, let us construct an analogous, hypothetical argument over the theory of wage rates:

Imagine that Böhm-Bawerk had offered a new subjectivist theory of wage rates, in which he argued that an employer would only pay money units for labor hours if he valued the labor hours more than the money units. Imagine that Böhm-Bawerk then proceeded to give reasons for *why* (and how much) an employer should value labor hours more than money, and concluded that the equilibrium wage rate was determined by the interaction of the subjective desires of consumers for goods, the subjective desires of laborers for leisure, and the objective productivity of labor in creating goods.

Finally imagine that Fetter criticized Böhm-Bawerk for this eclectic theory, and wondered why Böhm-Bawerk had lapsed into a productivity explanation of wage rates. After all, as Böhm-Bawerk himself initially declared, wage rates were determined solely by the subjective valuation of employers of labor hours over money units. Fetter would offer instead a ‘pure labor hours preference’ theory of wage rates. In this theory, productivity considerations would play a role, to be sure, but only *indirectly* by affecting

the subjective valuations of the employer. The objective fact of labor's productivity as such would have no direct bearing on wages.

### *The example of Mises*

The above analogy may seem unfair to the critics of Böhm-Bawerk. As further proof that they have misunderstood his theory, let us examine the following passages from the great Austrian economist Ludwig von Mises:

There is no question of an alleged productivity of capital goods. The difference between the price of a capital good, e.g., a machine, and the sum of the prices of the complementary original factors of production required for its reproduction is entirely due to the time difference. He who employs the machine is nearer the goal of production. The period of production is shorter for him than for a competitor who must start from the beginning. In buying a machine he buys the original factors of production to be expended in its reproduction plus time, i.e., the time by which his period of production is shortened.

The value of time, i.e., time preference<sup>23</sup> or the higher valuation of want-satisfaction in nearer periods of the future as against that in remoter periods, is an essential element in human action. (Mises p. 490)

We see here that Mises is conflating the two meanings of TP. Böhm-Bawerk would agree entirely with the first paragraph; indeed, it merely expresses the “nub and kernel” of Böhm-Bawerk's explanation of ordinary interest. Mises seems to be arguing that time preference refers to the fact that present goods are preferred to future goods (i.e. TP in sense [i] as we have defined it above) and that this preference explains the higher prices for capital goods over the original factors required for their construction.

But in the second paragraph, Mises defines TP as the premium attached to present satisfaction or present utility *as such* (i.e. TP in sense [ii]). Böhm-Bawerk would *not*

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<sup>23</sup> Mises' usage of *time preference* is a bit subtler than either of the two senses of TP that we have defined in the text. However, the point is that at best, Mises has come up with a rival theory of interest that relies on an idiosyncratic definition of TP; his arguments have not at all shown the weakness in Böhm-Bawerk's approach.

agree that TP in this sense explains the higher price of capital goods over the original factors used in their construction. For example, even if there were no TP in this sense—so that want-satisfaction or utility now is evaluated on a par with want-satisfaction or utility next year—nonetheless present goods could be preferred to future goods (because of relative future wealth), and this would still result in a higher price for capital goods than for their constituents.

Mises' failure to appreciate Böhm-Bawerk's theory is also evident in this passage:

A lengthening of the period of production can increase the quantity of output per unit of input...But it is not true that the imputation of the value of this additional wealth to the capital goods required for the lengthening of the period of production generates interest. If one were to assume this, one would relapse into the crassest errors of the productivity approach, irrefutably exploded by Böhm-Bawerk. The contribution of the complementary factors of production to the result of the process is the reason for their being considered as valuable; it explains the prices paid for them and is fully taken into account in the determination of these prices. No residuum is left that is not accounted for and could explain interest. (Mises pp. 526-527)

In the first place, the last two sentences quoted are not quite correct. If Mises were to agree (if only for the sake of argument) with Böhm-Bawerk that a present machine is more productive than a future machine, then he would be conceding that productivity can generate ordinary interest. For, as Mises himself argues, the productivity of a machine explains the price paid for it. Consequently, if a present machine is more productive than a future one (judged in the present), then the spot price of the machine will be higher than the price of a future claim to the same machine. But this is precisely the phenomenon of ordinary interest which Böhm-Bawerk sought to explain! A capitalist could invest funds in a future claim to the machine, wait until the future arrives, then sell the machine for the (higher) spot price and reap the gain, i.e. earn interest on his capital investment.

*Productivity and 'reproductivity'*

The deeper issue here is the ambiguous term “productivity of capital.” What Böhm-Bawerk (and especially later neoclassical models of interest) really emphasized was the *net* productivity of capital, i.e. the ability of capital goods to generate a greater output of consumption goods *than the (opportunity cost of) consumption goods required to construct them.* In another paper, I have labeled this second phenomenon as the “reproductivity of capital” to avoid confusion (Murphy \_\_\_\_).

The difference between the productivity and reproductivity of capital is best illustrated by the modern neoclassical postulate of a capital good that automatically grows (without any other inputs) at a certain rate over time. (Historically this assumption has been defended as an approximation to Crusonia plants, sheep, and rice. [CITES]) For example, a capitalist may own a school of tuna fish that multiplies at a rate of ten percent per year. This capital stock would thus have a reproductivity of ten percent per year. But the fish would also possess productivity, since one fish can be used (with other inputs) to produce a certain amount of canned tuna (which can be sold to consumers). The productivity of this capital stock might thus be one can per fish.

Now, in such a world, a neoclassical economist would conclude that equilibrium can only be achieved when one present fish trades for 1.1 future fish. (This is because technologically speaking, one present fish can *produce* 1.1 future fish.) Since this is a necessary condition for equilibrium, it must be the case the consumers in their purely subjective evaluations *also* consider one present (canned) fish to offer the same utility as the current prospect of 1.1 (canned) future fish, and so they construct their consumption plans to achieve this. Further, the neoclassical—dutifully following Böhm-Bawerk in classifying interest as caused by the premium of present over future goods—would conclude that the ‘interest rate on tuna fish’ is ten percent per year. Finally, if (as is often the case in mainstream models) tuna fish were the only good in the economy, then it would quite naturally follow that the interest rate in this hypothetical world were fixed at ten percent per year. This is the reasoning used by modern proponents of productivity theories of interest.

We now proceed to Fetter's attempted refutation of such arguments.

*Fetter vs. Brown*

Fetter addresses the argument of Dr. Brown, who had offered an example of fruit-producing, reproducing trees as an illustration of the potency of Böhm-Bawerk's third cause:

Fruits can be expressed for economic purposes as a percentage of trees not as physical quantities, but only as value-relations in terms of some standard. Usually the money-standard is chosen: Dr. Brown chooses a present-fruit value standard and does not see that he is doing it. To say that 1,000 present fruit *equals* 1,100 future fruit is to express a value relation. Equal how? Evidently not in quantity, for they are unequal, but in value. It is a psychological not a physical ratio. If, now, the productivity part of the problem be considered, 10 present trees equal 1,100 future fruit. Again we ask, equal in what way? Evidently not in quantity, but only in value? Where then is the ten per cent ratio? The answer comes that 10 present trees equal 1,100 future fruit and *at the same time* equal 1,000 present fruit; herein lies a ten per cent rate of productivity. A certain value of labor invested in trees yields a ten per cent value surplus at the end of a year. Enter the value relation disguised as a rate of physical productivity. (Fetter p. 258)

Fetter is quite correct: The sense in which 10 present trees equal 1,100 future fruit (or 1,000 present tuna equal 1,100 future tuna) is one of value; the former can technologically produce the latter, and so the value assigned to the means is the same as the value assigned to the end. But since 10 present trees can *also* produce 1,000 present fruit (or, vacuously, 1,000 present tuna can produce 1,000 present tuna), it is also the case that the value assigned to the latter end is the same as the value assigned to the former means. And thus we can conclude, with no relapse into objective theories of value, that the value of 1,000 present fruit must be equal to the value of 1,100 future fruit; i.e. we can conclude that these technological facts have 'caused' a ten percent premium on present goods.

Before closing this section, let us again note that the only real point Fetter has made in the above quotation is that the subjective evaluation of goods must enter the picture. In particular, he could point out that only if (in equilibrium) trees are used to produce *both* present and future fruit, can we conclude that the own-rate of interest on fruit is ten percent.

But in any static equilibrium setting—even the ones used by Fetter and the Austrians to illustrate the nature of interest (as distinct from pure profit)—present and future goods must be produced, lest the consumers *never* get to consume. In any event, to point out that present fruit must be produced in order for Brown’s demonstration to work, is just as (ir)relevant as pointing out that only if widgets are produced in equilibrium, will labor’s productivity in widget-production have any influence on wage rates. Such an observation would not disqualify productivity theories of wages, and thus neither does Fetter’s observation disqualify Brown’s productivity theory of interest.

### *Conclusion*

In summary we see that Böhm-Bawerk’s approach can withstand the particular attacks made by Fetter and members of the Austrian School. More generally, the above has shown that Böhm-Bawerk’s theory does in fact survive his criticisms of the naïve productivity theories of interest. Böhm-Bawerk never claimed that physical productivity as such is irrelevant to interest; what he claimed was that the naïve theorists had offered *no satisfactory explanation* of why the physical superiority of capitalist processes should result in a higher valuation placed on the products of capital over the capital goods themselves.

Böhm-Bawerk’s agio theory does (at least superficially) pass the tests that he himself set up for any productivity explanation. This is seen most clearly in the modern (and quite unrealistic) examples of reproducing capital goods, where a present unit of capital is *always* more productive than a future unit, for the simple reason that a present unit can create a greater number of future units. Making no assumptions on consumer preferences

(except that more is preferred to less), we can conclude that present goods would be preferred to future goods because of this technological fact. Such an explanation is not susceptible to Böhm-Bawerk's critiques of the naïve productivity theories of interest.

#### FISHER: THIRD CAUSE REALLY THE FIRST TWO IN DISGUISE

Finally we turn to Böhm-Bawerk's dispute with Irving Fisher. Fisher did not so much challenge Böhm-Bawerk on the grounds that he had violated his own strictures against productivity theories,<sup>24</sup> but rather on the smaller charge that Böhm-Bawerk's third cause for interest was not truly independent of the first two:

Our conclusion is that if we eliminate the "other two circumstances" (relative underestimate of, and overprovision for, the future [i.e. second and first causes, respectively—RPM]), we eliminate entirely the superiority of present over future goods, and the supposed third circumstance of "technical superiority" therefore turns out to be non-existent. (Fisher qtd. in III, p. 177)

The arguments Fisher advances, and the responses given by Böhm-Bawerk, do not concern us here, for both economists relied on specific numerical examples; a more general defense (i.e. what Böhm-Bawerk *could* have argued more persuasively) is presented in the following section.

What *is* relevant for this paper is the differing *methods* of the two economists, their fundamentally different approaches to economic phenomena. In arguing that Böhm-Bawerk's third cause is redundant, Fisher seeks to prove (and, it must be admitted,

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<sup>24</sup> Indeed, regarding the productivity vs. time preference debate, Fisher has to say: "If, then, I am asked to which school I belong—subjective or objective, time preference or productivity—I answer 'To both.' So far as I have anything new to offer, in substance or manner of presentation, it is chiefly on the objective side" (Fisher p. 182). Inasmuch as Fisher's definition of *time preference* seems closer to our sense (i) (see e.g. Fisher p. 62, though he incorrectly links his own definition to Böhm-Bawerk's second cause, i.e. TP in our sense [ii]), it would seem that productivity is not an "independent" cause of interest in Fisher's approach, either. I.e. if we agree with Fisher's criticism of Böhm-Bawerk's emphasis on roundabout productivity, then we must also judge Fisher's own theory to be guilty of redundancy.

appears to have successfully done so) that the third cause cannot generate interest in the absence of one of the other two causes. Böhm-Bawerk argues, on a self-admittedly “scholastic” level, that such a proof would *not* demonstrate that his third cause isn’t really an “independent” factor:

[Fisher] obviously assumes the following intermediary step: If my third reason cannot bring about the value advantage of present goods when the two other reasons are absent, this proves that it is no independent reason in addition to them. The effect must then *solely* be ascribed to the two other reasons. In other words, Fisher postulates the logical equivalence of “not without me” and “only through me,” which is a fallacy based on an insufficient premise. It is a false conclusion similar to the one we often meet in the negligent manner of thought and speech of everyday life, which nevertheless constitutes negligent and incorrect thinking.

[Let us illustrate this fallacy with] an example. On his first stroll out a convalescent passes a house from whose pediment a piece breaks off and injures him fatally. Certainly the man would not have been killed if he had postponed his first stroll, which perhaps was too early also from the point of view of his recovery. Nothing is more common in popular thought and expression than to make the following comment: “The man died only because of his obstinacy. If he had postponed his walk, which everybody advised him to do, he would still be alive.” Of course, this comment is wrong materially and logically with respect to the word “only.” In dialectic exaggeration it substitutes for the circumstance that the early stroll exerted an influence indispensable for the fatal effect the entirely different circumstance that the early stroll *alone* exerted the whole influence. It is obvious that the indispensability of one reason (the early stroll) for the fatal accident offers no satisfactory logical basis for denying at least the position of an equal independent reason to the fall of the pediment besides the early stroll. The falling stone is certainly not only “the early stroll in disguise.” (III, pp. 170-171, italics original)

Those readers intrepid enough to analyze the actual arguments of Fisher and Böhm-Bawerk will find, somewhat paradoxically, that *both* seem to be correct: When looking at the interest problem from a mathematical point of view, the fact that roundabout productivity is neither necessary nor sufficient (*vis-à-vis* the first two causes) for interest certainly seems to rule it out as an “independent reason” for interest.

Yet, surely one must agree with Böhm-Bawerk's logical analysis of the causes of a fictitious historical event. If, then, the economist is offering the causes of interest as it exists in the real world, it would seem Böhm-Bawerk's third reason is indeed an independent factor.

This methodological divide is illustrated by another exchange. In yet another demonstration of the ostensible redundancy of the third cause, Fisher writes:

The fact is that the only reason anyone can prefer the product of a month's labor invested today to the product of a month's labor invested next year is that today's investment will mature earlier than next year's investment. If a fruit tree is planted today which will bear fruit in four years, the labor available today for planting it is preferred rather than the same amount of labor available next year; because, if the planting is deferred until next year, the fruit will likewise be deferred a year...It does not alter this essential fact to speak of the possibility of a number of different investments. A month's labor today may, it is true, be spent in planting slow-growing or fast-growing trees; but so may a month's labor invested next year. It is from the preference for the early over the late fruition of *any* productive process that the so-called "technical superiority of present over future goods" derives all its force. The imagined "third circumstance" producing a superiority in present goods is only the first two circumstances in disguise. (Fisher qtd. in III, pp. 177-178, italics original)

To this Böhm-Bawerk replies:

I merely ask: is it or is it not true that in Fisher's example and in actual life the earlier labor month affords us the choice of obtaining for ourselves the same yield for an earlier period or a greater yield for the same period? If we have this choice, in the name of what law of logic are we to stare at the first alternative only and close our eyes to the second one as if it did not exist? **Fisher would be right if there were a law that forces us to employ our resources of the various years always in precisely identical ways.** He would be right indeed if we could choose freely according to Mephisto's motto in Goethe's *Faust*: "Man is free to choose the first but shall be slave to the following." (III, p. 178, bold added)

From these remarks, it is clear that what separates Fisher and Böhm-Bawerk is not so much a disagreement on the facts of the case, but rather in the method by which these facts shall be interpreted. Fisher is subtly employing a general equilibrium view of the economy, and using the method of comparative statics to test whether technical productivity can “cause” interest.

Böhm-Bawerk, on the other hand, is using an entirely different notion of causality. He is analyzing the circumstances of real, individual actors, who do not blindly carry out the equilibrium plan decided at one moment in the past. On the contrary, these actors must make new decisions with every change in the situation:

[Fisher is right; if] we choose whether we want to employ a labor month in production for the present, or in a 1, 2, or 3-year method, etc., but having decided in favor of a certain utilization, e.g., taking three years, [and our choices had to remain constant over time,] we must decide for the same employment also with respect to next year’s labor month. If in such a case the present labor month evidences greater value than next year’s labor month, we must ascribe it to the “sole reason” that we prefer the *earlier* enjoyment (of the same product quality) over *later* enjoyment.

But our freedom of choice goes much further. We need not choose in a parallel way, we may also choose divergingly or convergingly. We can employ our means of production available in different years for the *same purpose*, that is, for the satisfaction of wants of one and the same period....Such converging choices in favor of a single purpose are very frequent in actual life. As the best open possibilities they play a role in our valuations. We readily perceive in them the “technical superiority” of older over newer productive forces which no dialectics can deny....When a timber dealer simultaneously clears a 100-year old and an 80-year old forest, he will value the older forest higher simply because it actually yields more timber. And when we drink “old” and young wine, we value the older wine higher simply because it is superior in quality. Is this or is this not a real technical superiority? (III, p. 178, italics original)

## CONCLUSION: BÖHM-BAWERK’S VISION

As in so many academic disputes, the critics of Böhm-Bawerk seem to have proven, not so much that he was ‘wrong’ for including roundabout productivity in his explanation of interest, but rather that they can offer rival theories of interest that do not require such a feature. Let us summarize Böhm-Bawerk’s theory, in order to demonstrate how ‘natural’ his choice of the three causes is:

Originary interest is caused by a subjective premium placed on present versus future goods. There are three main causes of this premium, i.e. three main reasons that a present good will yield more utility than the same good available at a future date. First, the marginal utility yielded in each time period by the good may change over time; whatever the pattern of change, the present good (assuming no storage costs) will be preferred since it can satisfy consumption in any time period that the future good can, while it can also satisfy consumption in the earlier time periods when the future good cannot.

Second, people tend to systematically discount future utility *per se*. Thus, even if the first cause were absent (i.e. if there were constant marginal utilities of consumption over time), a present good would yield more utility (as reckoned in the present) than the certain prospect of the same good available at a future date.

Finally, there exist technical methods for *transforming* present goods into a *greater number* of future goods. This is seen most clearly in natural goods such as fruits and herds of livestock. But it is also true (from an economic point of view) for virtually all other consumption goods, since they can be produced with various techniques, the more time-consuming of which will necessarily be more productive. Thus, even if the first and second causes were absent—so that the intraperiod marginal utility of consumption remained constant over time, and future utility were not discounted relative to present utility—it would still be the case that present factors of production were preferred to future factors of production, since the former could generate more consumption goods in any period within the planning horizon.

*A formal model*

We shall close with a somewhat formal model to illustrate the above interpretation of Böhm-Bawerk's explanation of interest. Suppose an agent possesses an initial stock  $S_0$  of Crusonia plant, which grows at rate  $R$ , and suppose that the agent must form his consumption plan for a horizon of  $T$  periods, where  $T$  is finite. Suppose further that his total utility in period 0 is given by  $U = \sum_{t=1}^T \hat{a}^t u(c_t)$ , where  $t = 1 \dots T$ ;  $c_t$  denotes the amount of consumption in period  $t$ ;  $u$  is the constant intraperiod utility function of consumption, which we assume is differentiable and has the properties that  $u' > 0$  and  $u'' < 0$ ; and  $\hat{a}$  is the numerical discount on future utility.

In such a single-good model, the equilibrium (gross) interest rate (following the Böhm-Bawerkian approach) is equal to the equilibrium ratio of  $u'(c_t) / \hat{a}u'(c_{t+1})$ . That is, the real (net) rate of interest is equal to the premium placed on present marginal consumption over future marginal consumption.

Now let us illustrate the 'independent' nature of Böhm-Bawerk's third cause: Suppose  $R = \hat{a} = 1$ . That is, suppose there is no net productivity of capital, and no discounting of future utility. In that case, the optimizing consumer will consume  $S_0 / T$  of the Crusonia plant each period, and the net interest rate will be zero.

If we alter our assumptions and set  $R > 1$ , so that now capital has a net physical productivity, the optimizing consumer will pick his new consumption path such that  $c_1 < c_2 < c_3 \dots < c_T$ , making the equilibrium net rate of interest positive. Thus, although declining marginal utility (i.e. a condition falling under the scope of Böhm-Bawerk's first cause) is still *necessary* for the emergence of a positive net rate of interest, it is not *sufficient* (vis-à-vis the third cause), in the sense that there are circumstances when the first and third causes *in conjunction* will produce interest, while the removal of the third cause will reduce the net rate of interest to zero.

[WOULD THE REAL RATE OF INTEREST BE DETERMINED BY  $R$  ALONE? IF SO, THEN HOW DOES  $\hat{a} < 1$  EVER AFFECT INTEREST RATE?]

## CONCLUSION

Eugen von Böhm-Bawerk's three volumes on *Capital and Interest* are a magisterial work in the history of economic thought. His basic claim, that interest can be viewed as an intertemporal exchange of real goods, spawned both the neoclassical and modern Austrian theories of interest.

Beyond this insight, Böhm-Bawerk offered three explanatory causes of the premium typically placed on present goods. The third cause, the technical superiority of roundabout production processes, has generated inordinate controversy. However, if one accepts the Böhm-Bawerkian view on the essence of interest (i.e. that it is an exchange of present goods for a greater number of 'the same' future goods), then it is quite natural to incorporate, as an entirely independent factor, the observation that present goods can (economically speaking) *be transformed* into a greater number of the same future goods.<sup>25</sup>

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<sup>25</sup> Böhm-Bawerk's observation is no more fallacious nor redundant than the analogous claim that 'a chainsaw is more expensive than an axe because the former can fell more trees per hour'; after all, this objective fact does not constitute an 'independent' reason besides the more fundamental fact that consumers place a higher marginal utility on chainsaws than on axes.