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PURE-TIME PREFERENCE THEORY:  
A POST SCRIPT TO THE "GRAND DEBATE"

by

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It is now some years since the heat and excitement generated by the "Cambridge Controversy" in the theory of capital began to subside. Despite the occasional appearance of articles and books dealing with the issue,<sup>1</sup> the confrontation appears to have established itself as a completed episode in the modern history of thought. As such the sides of what Professor Lachmann (1973) has called the "Grand Debate" have become firmly defined in the consciousness of the profession. On the one hand we have the neo-classical orthodoxy seeing the phenomena of the capitalist economy, especially the assignment of income shares (including interest income), as being essentially price phenomena to be understood within the framework of market equilibrium. In this view the market prices (and thus interest) have to be paid if consumers are to receive that which the productive capacity of the market is able to provide, and for which the consumers are prepared to pay. Interest is rendered necessary and thus, in a sense, "justified" by efficiency - or, if one prefers the phrase, consumer-sovereignty - considerations. On the other hand we have the Cambridge critics who vigorously deny that interest incomes are caused "by individual exchanges as constrained by technology and the availability of factors of production." (Hausman, 1981, p. 167). These critics see the distribution of income between wage-earners and interest-receivers as being determined by the power balance between workers and capitalists, rather than by marginal products, consumer preferences, and factor supplies.

There can be no doubt concerning the importance of the issues that were involved in the debate. Not only, as we shall see, were there highly sensitive "ideological" issues at stake; at issue, more basically, was the very claim of economic science to provide fundamental theoretical insight into the operation of modern western economies. So that the identification, in the eyes of the profession, of the two sides participating in this primordial debate, can hardly fail to define the range of theoretical and ideological alternatives perceived as being, in principle, available.

The purpose of the present paper is two-fold. Its major goal is to point out the existence, within the stream of modern economic thought, of an important long-established theoretical tradition, bearing directly upon the central issues debated in the "Cambridge Controversy," that was, quite inexplicably, never mentioned (as far as I have been able to discover) in any of the countless polemical contributions to the controversy. This puzzling lacuna has had the unfortunate effect, I shall argue, of gravely misrepresenting the relevant available theoretical alternatives. If it is perceived that one must choose between theoretical position a and theoretical position b, then the demonstration of the existence of a serious flaw in position a, serves ipso facto as theoretical ammunition for position b, - in fact it may even be erroneously perceived as a demonstration of the validity of b. Where, however, the truth is that there exists an available theoretical position

c, then the demonstration of the invalidity of a may in fact turn out to lead directly to a demonstration of the validity (or at least the possible validity), of position c. We shall argue that precisely this kind of serious confusion has pervaded the Cambridge Controversy. Much of the disputation led to unjustified conclusions due to failure to recognize a third alternative theoretical approach to the nature of the interest share and its place in modern economic systems. This third, "missing" view is the pure time preference theory (often to be referred to in this paper as PTPT) of interest.

The second purpose of this paper is to present a careful restatement of this neglected alternative position. This restatement will attempt to highlight the elements in the pure time preference view that are most relevant to the modern debate, and to clarify aspects of the view that have, again and again in the history of modern economics, obstructed proper appreciation of it.

In particular we shall find, (a) that the pure time preference theory (PTPT) shares, respectively, important ideas with each of the sides in the Cambridge debate, and that this circumstance has important implications for one's view of the ideological issues at stake; (b) that although Cambridge theorists have deployed the well-known reswitching and capital-reversal "paradoxes" against Austrian capital theory, it turns out that these paradoxes present no problems whatsoever for the pure time preference versions of the



Austrian theory.

The following two sections of this paper will now (i) briefly spell out the two well-known alternative positions recognized in the Cambridge Controversy literature, the neo-classical view and the Cambridge view,<sup>2</sup> and (ii) draw attention to their "ideological" implications. (This statement will, rather than seeking to present a comprehensive review, concentrate only on those features of the debate most affected by the neglect of the third position identified here.) The subsequent section will then set forth the nature of this third ("neglected") view, the Pure Time Preference View.

#### THE INTEREST SHARE - NEO-CLASSICAL AND CAMBRIDGE VIEWS

In capitalist economies a portion of aggregate annual output is regularly received by the owners of capital. (This share has been variously called interest, or profit; in this paper we will, in order to avoid any possibility of confusion with pure entrepreneurial profit, refer to this share as interest.) The existence of this interest share offers a theoretical problem. As Hausman puts it, an "individual's capital...enables that individual to earn interest. If the capital is invested in a machine, the sum of the rentals the machine earns over its lifetime is greater than the machine's cost. Why?" (Hausman, 1981, p. 3). Why, for example, should not the price of the machine (paid by the capitalist at the time when he invests his capital in the machine) be

bid up by the competition of others eagerly seeking to capture this net surplus (of the sum of rentals over the initial cost of the machine) until that price fully reflects the sum of those rentals, leaving no surplus to be received as interest on the invested capital? It is in its attempt to provide an answer to this question that the neo-classical theory has encountered the objections raised by the Cambridge theorists.

The neo-classical view has been couched in a variety of formulations, with these formulations (despite their sharp differences) being, in regard to the central problem at hand, essentially equivalent. The neo-classical view sees the interest received by the owners of capital as revenue obtained through the sale, to producers, of productive services of a special kind. Interest emerges as the price necessary to be paid in order to persuade the owners of capital to make these resource services available; it is able to be offered by producers because the use of these of these productive services (along with the services made available by other resource owners, particularly by owners of labor services) permits an output larger than would have otherwise been possible.

In the versions of this neo-classical theory attributed to J.B. Clark and to F.H. Knight, the services provided by the owners of capital are the productive services of capital itself; interest is thus the productivity return to capital, in exactly the same way as wages are the productivity return

to labor. In the versions of this neo-classical theory attributed to the Austrians, the services provided by the owners of capital are associated with the time, (or "waiting") that separates the date of application of the original inputs (used to produce the capital goods which permit enhanced final output) from the date at which final output is forthcoming. In the Austrian version (of the neo-classical view) interest is thus the productivity return to time, or waiting. For these neo-classical approaches, then, interest is a market-determined revenue that emerges from the interplay of the conditions of demand, (expressed in the bids of producers eager to obtain the additional output generated by application of capital services, time, or waiting), and supply (expressing the disinclination of potential investors to undertake the sacrifices necessary to make available these capital services, time, or waiting).

When interest rates accurately reflect the market equilibrium appropriate to these demand and supply conditions, it is then possible to say that interest is paid by consumers to capitalists in precisely those amounts needed to elicit those productive services of capital (or time, or waiting) which, in the eyes of consumers, it is worthwhile to use (or, put alternatively, the usefulness of which to consumers is sufficient to make the sacrifice of these units worthwhile to investors.) Higher rates of interest might indeed elicit additional services that would increase output, but only by small marginal amounts for which

consumers are not prepared to pay (the necessary increment in interest payment). Lower rates of interest might indeed make it worthwhile for consumers to wish to wish to enjoy the increased output that would be forthcoming with the use of greater volumes of capital services (or time, or waiting), but the associated interest revenues would then not be enough to induce potential investors to undertake the sacrifices needed to make these greater volumes of services available. Looked at in this way interest rates express, in the light of resource availabilities, consumer preferences. They appear to be "justified" (in the same sense as, in the neo-classical system, wages are "justified" by the productive labor services in exchange for which they are received) by the productive services of capital, or time, or waiting, in exchange for which they are received by capitalists.

For the purpose of this paper the important element in the Cambridge view,<sup>3</sup> is its denial of the neo-classical theory of interest as an exchange phenomenon. In particular the Cambridge view denies that the interest share is the expression, through the system of market exchanges, of consumer preferences. (Indeed a central theme running throughout the literature expressing the Cambridge view, is the denial of the doctrine that consumer demand plays a decisive role in determining values of any kind.) In this respect the Cambridge view calls for a return to classical economics in which exchange values are seen as determined by costs of production, technical conditions, and the like, not

by consumer preferences. Viewed through neo-Ricardian eyes, interest receipts are not revenues received for the sale of anything at all. As E.J. Nell put it, "modern Ricardian theory puts a good deal of emphasis on the fact that the payments to capital are dispositions of a surplus and do not involve any kind of exchange. There simply is no corresponding stream moving in the opposite direction."

(Nell, 1967, reprinted in Harcourt and Laing, 1971, p. 200).

Put somewhat differently the Cambridge view objects to the neo-classical view that income distribution is merely a matter of the general pricing process, independently of "what Marx called the social relations of production" (Dobb, 1970, reprinted in Hunt and Schwartz, 1972, p. 206).

What Dobb understand by locating "a theory of distribution entirely within the circle of market relations" is exemplified in Menger's derivation of the prices of goods of so-called 'higher order,' and hence prices of factors, by a process of 'imputation' from the prices of goods of 'first order' (products sold to final consumers). By contrast the Cambridge view sees the distribution of income as "determined by the relations between workers and capitalists including possibly their relative bargaining power." (Hausman, 1981, p. 167). In this view the price system is not sufficiently all-embracing to determine the pattern of income distribution merely on the basis of the preferences of consumers. The "system of relative prices (which determines the value of the 'means of production' and, consequently,

distribution) has a degree of freedom, and becomes locked only when either the rate of exploitation or the rate of profit or the real-wage rate is taken as an independent datum...The theory of distribution therefore continues to be a matter of political economy, simply because one has to form one's judgement regarding how this degree of freedom is closed through the functioning of capitalism." (Bhaduri, 1969, reprinted in Harcourt and Laing, 1971, p. 259). From this perspective the various specific competing theories offered within the general Cambridge view differ from one another merely in the particular ways through which they seek to close the system. "A large number of Cambridge growth models 'close' the system through a relation between the rate of profit and the rate of growth...In classical political economy the system was 'closed' through the 'iron-law of wages.' In Marx's writings there is also the notion of a long-run inflexible real-wage rate..." (Bhaduri, *ibid.* footnote 8).

#### IDEOLOGY AND THE INTEREST SHARE

It is not difficult to recognize the ideological implications that can be drawn from each of the two views on interest involved in the Cambridge controversy. We shall dwell briefly on these implications not only because of the further light they throw on the controversy itself, (and upon the reasons for the extraordinary passion, even bitterness, with which the controversy was pursued). These ideological

implications of the Cambridge controversy will be useful, in particular, in underscoring, in subsequent sections of this paper, the nature of the third, neglected, theoretical position that we shall show to have been missing from the Cambridge controversy literature.

It was Mrs. Robinson who was, from the Cambridge side, most insistent upon the extra-scientific implications of the neo-classical view. "The unconscious preoccupation behind the neo-classical system was chiefly to raise profits to the same level of moral respectability as wages. The labourer is worthy of his hire. What is the capitalist worthy of?" (Robinson, 1962, pp. 57f). "Capital must be allowed to create the value that it receives." (Ibid, p. 36). "The hard-headed attitude of the Classics, which recognized exploitation as the source of national wealth, was abandoned. Capital was no longer primarily an advance of wages made necessary by the fact that the worker has no property and cannot keep himself till the fruits of his labour appear. Capital...produces the extra output that a longer gestation period makes possible. Since capital is productive, the capitalist has a right to his portion. Since only the rich save, inequality is justified." (Ibid, p. 58). From the neo-classical side Robert Solow has written of the Cambridge (U.K.) school, that they see the neo-classical theory of interest as "an important part of an apology for private capitalism. It sounds as if capitalists are entitled to their profits..." (Solow, 1975). As Mark Blaug has written,

in the course of his critique of the Cambridge view: "There is no doubt that the conviction that neo-neo-classical theory somehow serves to justify the private receipt of profit in terms of the productive contributions of 'capital' is responsible for much if not all of the venom directed at Cambridge, Mass. by Cambridge, Camb...For the Cambridge critics, any notion...implying that the rate of interest or profit is an index of the scarcity of capital, is taken to be an argument in favour of private property." (Blaug, 1974, pp. 75f).

As we have seen the neo-classical view sees interest as the reward to the capitalist for his making available the productive capacity of his capital, or time, or waiting. This would appear to "justify" interest, as Joan Robinson pointed out, in the same way as wages are seen as "justified" in the course of the marginal productivity theory. Moreover, as we saw, there would appear, in the neo-classical view, to be important efficiency considerations served by the payment of interest: interest serves to elicit the "right" amount of capital investment (taking into account both the sacrifices so involved and the usefulness to consumers of the incremental output that the investment will eventually generate.) Thus interest receipts, from the neo-classical perspective not only seem (at least from the Cambridge, U.K., judgment of that perspective) to possess moral justification, in the sense of the invocation of commutative justice; they also possess direct efficiency justification in terms of the



ideal of consumer sovereignty. To have exploded the analytics underlying the neo-classical view, (a task the Cambridge critics believed themselves to have successfully accomplished), was thus at the same time to have destroyed any claim, on the basis of economic understanding, for the moral or even the strictly economic, justification of interest receipts.

Let us now turn to establish the existence, within twentieth-century economic thought, of a theoretical tradition that views interest in a way which fits into neither of the two analytical boxes provided with the Cambridge controversy kit. This third view, the Pure Time Preference Theory (PTPT) of interest shares, as we shall see, important elements with each of the sides in the Cambridge controversy. It shares with the Cambridge critics (although for entirely different reasons) their rejection of the view of interest as a reward for a productive contribution rendered. On the other hand it shares with the neo-classical view (although, again, on different analytical grounds) their perception of interest as an exchange phenomenon, with the distribution of income between interest and wages seen as understandable entirely within the theory of market prices.

Among the misunderstandings that we shall have to clear up concerning this third view is its relationship to "Austrian" economics. As we have seen, one formulation of the neo-classical view, a formulation that was emphasized in the Cambridge controversy literature, was attributed to an

Austrian tradition stemming from Böhm-Bawerk. It was that Austrian tradition that saw interest as reflecting the productivity, not of capital itself, but of the time, or the waiting, required to engage in "roundabout methods of production." Yet, we shall argue, the third, "neglected", view, missing from the Cambridge controversy literature, is equally entitled to claim Austrian lineage, and, in fact, to be seen as stemming from Böhm-Bawerk. So that we shall have to discuss rather carefully the relationship between the two quite different Böhm-Bawerkian, Austrian, views on interest. The Austrian view of interest that is missing in the Cambridge Controversy literature, is the Pure Time Preference Theory (PTPT).

#### THE PURE TIME PREFERENCE THEORY OF INTEREST<sup>4</sup>

Although it was not introduced into the Cambridge controversy, the pure time preference theory of interest, some may perhaps need to be reminded, is well-established in the history of economic thought. It was articulated most powerfully, over a long period of decades, in the United States by Frank Fetter,<sup>5</sup> who drew his central ideas from the work of Böhm-Bawerk. (Irving Fisher, whose eclectic theory of interest embraced important elements of the time preference view, found it necessary to justify his rejection of Fetter's pure time preference theory.) (Fisher, 1930, pp. 468f). In fact Fetter found such persuasive support in Böhm-Bawerk for the pure time preference theory, that he was

completely nonplussed by Böhm-Bawerk's own notorious defec-  
tions from the pure time preference view (Fetter, 1902,  
reprinted in Rothbard, 1977, pp. 185ff).<sup>6</sup> More recently  
the most consistent exponent of PTPT was Ludwig von Mises  
(1949, chapters 18, 19).<sup>7</sup> In his long 1941 review article  
on Mises' 1940 Nationalökonomie (the work later translated  
and revised by Mises to make his noted 1949 treatise, Human  
Action) Frank Knight devoted virtually his entire space to a  
discussion (and severe critique) of Mises' pure time  
preference theory. (Knight, 1941). Knight recognized that  
the pure time preference theory represented a consistent  
development of the pure subjective Austrian approach to  
market theory in general, - and subjected both to outspoken  
polemical attack, while restating his own view of interest as  
expressing the productivity of capital itself. (Knight's own  
theory, in which time was dismissed as of utterly no  
consequence at all, was thus sharply at variance with  
Austrian theories of all varieties. Hayek, in his celebrated  
controversy with Knight during the 'thirties, had vigorously  
criticized the Knightian theory. Hayek's own approach,  
however, was not the PTPT to be discussed here; it was,  
instead, in the Wicksell-Fisher line of development from  
Böhm-Bawerk, in which both productivity and time-preference  
considerations are deployed.) The pure time preference  
theory of interest rests upon two quite separate sets of  
insights: (a) the necessary invalidity of all productivity  
theories of interest; (b) the possibility of accounting for

interest receipts as emerging from intertemporal exchanges (even altogether without production) in which the time preferences of the participants play decisive roles.

(a) The Invalidity of Productivity Theories of Interest

It was Böhm-Bawerk who had argued the basic Austrian case against productivity theories of interest. In his critical history of earlier theories of interest, Böhm-Bawerk had cited a long list of writers, including Say, Lauderdale, Roscher, and von Thünen, who had offered different variants of productivity theories of interest (Böhm-Bawerk, 1959, Vol. I [1884], chapter 7) Böhm Bawerk rejected all of these explanations of interest, on the basis of the fundamental Austrian (Mengerian) tenet that sees the value of instruments of production ("higher order goods") as being derived from the value of the consumption output ("goods of lowest order") which they produce. The full value of consumption output comes, through a process of imputation, to be attributed to the complex of resources from which they sprang. (It was a central theme of Menger's 1871 Grundsätze that individuals, and thus markets, assign values to "means" strictly because and only insofar as, these means are crucial for the attainment of valued ends. If the achievement of valued ends is held to depend upon command of a complex of specific means, the full value of the former comes to be associated with the latter.)

So that the circumstance that command over capital goods

of any kind appears to assure an enhanced physical output stream, is by no means sufficient to account for a regular stream of net receipts to the owners of capital (after deducting what must be paid to the owners of the "original" resources responsible for the production of these capital goods.) Greater output simply means correspondingly greater value imputed back to capital goods, which greater value will surely come to be fully imputed back, in turn, to the factors of production from which the allegedly "productive" capital goods themselves sprang, and so on. As Schumpeter (citing Bohm-Bawerk) expressed it in a well-known passage:

"Competition...and imputation...must annihilate any surplus of receipts over outlays, any excess of the value of the product over the value of the services of labor and land embodied in it. The value of the original means of production must attach itself with the faithfulness of a shadow to the value of the product, and could not allow the slightest permanent gap between the two to exist." (Schumpeter, 1934, [1911], p. 160).

It was this Bohm-Bawerkian refutation of productivity theories of interest which Fetter cited as the basis of PTPT. Pursued consistently, Bohm-Bawerk's reasoning must seem impossible to reconcile with what we have earlier described as the neo-classical theory, in which interest is seen as a productivity return. (It is true that the Böhm-Bawerkian reasoning might be rendered harmless, for a neo-classical productivity approach, if it were acceptable to introduce

"time" (or "waiting") as a genuine, independent, "original" factor of production, with its own productivity (that is not to be imputed to "earlier" resources). We shall return later to discuss this escape route for neo-classical "Austrian" theories of interest. At this point it suffices to note that Böhm-Bawerk himself explicitly refused to recognize "waiting" as constituting an independent factor of production the services of which are remunerated in the form of interest payments. (Bohm-Bawerk, 1959, Vol. III, [1921], Essay XIII). It is not surprising that Fetter (1977) [1902] found Bohm-Bawerk's own positive theory of interest - in which the technical productiveness of roundabout processes appears as an important building block - to be bafflingly at odds with Böhm-Bawerk's own decisive refutation of the earlier productivity theories.)

Basically Böhm-Bawerk's refutation of productivity theories showed that the phenomenon of capital-using production is not sufficient to account for a net income stream to the owners of capital. In order to deny completely any causal linkage between the process of capital-using production and the receiving of interest, an additional simple step is called for. This is to show that capital-using production is not necessary to account for the phenomenon of interest: time-preference can generate interest in a world of pure exchange, without production processes of any kind. For the sake of completeness, we spell out this simple step.

(b) Interest Payment in the Pure Exchange Economy

Consider a simple world in which daily endowments of consumable goods are available to individual participants in a pure exchange market that permits intertemporal exchanges. Time preferences can, clearly, generate interest receipts in such a world, without production of any kind. Using the very same reasons that account for a rate of exchange between plums and peaches that is other than a one-for-one ratio (viz. for reasons having to do with individual preferences with respect to marginal quantities of peaches and plums), we can readily account for a rate of exchange to emerge between today's plums and the prospect of plums tomorrow, that differs from a one-for-one ratio. Market participations may simply not be indifferent between one plum available today and one plum available tomorrow, that is all. If there is a general tendency to prefer given quantities of today's plums over physically similar quantities of plums promised for tomorrow,<sup>8</sup> intertemporal exchange rates will generate interest receipts. A market participant possessing an initial endowment of plums may, by selling, each day, 100 plums (of that day) for the promise of 110 plums the following day, enjoy a continual net daily stream of ten plum-interest receipts, without diminishing the number of plums available in the revolving loan fund. (Of course, the continuity of the interest receipts stream depends on the plum-capitalist's ability to continually discover some borrowers each day, - who need not, certainly, be the same

ones each day, - willing to consume less in future periods, or expecting future endowments greater than today's.)

With production neither sufficient nor necessary for the generation of interest, the pure time preference theory accounts for interest, in a world of production, by referring, most definitely, to the time consumed by production processes, but without any reference whatsoever to the productivity of roundaboutness, of time, or of waiting. It may be instructive to spell this out.

#### PURE TIME PREFERENCE AND TIME CONSUMING PRODUCTION PROCESSES

In a world of time consuming production processes the PTPT accounts for the interest received by capitalists, in the following way. Production processes take time. This means that inputs must be applied now, in order to command output, not immediately, but only some distance away in the future. In selecting among alternative available productive uses of current inputs, therefore, producers will - because they and the owners of the current inputs are not indifferent as to the dates at which outputs will be forthcoming - take into account, among other things, the prospective lengths of the various processes available. Other things being equal, "longer" processes will be adopted only if they offer output quantities so much greater (than outputs of "shorter" processes) as to overcome the general preference for prospective earlier, rather than later, receipts.

Because entrepreneurs produce by buying resources now



(and cannot, with time consuming production processes, expect to command sales revenues with which to make payments for resource services purchased, until some time in the future) they will regularly borrow capital funds from capitalists (or draw on their own capital resources) in order to carry out their projects. Interest payments will emerge, in competitive markets for borrowed capital, out of the interplay of the demand and supply for loans. Both the demand and the supply sides of this market, however, are similarly governed by time-preference considerations. The supply of loans is governed by the willingness of capitalists to lend capital, but only if a sufficiently attractive interest payment is offered to overcome the preference of the capitalists for prospective earlier rather than later receipts. But the demand side, too, reflects time-preference. An entrepreneur is prepared to offer a positive rate of interest because command over the borrowed capital will permit him to engage in a time consuming production process which, after paying for his inputs, at prices reflecting their time-preference-based discounted future productivities, offers a pure entrepreneurial profit. In other words he has discovered an opportunity to command a large, valuable output in the future, if only he can obtain access to immediate resources. The discovery of this opportunity motivates him to seek immediate resources, for which he is prepared to offer the necessary price in terms of future payments. (It may be perhaps objected that this

demand for immediate resources is motivated by their productivity in the processes to be undertaken: surely only the superior output expected from their use permits the entrepreneur to offer the interest payment. But we have already seen how the PTPT would dismiss this objection. In the absence of time preference the prospect of the superior output would have led to the bidding up of the prices of the relevant resource services until there would be no source from which any interest payments might emerge. What permits borrowers to offer interest is the time-preference-based discounting of the expected future output.) We should notice a number of important features of this way of looking at time-consuming, capital-using, productive processes.

(a) Ex-Ante Time

Time enters into the PTPT only in the prospective sense.<sup>9</sup> In this respect the theory is to be sharply distinguished from neo-classical theories that see interest as the payment for the superior productivity of allowing the use of more time. In the latter view it is the greater productive output attributed to the elapsed passage of a longer period of time ("clock-time") that is the source of interest. In PTPT, on the other hand, interest is offered or insisted upon only because, at the moment at which the intertemporal transaction is struck, the trading parties assess the availabilities of resources at alternative times in the future prospectively. It is this prospective

valuation of future receipts that is the source for intertemporal rates of exchange on anything other than a one-for-one basis. As time passes, what used to be seen as the distant future becomes the near future and eventually the immediate future. So that given receipts expected at a particular future date are subject to changing valuation as time passes. Interest emerges because at each date at which funds are loaned and borrowed, there are choices being made in which more immediately future receipts are being compared prospectively with receipts in the more distant future. It is not the actual passage of time that generates interest, but the circumstance that loans do involve the prospective delay in receipts. The terms at which, given the latter circumstance, loans are granted, therefore means certainly that, after the passage of specific periods of time, fulfillment of the loan contract term provides the lender with interest receipts. But these receipts, although they may seem to be "yielded" by the passage of time, are in fact to be explained, it is clear, purely in terms of the valuations that, at the moment of the loan, governed the decisions made and embodied in the loan contract.

(b) Interest as the Market Expression of Consumer Preferences

In the PTPT view interest emerges in the course of intertemporal exchanges. Since production involves, necessarily, intertemporal exchanges, interest indeed

emerges in the context of production processes, but does not (as do the prices of resource services) express the market evaluation of the usefulness to consumers of the productive services of anything. We cannot say, therefore, that interest receipts, as a distributive share, represent a portion of total output "produced by capital." We cannot pronounce interest payments to be expressive of the intensity of desire by consumers for the additional output produced by capital resources (the availability of which depends upon provision of such interest payments.) Yet it must be emphasized that on this pure time preference theory, too, (just as was the case with the neo-classical theory), interest payments are (like all market payments) to be seen as the market expressions of relevant consumer preferences.

On the pure time preference view the circumstance that a portion of current output is, in each period, paid out as interest, reflects a continual series of evaluations made, at respective earlier dates, when (what are now) current outputs appeared only as prospective future receipts. At the moment of output emergence, the value attached to current output is of course simply its total current value. Were that value to be imputed now to the factors of production that produced the output, payments to those factors would exhaust the total current output; there would be nothing left for any interest payments. But, because production takes time, the purchase of the input services responsible for today's emerging output occurred at an earlier date (when the prospective output,

properly discounted in time-preference context, permitted only a smaller value to be imputed to those input services.) Similarly the input services purchased today (and paid for today out of today's emerging output) are valued at the time-preference-based discount of their future output. The difference between the total value today of today's output, and that portion of it paid out to today's input services (for their contribution to future output) constitutes, in the steady state, the source of interest paid today on last period's borrowed capital funds. This interest payment therefore is a reflection of intertemporal market prices, and thus of the intertemporal preferences of market participants, in the very same way as all market payments reflect relevant market preferences. There is no arbitrary, non-price-determined distributive procedure at work here. All payments have their origin and their determination as part of the intertemporal market process.

(c) Interest and the Time-Structure of Production

An important element in the Böhm-Bawerkian tradition has been the understanding it has conveyed concerning the time-structure of production, and the role played by interest rates in determining this structure. In the Wicksell-Fisher-Hayek stream within this tradition (that responsible for the view that interest is a payment for the productive contribution of roundaboutness) this determining role was an obvious one. It was the array of time-consuming processes

adopted that generated the additional output from which interest was forthcoming; it was the willingness of potential savers to postpone consumption in order to obtain greater subsequent consumption that provided the investment capital that in fact permitted the additional outputs resulting from the chosen degrees of roundaboutness. The time profiles of inputs and outputs, the chosen degrees of durability of capital goods, the levels of "higher order" capital goods that were selected in implementing the preferred intensity of capital usage in production - all were reflections of the market rates of interest, while these rates were themselves, of course, determined in the market process within which these temporarily-relevant production decisions were being made.

In the pure time preference theory, too, it should be noted, the time structure of production is determined in the course of the very same market processes in which interest rates emerge. Although, in the PTPT interest is not generated by any additional outputs arising out of roundaboutness, we have already seen that the degree of roundaboutness chosen certainly depends upon the time preferences of market participants as expressed in market rates of interest. We can still conceptually identify a structure of production as "too long" -- not, notice, in that (because of diminishing marginal productivity of time) increments of roundaboutness have generated additional output too small to produce the interest payments needed to elicit

the necessary "waiting", but instead simply -- in that the production processes in question happen to involve so long a delay in the generation of output, that the necessary interest charges render the process too costly. (Put differently, the time-preference-discounted values of the inputs fall below the value of those same inputs in alternative, less time-consuming, uses.) What is important is that in the PTPT, too, the selected time-consuming processes of production tend, under the impact of the market process in which interest rates are determined, to reflect the willingness of the market participants to sacrifice earlier consumption for expected greater consumption in the future.

#### AUSTRIANISM, THE PTPT, AND THE CAMBRIDGE VIEW

It may be helpful, in assessing the consequences for an understanding of the Cambridge controversy, of recognizing the existence of the neglected PTPT option, to dwell briefly on the role of "Austrianism" in the theory of interest. In many accounts of the Cambridge controversy the neo-classical view is presented in Austrian garb. In this sense of Austrianism, a neo-classical view is "Austrian" if it focusses attention, as we have seen, on the Böhm-Bawerkian emphasis on the productivity of roundaboutness. On the other hand, we have seen, Knight identified the PTPT of interest as quintessentially Austrian because it appears to emphasize exclusively the purely subjective factors (i.e., Böhm-Bawerkian time-preference factors) that operate on the

intertemporal market. Clearly both offshoots of the Böhm-Bawerkian theory, both the Wicksell-Fisher synthesis of productivity and time-preference elements, and the Fetter-Mises pure time-preference theory, are "Austrian" in significant respects. But there is yet a further sense in which specifically Austrian insights are relevant to a theory of interest - a sense associated not so much with the name of Böhm-Bawerk as with that of Menger. To appreciate this can, I believe, be useful in clarifying the nature of the Neo-classical-Cambridge-PTPT triangle.

The Mengerian insight we wish to emphasize is that, mentioned earlier in this paper, which assigns economic significance to resources only insofar as they contribute to final consumption output. At the level of the individual this insight sees means as deriving their value from ends. At the economy-wide level this insight translates into the thesis that distributive shares of aggregate income to the owners of factors are to be understood as the market-determined expression of the ways in which consumers evaluate the productive usefulness of the different resources. It seems appropriate to label this latter insight as "Austrian". It has been recognized by historians of thought that this thesis, that emerged in neo-classical economics generally (in the form of the marginal productivity theory of distribution), only about twenty years after the initial marginal revolution - was already stated by Menger as an integral element in his original 1871 Austrian contribution



to that revolution. And Marxist critics of this consumer sovereignty theory of distribution from Bukharin (1927) to Dobb (1973, pp. 33-35) in fact emphasized its Austrian credentials.

From a perspective that emphasizes the Austrian character of the thesis (that incomes reflect consumer evaluation of the productive contributions of resources), therefore, it is, clearly, against the Austrian character of neo-classical views on interest that the Cambridge critics have objected so strongly. And, as we have seen the PTPT would seem to escape the wrath of the Cambridge critics on this score - since the PTPT denies, as the Cambridge critics deny, that interest payments reflect any such valuation of productive contribution. So that one might be tempted to pronounce the PTPT, unlike the neo-classical view, as not being dependent upon this Austrian insight that we have attributed to Menger. But this would be quite incorrect. The truth is that the PTPT depends on this Mengerian insight even more fundamentally than does the "Austrian" version of the neo-classical view. (So that the PTPT may be considered Austrian not only in Knight's sense - in that it emphasizes the subjective factors overwhelmingly - but also in the sense of its radical dependency upon the Mengerian insight.)

That the PTPT does so depend on the Mengerian insight is seen immediately from the basis upon which it rejects all productivity theories of interest. It will be recalled that the way in which the PTPT severs any possible causal linkage

between interest and productivity is one which invokes, indeed, precisely this Austrian insight into the relationship between factor-service values and the value of output. All final output value, Fetter (following Böhm-Bawerk) had argued, must be swept back by the market to the original factors of production from which that output proceeded. Once one denies, as the PTPT (again following Böhm-Bawerk himself) denies, that time (or waiting) constitute independent, "original", factors of production, the Mengerian insight yields the inescapable refutation of all productivity theories.

So that while the PTPT indeed escapes the Cantabrigian wrath (insofar as it denies that interest is paid in return for productive service rendered), the PTPT can be seen, most emphatically, as depending on precisely those Austrian insights that the Cambridge view is most concerned to demote, viz. that consumer preferences are sufficient to set in motion market tendencies towards correspondingly definite income shares, and that these shares do tend to express these valuations of the consumers.

PURE TIME PREFERENCE THEORY, RESWITCHING PARADOXES, AND ALL THAT

Perhaps the most effective way to convey the extent to which the PTPT does indeed differ from the neo-classical position (even in the most "Austrian" versions of this neo-classical position) -- will be to point out how irrelevant,

to the PTPT view, are the reswitching and capital-reversing paradoxes that played so visible a role in the Cambridge controversy. There can be no doubt that, in terms of the shadow these paradoxes cast on the intuitive plausibility of the neo-classical story, their practical significance for the persuasive rhetoric of the Cambridge theorists can hardly be over-rated. Yet, as we shall see, these paradoxes present no problem at all for the explanation of interest contained in the PTPT. These paradoxes seem to offer challenges to the neo-classical view, it turns out, solely because that view sees interest as a productivity return; for a theory which, like PTPT, attributes no role at all to "productivity", no such challenge is to be discovered.

The problem posed for the neo-classical theory by the phenomenon of "capital-reversal" is well-known. Capital-reversal occurs when a change in the rate of interest is associated with a seemingly "perverse" change in adopted production technique - for example when a reduction in the interest rate implies a switch to "the less, not the more, time-consuming, or roundabout or capital-intensive technique." (Yeager, 1976, p. 313). That capital-reversal is at least theoretically possible was conceded by major exponents of the neo-classical position in the 'sixties (Samuelson, 1966; Ferguson, 1969, pp. xv, 265f, 269f). That this concession implies serious difficulties for the neo-classical view of interest as the supply-and-demand-price of a productive service has been emphasized by many writers,

and especially, of course, by Cambridge theorists. "If capital is an input into production whose value measures its quantity and whose marginal product decreases with its quantity, and if the rate of interest is proportional to the marginal product of capital, then the rate of interest and the value of capital must be inversely related. How can one regard capital as a factor of production if...firms find it profitable to use less capital when its price (the rate of interest) declines? When an input becomes cheaper one should expect firms to find it profitable to use relatively more of it. Something is drastically awry." (Hausman, 1981, p. 76). "The doctrine that incomes are paid in approximate proportion to the productive contributions of persons and their property is", Professor Yeager reports Cambridge theorists as believing, "crumbling under the criticism of the Cambridge School." (Yeager, 1976, p. 315). Capital-reversal erodes the notion of a demand curve for capital, and thus the view of interest as "a true scarcity price." (Harcourt and Laing, 1971, p. 23). "The initial result of no general relationship between rate of profit and value of capital goods per man came to contradict the marginal-theory interpretation of the rate of profit as a selector of capital-intensity, i.e., as an 'index of scarcity' of the 'quantity of capital'" (Pasinetti, 1971, [1969], p. 283). These difficulties do not depend on which variant of the neo-classical view is being considered. Treating interest as the reflection of the marginal productivity of time, or waiting, or roundaboutness,

offers no escape from the problems identified in the above citations, - (in which quantities of capital, rather than time, or waiting, were referred to).

For our purposes it is worthwhile to underscore the fact that these difficulties in the neo-classical position arose entirely from its view that the demand curve for capital (or time, or waiting, or roundaboutness) expresses the demand for the productive services of capital (or of time, etc.). It is only because the rate of interest is seen, in the neo-classical view, as an index of the scarcity of these productive services, that the possibility of capital-reversal appears to play havoc with the notion of a well-behaved, downward-sloping demand curve playing a conventional role in the market determination of the interest price. From the perspective of a pure time-preference approach to interest, therefore, a demonstration that a lower rate of interest might make it more profitable to employ an apparently less time-consuming technique of production, would seem to present no direct challenge. Interest is not offered, in this view, in order to command the productive services of time; the shape attributed to the curve of marginal productivity of time is thus of no relevance to the market determination of interest. What may be a problem for productivity views of interest can create no difficulty for the pure time-preference view. It must be pointed out that these observations, while correct as far as they go, are in themselves not quite enough.

It may, after all, be properly objected that while the PTPT indeed escapes the particular problem posed for productivity theories by the possibility of capital-reversal, it must nonetheless confront an altogether parallel difficulty. Surely a reduction in the rate of interest must, on the PTPT view too, be expected to lead to the employment of more time-consuming methods of production (even if for reasons having nothing to do with the productivity of time). On the PTPT view there are likely, at any given rate of interest, to exist possible time-consuming processes of production that are not adopted because the necessary outlays, including interest, are too large to be justified by the prospective output. Surely a reduction in the rate of interest must tend to transform some of these (hitherto "too long") processes of production, from unprofitable to profitable projects. So that a demonstration that a fall in the rate of interest leads to the adoption of less lengthy processes of production must seem to be as much a puzzle for the PTPT view as it was, for other reasons, for the neo-classical view. To see that this objection is in no sense damaging to the PTPT position it is necessary to reconsider the very possibility of capital-reversal in terms of the prospective waiting relevant to time-preference considerations.

In the literature that applies the capital-reversal notion to the Austrian temporal context, it is taken for granted that the input-dating requirements for a given

production process, together with the associated date of output availability, unambiguously define the quantity of time (or waiting, or the degree of roundaboutness) required for that process. It is then shown, for example, that with given prices of inputs, the relative profitability of one technique as compared with a second, depends upon the rate of interest -- with, say, the first technique being more profitable than the second at very low rates of interest (say, less than  $r_1$ ) and at very high rates of interest (greater than  $r_2$ ), but less profitable at a range of intermediate rates of interest. With such a "reswitching" situation it is clear that at one or other of the two switch points (i.e., either at  $r_1$  or  $r_2$ ) we are confronted with the paradox that a fall in the rate of interest is associated with increased relative profitability of the technique that calls for less "waiting". (Thus, in terms of our example, if the first of the two techniques happens to involve the more waiting, a reduction in the level of interest rates from above  $r_2$  to below  $r_2$  seems to bring about a paradoxical switch from the more time-consuming to the less time-consuming technique.)

But reflection should convince one that the basic premise upon which this reasoning depends is by no means to be accepted without question. This premise is that each technique of production involves a simple, undimensional "quantity" of time, such that different techniques can be unambiguously ranked as involving greater or lesser

quantities of time (or waiting). In fact there is no reason at all to accept this premise. The cases that yield the capital-reversing paradoxes all arise from production processes involving more or less complicated dating patterns for inputs and outputs. (For example in the text-book example made famous by Samuelson (1966), a given quantity of output can be obtained in year 4 from one technique that calls for the input of 2 units of labor in year 1, and 6 units of labor in year 3, or alternatively by a second technique of production calling only for the input of 7 units of labor in year 2.) It appears to be obviously mistaken (or at least to involve an arbitrary and possibly misleading oversimplification) to wish to collapse the possibly incommensurable quantities of time associated with individually-dated input components of a given complex production technique, into a single simple undimensional quantity of time. The fact that economists ever since Bohm-Bawerk have argued about the "correct" formula through which to square this particular circle, should not mislead us into failure to recognize that such a task can hardly be anything but an arbitrary, "simplifying" undertaking. We shall see below why, for economists such as Bohm-Bawerk, attaching significance to the productivity of roundaboutness (or of time, or waiting), there may perhaps seem to be reason to believe this undertaking to be necessary. But for a PTPT view such reasons, as we shall see, simply do not exist, and the confusions generated by the capital-reversal paradoxes that



arise from insisting on pursuing this undertaking, clearly demonstrate how unfortunate this insistence can be.

The truth surely is, of course, that, with positive time-preference assumed, we simply cannot entertain the possibility that, with respect to a given quantity of physical input, a decision maker might, merely as a result of a decrease in the rate of interest (that he must pay for the use of borrowed funds, with which to advance payment for the input), choose to assign that input to a shorter time-consuming process of production. If then we find that, as interest falls from very high levels to below  $r_2$ , technique A is replaced by technique B, while when interest continues to fall even lower and reaches below  $r_1$ , technique b is replaced, in turn, by technique A (which had been preferred at the very high rates of interest) we should not, surely, conclude that at one of these two switch points the reduction in interest has perversely brought a change to a less time-consuming technique. Rather we should understand that comparing the complex, multidimensional waiting requirements for different techniques simply does not permit us to pronounce one technique as involving unambiguously less waiting than a second technique. (In the case of the Samuelson example, for instance, the one technique involves a long wait for the marginal output of the 2 units of labor and a short wait for the output of the 6 units, while the second technique involves an intermediate wait for the output of 7 units of labor. There is no need (and there need not be in

fact any way) to rank the two techniques in terms of their overall waiting requirements.) They involve different patterns of waiting, such that both very low and very high rates of interest might make technique A seem the more profitable, while at intermediate rates it is technique B that is the more profitable. There is nothing perverse about this, unless one insists, mistakenly, that one or other of these two techniques involves the greater quantity of time, or of waiting.

Professor Leland Yeager seems perhaps to have sensed something similar to this in his exhaustive and lucid discussion of the issues (Yeager, 1976, 1979) in which he sought to dissolve the "paradoxes" by insisting that "waiting" should not be measured in physical clock-hour terms, rather than "the amount of it required in physically specified production process does depend partly on its own price." (Yeager, 1976, p. 345). In this way Yeager argues that, appropriately measured in terms of the relevant rates of interest, lower interest rates do always stimulate the use of techniques involving "more" waiting. But the point made in the preceding paragraphs does not revolve around the particular measurement technique to be used in measuring waiting,<sup>10</sup> rather we argue that there is no need (and may well be no way) to measure waiting, for the relatively complicated production cases in which reswitching and capital-reversal paradoxes have their habitat.

It should be pointed out that it is altogether under-

standable that theorists from Böhm-Bawerk to Yeager, who attach significance to the productivity of roundaboutness, or of time or of waiting, do feel it necessary to insist on being able, in principle, to rank different techniques in terms of the quantities of waiting they respectively involve. After all, if time, or waiting, is being treated as a factor of production, it seems reasonable to ask which of the two techniques calls for use of the greater quantity of this additional resource. (In fact from this perspective it is possible to sympathize with Hausman who finds Yeager's refusal to measure waiting in physical terms "unpalatable" - quite apart from other difficulties (Hausman, 1981, p. 79). What moves Hausman to find Yeager's view unpalatable is presumably the circumstance that productivity is indeed ordinarily assessed in terms of physically measured inputs. From this perspective it does seem reasonable to assume that, somehow, the one technique does unambiguously call for a greater "physical" quantity of this resource called "time", or waiting.)

What should be emphasized is that, from the PTPT perspective, there is absolutely no need to assume any possibility for such unambiguous ranking. In the PTPT view time is not viewed as an input. A technique of production calls for a specific pattern of dating for its inputs, thus confronting the producer with a correspondingly complex pattern of prospective delay before the output is to be forthcoming. Different techniques involve different patterns of prospective delay, that is all.

SHEEP, RICE, AND AUSTRIAN HOCUS-POCUS

We have described the PTPT as concurring in the Cambridge rejection of interest as a productivity return. And we have seen how the PTPT arrives at this rejection by applying - relentlessly and consistently - the Mengerian insight that significance is to be assigned to productive resources only insofar as they contribute to final consumption output. It was this insight that convinced the pure time preference theorists that all final output value must tend to be swept back by the market to the original factors of production from which that output proceeded. Critics of the PTPT have, again and again during the past century, argued that simple stylized examples demonstrate irrefutably that "productivity" considerations must indeed play an important role in accounting for the phenomenon of interest. Very recently Samuelson has once again concisely raised a closely similar difficulty (in the context of his discussion of a different doctrinal issue).

Samuelson's observation came in the course of his recent critical reconsideration of Schumpeter's zero-interest-rate doctrine (Samuelson, 1981). Schumpeter had argued on the basis of what we have described as the Mengerian insight, that in a world in circular-flow equilibrium, the rate of interest must be zero, with all output value decomposable into land rent and labor wages, with nothing left for any interest share. Samuelson objects that a possible technological case refutes Schumpeter's argument. The case

Samuelson identifies is that of 100 units of rice ripening into 110 units of rice during the period of one year, without the input of any labor or any scarce land. This case shows, Samuelson claims, that final value need not necessarily be swept back to labor and land; apparently we have 10 units of rice ("real interest income") that can be attributed only to the productivity of the initial rice stock. Samuelson hastens to anticipate the Schumpeterian response. Schumpeter had emphasized that, with interest zero, "the greater magnitude of the forest is already imputed back in value to the saplings." So that today's 100 units of rice already have the value of next year's 110 units: "these foreseen changes...only conserve the already calculated value of the process", without involving any creation of new value. But Samuelson finds this response "pure deception. Real rice is being produced net. Kuznets can measure it. You can eat 10 rice every year and still not impair your circular-flow income...No hocus-pocus of backward imputation - of forest to sapling, or rice grain to rice grain - evades the naive fact of productive interest." (Samuelson, 1981, p. 23).

Samuelson's rice-example-grounded protest against what he calls the "hocus-pocus of backward-imputation", (i.e., the consistent application of what we have called the Mengerian insight), echoes the lessons asserted by productivity theorists over the decades as being evident from similar examples, and reminds us of the subtle and tantalizing conundrums that have complicated the apparently never-ending

debates. Irving Fisher, despite his acceptance of the Mengerian refutations of "naive" productivity theories of interest, nonetheless insisted on the importance and independence of a productivity component in the determination of interest rates. A sheep economy, Fisher argued, in which 100 units of today's mutton-and-wool can yield, in one year's time, 110 units of mutton-and-wool, is an economy in which the rate of interest cannot systematically remain below the 10 percent level (Fisher, 1930, p. 193). H.G. Brown repeatedly referred to an island economy in which a choice must be made between (a) importing 1000 fruit today, or (b) importing today trees that can, in a year's time, provide 1100 fruit (Brown, 1914, 1926)<sup>11</sup> arguing that the case did establish the role of productivity. Frank Knight, undoubtedly the most uncompromising productivity theorist of interest ever, wrote (Knight, 1944) of a Crusonia economy in which "all human wants are supplied by a species of vegetation that grows at a rate unaffected by human endeavor except as tissue is cut away for consumption." (Dewey, 1965, p. 52).

What is common to all these examples is that they appear (and have sometimes been deliberately constructed so to appear) to escape the Böhm-Bawerkian refutation of the naive productivity theories. By permitting direct "physical" measurement of the "rate of productivity", they appear to escape the charge that what seems to be a rate of productivity in fact depends upon use of a value for the

capital base that implicitly involves an already-assumed-time-preference-generated rate of discount. These "physical quantity" examples demonstrate that genuine productivity does occur, since they involve no valuation of the capital base at all (and hence no implicit rate of discount already assumed). H.G. Brown was quite explicit on this as his purpose in developing his example, (and expressed dismay that Fetter yet accused him of the same fallacy committed by the refuted naive productivity theorists) (Brown, 1914; 1926, p. 125, fn. 13). Yet it must be pointed out that, from the perspective of the PTPT, these demonstrations of genuine physical productivity are not yet quite sufficient to establish the case for productivity-generated interest. Fetter saw this quite clearly in his response to H.G. Brown's expression of dismay.

Brown had, Fetter pointed out, believed himself to have accomplished his goal by limiting productivity theory as dealing "with quantities of goods instead of with values." But in so doing, Fetter observes, Brown's "proposition speaks a different language from that of an interest-theory, and concerns a different question...A theory of interest must be essentially a value-theory. The thing to be explained is the ratio between the value of the income and the value of the income-bearer." (Fetter, 1977, [1914], p. 257) Surely this insight of Fetter's can go far to resolve some of the perplexing confusions surrounding physical productivity and its relevance for the phenomenon of interest.

Some of the above examples (in particular that of Knight's Crusonia plant) explicitly involve a single-good economy. Dewey (1965, p. 80) has, in fact, claimed that this feature of the example has the outstanding merit of avoiding all measurement problems. Rates of productivity can be arrived at directly, since "capital stock" and "income" consist of the same physical entities. No resort need be had to calculation in "value terms", with all its attendant pitfalls. So that those productivity examples, from sheep to rice, do indeed demonstrate that, even with zero rate of time preference, present rice exchanges for future rice at a rate that expresses the physical productivity of rice. And it can readily be agreed that, with this demonstration, productivity theorists may well have in fact achieved their apparent purpose: physical productivity has been shown to affect (or even to "determine") the intertemporal exchange rate (the own-rate) on sheep, on rice, and on Crusonia. But surely, as Fetter saw, the PTPT refutation of the productivity argument cannot, insofar as concerns the broader purposes of a theory of interest, be dismissed quite so simply.

If 100 of today's rice will, next year, become 110 rice, then, for any individual contemplating 100 rice today, what he sees is in fact the potential promise of 110 rice to be available next year. To state that individuals will be prepared today to promise to deliver 110 rice next year in exchange for 100 rice today (or that they will refuse to give up 100 rice today for a promise of less than 110 rice of next



year), may if one wishes, be described in terms of an own-rice-interest rate of 10 per cent -- but in fact such an intertemporal rate of exchange is, in way, hardly a rate of interpersonal exchange at all. Rather the 100/110 rate merely describes the technological equivalency relating present rice to the promise of future rice. To put it somewhat differently, since 100 present rice yields 110 of next year's rice it is, in a definite sense, inappropriate to treat a unit of today's rice as "the same" as a unit of rice promised for the future. In the sense relevant to the Mengerian insight the relevant comparable units are either 100 present rice or 110 future rice. From this perspective (a "value" perspective?), to discover that 100 rice today, trades in the intertemporal market today for 110 rice of next year is to discover a zero rate of interest. That is, 100 units of today's rice is found to be exchanging for an exactly equivalent (physically equivalent!) quantity of future rice. (Moreover, if it be objected that there would then seem to be no reason at all, given zero time preference, for any exchanges to be occurring at all at this "zero" rate of interest between equivalents (after all, we do not find 100 rice today exchanging for 100 rice today), the response would then be a triumphant "Exactly! The 100/110 rate is in fact not an exchange rate at all. It is a rate of technological equivalency; exchange will occur only if the market offers rates of exchange differing from this equivalency ratio. Market exchanges and market rates of

exchange emerge from (diverse) judgments of preference, they do not reflect universally recognized ratios of technological equivalence".) <sup>12</sup>

Böhm-Bawerk demonstrated the fallacy of the "naive" productivity theories of interest. A tree costlessly yields an annual income of desirable fruit. With zero time preference, however, this situation offers no example of the interest phenomenon: the value of the tree should rise to reflect, exactly and arithmetically, its full expected fruit yield, for all future time. One does not escape this insight by replacing the tree (which can obviously be compared with its fruit only in value terms, leading directly to the above Böhm-Bawerkian demonstration) by today's fruit (which will somehow change into greater quantities of fruit in the future). Some may have thought (as Dewey thought, in regard to Crusonia) that this device neatly avoids the quicksands of value measurement and permits one to plant one's feet securely on the terra firma of quantity comparisons. But what underlies the tree-fruit demonstration is not so much a matter of the measurement of value, as it is the insight into the essential (technological) equivalence of the tree with its fruit. To have a tree is to have its future stream of fruit crops. (Expressing tree and fruit as values must of course directly reflect this equivalency. But even where quantity comparisons are made, the equivalency itself need never, and should never, be lost sight of.)

Samuelson sees Austrian "hocus-pocus" as somehow

denying that when 100 rice ripen into 110 rice next year, this constitutes the production of real rice. "You can eat 10 rice every year", he protests, "and still not impair your circular-flow income". But no one would deny that real fruit grow on trees, and that that fruit crop can be eaten each year without impairing the health and fruitfulness of the trees. To recognize, as Samuelson knew that Schumpeter would have recognized, that the full value of next year's 110 rice must be imputed (without discount in a zero-time-preference world) to today's 100 rice, is not to deny either that 10 new units of rice have come into existence, or that this ensures (in a zero-time-preference world) a positive own-rate of rice interest. Instead this Austrian recognition permits us to filter out from any real-world rates of intertemporal exchange that we may encounter, elements that purely and strictly express technological equivalence. To be sure the ownership of a capital stock of 100 rice gives command over an annual crop of 10 units of new rice. But this represents a zero rate of return on this capital stock, appropriately considered. A zero rate of return does not mean that nothing is being consumed each year; it merely means that what is being consumed each year was in effect fully paid for, without discounting, when the capital stock was acquired in the past. Examples that, like Knight's Crusonia case, involve economies with but a single good, appear not to have room for this interpretation of physical productivity as consistent with a zero of interest (since in a one good world

there is nothing else in terms of which a stock of it can be valued.) But, as we have seen, these examples do not affect the basic economics of the situation in the slightest.

#### TIME AS A FACTOR OF PRODUCTION?

At a number of earlier points in this paper it was remarked in passing that the PTPT denial that interest is a productivity return, ultimately depended, in turn, for its validity, upon the denial that time (or waiting) can be considered to be a factor of production. The Mengerian insight assures us that the full value of output will come to be swept back as factor incomes to the "original" inputs, leaving no residual from which any interest share might be forthcoming. But this assurance carries conviction only insofar as it is assumed that the list of "original" factors does not include time (or waiting). Were one to maintain that in roundabout, capital-using, methods of production we in fact deploy not only land and labor (directly as well as in the form of produced instruments of production), but also the services of a distinct "original" productive factor called "time" (or "waiting"), then one would be able, clearly, to account for an interest share as a simple marginal productivity remuneration to the capitalist for lengthening the productive process (i.e., for allocating more time, or for waiting). Not all the final output value comes to be swept back to land and labor; some of it is swept back to "time". There is no doubt that many ("Austrian")

variants of the neo-classical position have indeed adopted this latter view of things.<sup>13</sup> (A critic of the PTPT might then argue that, by flatly ruling out, by assumption, consideration of time as a possible factor of production, PTPT is engaged in question-begging: it ensures its refutation of productivity theories of interest by commencing with the unexamined premise that time is not to be considered itself as productive. Such a charge is in fact unmerited. It is true that the refutation of the productivity theory of interest is based implicitly on the denial of time as an independent factor of production. But this denial by itself, unaccompanied by the economic reasoning advanced by Böhm-Bawerk and Fetter, is not at all sufficient to ensure that interest cannot be seen as having its origin in the additional physical output associated with longer processes of production.)

We have already remarked in an earlier section of this paper that Böhm-Bawerk himself indeed explicitly refused to consider time, or waiting, as a factor of production. In the literature it has been pointed out that whether or not we wish to treat time as making an independent contribution to a process of production, or to treat it as a background framework within which the services of genuine factors of production generate output, is a matter of "philosophy" (Haavelmo, 1960, p. 47). The PTPT has, obviously, begun from the philosophical position that treats time as something other than an active ingredient in production processes.

Where a process of production is time-consuming, and results in greater output (than alternative processes of production using the same quantities of inputs but consuming less time), the PTPT does not see this additional output as marginal product attributable to the services of the additional time. Rather the PTPT sees the additional output as forthcoming from a different (and possibly a superior) technique of production - which happens, however, to be able to deliver its larger output only at a later date. (So that, in the economic sense, it may not in fact be a superior technique at all. The situation is similar to one in which a particular production technique produces a physically larger volume of output, but of output which is somehow perceived as being of lower quality.) Output is always produced by the cooperation of current labor, land services, and instruments of production (that were themselves produced in earlier production processes). But some techniques promise results with greater delay than do other techniques, that is all. These delays are themselves not causal ingredients in bringing about the resulting output.

Certain kinds of production processes certainly do seem plausibly to fit the PTPT view that time is itself not a causal ingredient. Others fit perhaps less obviously (or even less plausibly), but can nonetheless be seen as not necessarily inconsistent with the philosophical position adopted by PTPT. Consider, first, a simple example of time-consuming productive process in which it seems intuitively

bizarre to consider time as fulfilling any causal role. Two competing vending machines each yield, in exchange for the insertion of two quarters, quantities of a cold, canned soft beverage. Machine A yields a can containing 8 ounces of the drink, two seconds after the insertion of the coins. Machine B, perhaps because it is an older vintage machine, yields its contents only after a longer delay, let us say, of five seconds. The owner of machine B, fearing that the high time-preference of hot, thirsty customers may cause them to avoid his machine for that of his competitor, stocks his machine with larger cans (say, 10 ounce cans). Consumers thus have a choice of converting their coins into 8 ounces with a delay of two seconds, or into 10 ounces with a delay of five seconds. To any consumer the additional "output" is obtainable only if he is prepared to wait an additional three seconds. In this example, at least, it seems bizarre to maintain that the additional output is (except in a metaphorical sense) "produced by" or "attributable to" the additional three seconds. Much more plausibly, surely, we would say that for both machines, the production process is (as seen from the consumer's perspective) that coins inserted into a stocked machine produce cans of beverage, with Machine B being slower than Machine A, that is all. If one wishes to enjoy the larger can obtainable from Machine B, one must be prepared now to undertake to hold one's thirst in check a little longer. The additional time is an unmitigated prospective nuisance from the consumer's point of view. He

may be prepared to put up with this nuisance in order to get the larger can; but he will hardly see this nuisance as (again, except as a matter of metaphor) actually causing the size of the can to be larger (than the size of the cans in Machine A.)

To be sure, for other kinds of production processes it may appear far less bizarre to treat time as a causal ingredient. In the textbook cases of maturing wine, for example, it does not appear intuitively objectionable to see the passage of time as itself "causing" the enhancement in the quality of the wine. But, on the other hand, even examples of maturing wine do not compel us to accept time as an active ingredient. A PTP theorist may simply assert that the "correct" way to see a five-year maturing process is that young wine plus five years of the services of suitable storage facilities, results in mature wine. Except that, of course, time enters into the specification of the quantitative dimensions of the necessary storage services, the PTP theorist might maintain, the only way in which the five years is to be perceived in regard to the matured wine is, once again, as a necessary nuisance. The mature wine is available only after a delay.

Clearly it may be difficult, other than in terms of intuitive, "philosophical" plausibility, either to reject or to affirm a causal role for time in time-consuming productive processes in general, or in any of them in particular. This observation is emphasized because it is thoroughly consistent



with our earlier discovery that, in terms of how it "sees" interest, the PTPT is, at least in part, in agreement with the Cambridge theorists in their denial that interest is a payment for a productive service rendered. In being unable (or unwilling) to "see" time as playing an independent, causal role in processes of production, PTPT is pointing to its refusal to "see" interest as remuneration for the productive services of time, or of waiting. If time is not seen as itself causally responsible for anything, but merely as part of the background against which the material inputs are combined in processes of production, it becomes difficult to "justify" interest (in a Clarkian sense of distributive justice), as the reward for the provision of a useful service.

It is perhaps necessary to point out a certain possible confusion that may inadvertently be permitted to complicate the linkage between (a) the philosophical view that, with zero time-preference assumed, no share of final output is to be attributed and therefore imputed to time, or to waiting, and (b) the view that, with time preference positive, interest is to be ascribed entirely to time preference, with no independent role assigned to possibly superior productivity of time-consuming processes.

The source of the possible confusion is as follows: Let us, for the sake of discussion, accept the PTPT view that in a world of zero time-preference, time does not itself enter into production processes as a causal ingredient. It would

be a mistake to conclude immediately that in a world of positive time-preference, too, this same "philosophical" rejection of time as a causal agent necessarily follows. It need not. After all, in a world blessed with abundant, free air, air is not usually considered a productive factor.<sup>14</sup> No part of final output is imputed to it in the market. The entire output is swept back to the scarce factors. Nonetheless we can be sure that, were air indeed to become scarce, it would very soon assume all the economic characteristics of a productive factor. Quite similarly, surely, it may be argued that time may not be treated as a factor in zero-time-preference models simply because, in such models, time is treated as a free good, it does not have to be economized, later is as attractive as sooner, producers, consumers and owners of inputs all have the time in the world. What is relevant for such a world of free time may not hold, either economically or "philosophically", for a world in which time does matter, in which time preferences are positive. For such a world, it may be held, time may be treated as causal agent; where larger output is associated with greater (and thus more irksome) waiting, that increment in waiting may be credited with the associated increment in output.

For the PTPT view, it should be clear, the philosophical denial that time is a factor of production does not depend on its being a free good. Although its demonstrations that productivity is not sufficient to generate interest are

presented in the context of assumed zero time-preference, this latter assumption is not, for the PTPT view, the basis upon which it rejects the notion of time being itself productive. For PTPT when we say that a process of production "takes time" we mean no more than that we must wait before being able to enjoy the availability of output.

#### PTPT, AND THE CAMBRIDGE CONTROVERSY

In concluding the paper it may be useful to draw together the principal ideas it has presented.

1. In the debate between the Cambridge theorists and the neo-classical theorists regarding the nature of the interest share, the existence of a third view, the pure time-preference view of interest, has been unfortunately ignored.
2. What is particularly noteworthy about this third view, is that on the sensitive ideological issues involved in the Cambridge controversy, the third view shares respectively important common ground with each of the two other views.
3. The pure time preference view shares with the Cambridge view, its rejection of interest as a reward for productivity. For the pure time preference theory interest is not explained as part of a theory of distribution in which factors receive marginal-productivity shares. (It was because of this, it turned out, that the pure time preference view is not

threatened at all by the reswitching and capital-reversal paradoxes that have been deployed with such great effect in the Cambridge controversy, by the Cambridge theorists.)

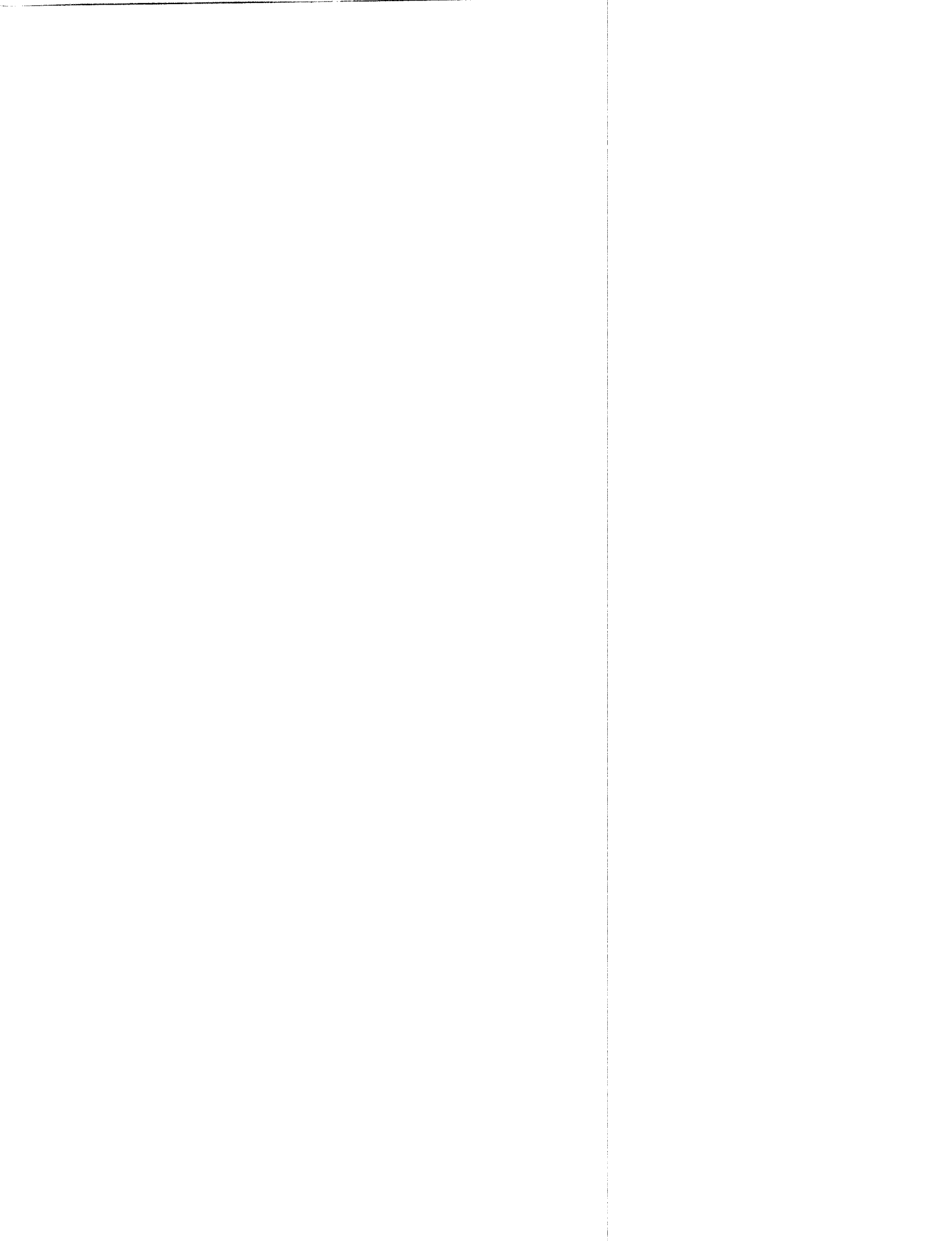
4. The pure time preference theory shares with the neo-classical view the insight that the interest share is a market determined share, a share expressing the interplay of supply decisions and demand decisions of individual market participants. Interest is to be understood in price-theoretic terms. In particular the pure time preference view shares with the ("Austrian" variant of the) neo-classical theory, its understanding of how interest rates govern the time-structure of production, as a reflection of individual preferences expressed in markets.

This latter point of agreement asserted to exist between pure time preference theorists and neo-classicals is, however, a little more complicated than may appear at first glance. It happens to be the case that, with respect to certain of the key arguments used by the Cambridge theorists to attack the neo-classical view of the market economy, pure time preference theorists have in fact appeared to side with the Cambridge theorists. This point seems sufficiently important to call for brief discussion, and, indeed, its significance makes it entirely appropriate for it to serve as the concluding theme of this paper.

The pure time preference view is, as has been discussed in

this paper, firmly rooted in the "Austrian" tradition. The Austrian view of the market economy differs in important respects from the view that has dominated in the neo-classical orthodoxy. In particular Austrians refuse to accept the neo-classical emphasis on market equilibrium with given, known prices facing all market participants, as providing the central explanatory insight for an understanding of market phenomena, (focussing attention, instead, upon the pure-profit-seeking activities of market participants operating in a world of differential ignorance and open-ended uncertainty). Now it happens that these latter ("Austrian") considerations are closely parallel to some of the grounds upon which Cambridge theorists have rejected neo-classical general equilibrium economics. (Joan Robinson writes, for example, that the "recognition of uncertainty undermines the traditional concept of equilibrium." (Robinson, 1978, p. xi)) So that, in emphasizing that the pure time preference theorists find themselves in agreement with the neo-classical view of interest as a price-theoretic, market determined phenomenon, we should certainly not deny that many "Austrian" pure time preference theorists find themselves sympathetic to many of the Cambridge criticisms of neo-classical economics in general. The point is, however, that whereas Cambridge theorists have seen these criticisms as supporting their rejection of price theory as providing understanding of market economies, Austrian economists have reached quite

different conclusions. Austrians have used their dissatisfaction with equilibrium economics, not to reject price theory, but to develop a price theory in which equilibrium concepts occupy a wholly peripheral, rather than central role. There is, therefore, no paradox involved in our discovery that Austrian pure time preference theorists (such as, say, Ludwig von Mises) while fully as critical of many aspects of neo-classical microeconomics as are the Cambridge theorists, must, nonetheless, be counted emphatically together with the neo-classicals in their understanding the interest share to be a market-determined, supply-and-demand generated, phenomenon.



FOOTNOTES

1. An important work, lucidly presenting and exploring the issues involved is (Hausman, 1981).
2. Although the Cambridge Controversy was, of course, between Cambridge, U.S.A. and Cambridge, U.K., we follow the normal jargon, referring to the former position as included under "neo-classical", and the latter simply as "Cambridge".
3. Although we refer, throughout the paper, to the Cambridge view, there have, of course, been a number of different "Cambridge" views, by no means always in agreement with each other. (See Blaug, 1974).
4. The following pages lay no claim to originality. They emphasize those aspects of the pure time preference theory that hold greatest relevance to the Cambridge Controversy.
5. Frank Fetter, one of the two or three most outstanding U.S. economists during the first quarter of this century, has recently been "rediscovered". See Gerald P. O'Driscoll (1980); see also Rothbard's comprehensive introduction to a recently published volume of Fetter's papers (Fetter, 1977).
6. For a discussion of the two separate traditions in interest theory that derive from Böhm-Bawerk, see Hayek, 1941, Appendix I.



7. Recent pure time preference expositions following Mises are Rothbard, 1962, chapters 6, 7; and Baird, 1982, chapter 11. Both works reflect the current revival of interest in Austrian (especially Misesian) economics.
8. For the purposes of this paper it is not particularly important to discuss the grounds upon which a general presumption to positive time preference is held to be justified. For the present exposition of PTPT such universal positive time preference is simply taken as if it were an accepted fact.
9. On this see Kirzner, 1966, pp. 79-80.
10. Hausman, 1981, p. 79, challenges Yeager's claim that his particular measurement technique successfully resolves the capital-reversal paradoxes.
11. H.G. Brown's 1926 discussion is a virtually verbatim repetition of the bulk of his 1914 paper. His discussion was approvingly referred to by Fisher (1930, p. 193).
12. See Menger, 1981, [1871], pp. 192f, for a critique of the older views that saw price as expressing equivalence.
13. See, for example, Dorfman, 1959.
14. See Hicks, 1960, pp. 673-675.

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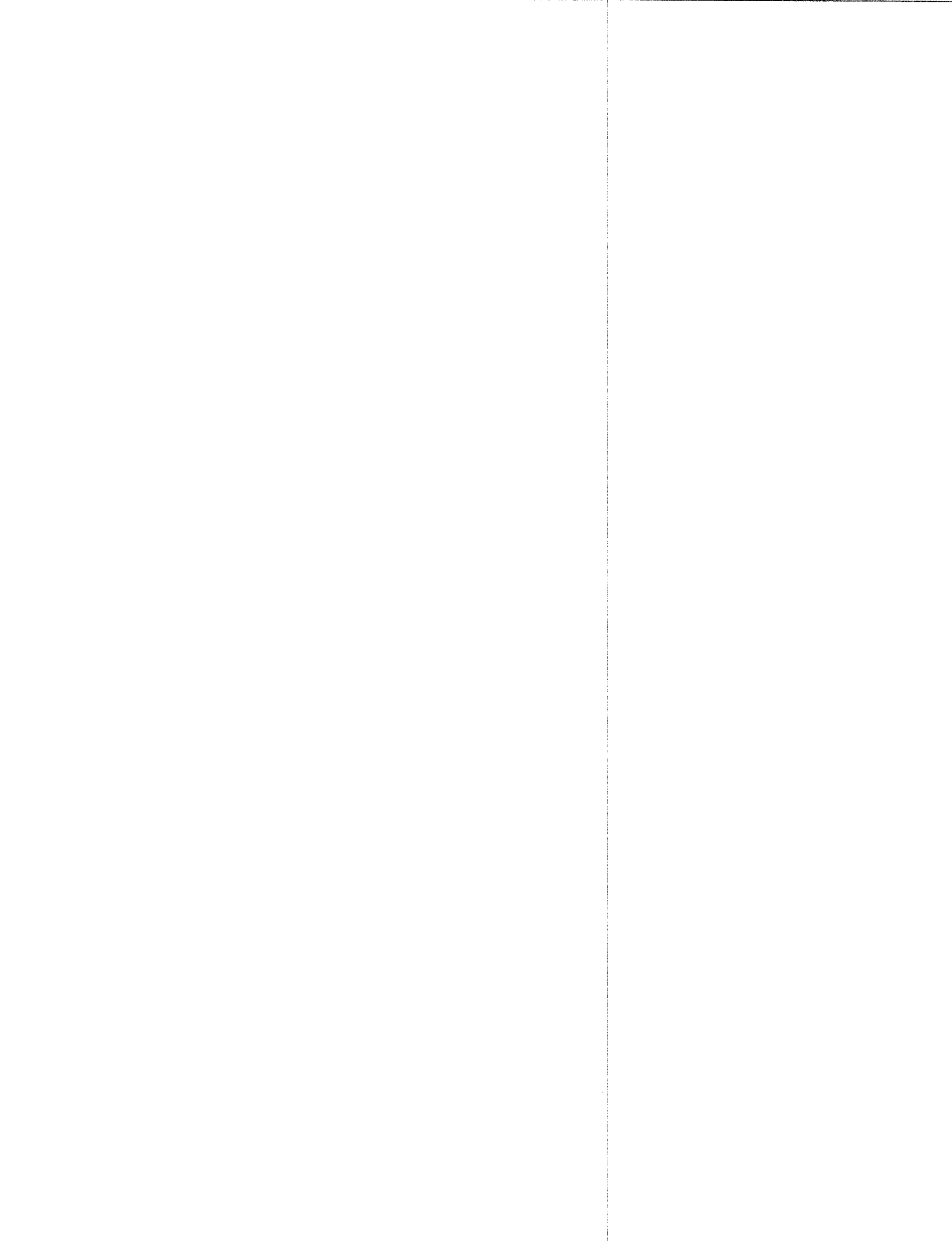


PURE-TIME PREFERENCE THEORY  
A POST SCRIPT TO THE "GRAND DEBATE"

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It is now some years since the heat and excitement generated by the "Cambridge Controversy" in the theory of capital began to subside. Despite the occasional appearance of articles and books dealing with the issue,<sup>1</sup> the confrontation appears to have established itself as a completed episode in the modern history of thought. As such the sides of what Professor Lachmann (1973) has called the "Grand Debate" have become firmly defined in the consciousness of the profession. On the one hand we have the neo-classical orthodoxy seeing the phenomena of the capitalist economy, especially the assignment of income shares (including interest income), as being essentially price phenomena to be understood within the framework of market equilibrium. In this view the market prices (and thus interest) have to be paid if consumers are to receive that which the productive capacity of the market is able to provide, and for which the consumers are prepared to pay. Interest is rendered necessary and thus, in a sense, "justified" by efficiency - or, if one prefers the phrase, consumer-sovereignty - considerations. On the other hand we have the Cambridge critics who vigorously deny that interest incomes are caused "by individual exchanges as constrained by technology and the availability of factors of production." (Hausman, 1981, p. 167). These critics see the distribution of income between wage-earners and interest-receivers as being determined by the power balance between workers and capitalists, rather than by marginal products, consumer preferences, and factor supplies.

There can be no doubt concerning the importance of the issues that were involved in the debate. Not only, as we shall see, were there highly sensitive "ideological" issues at stake; at issue, more basically, was the very claim of economic science to provide fundamental theoretical insight into the operation of modern western economies. So that the identification, in the eyes of the profession, of the two sides participating in this primordial debate, can hardly fail to define the range of theoretical and ideological alternatives perceived as being, in principle, available.

The purpose of the present paper is two-fold. Its major goal is to point out the existence, within the stream of modern economic thought, of an important long-established theoretical tradition, bearing directly upon the central issues debated in the "Cambridge Controversy," that was, quite inexplicably, never mentioned (as far as I have been able to discover) in any of the countless polemical contributions to the controversy. This puzzling lacuna has had the unfortunate effect, I shall argue, of gravely misrepresenting the relevant available theoretical alternatives. If it is perceived that one must choose between theoretical position a and theoretical position b, then the demonstration of the existence of a serious flaw in position a, serves ipso facto as theoretical ammunition for position b, - in fact it may even be erroneously perceived as a demonstration of the validity of b. Where, however, the truth is that there exists an available theoretical position

c, then the demonstration of the invalidity of a may in fact turn out to lead directly to a demonstration of the validity (or at least the possible validity), of position c. We shall argue that precisely this kind of serious confusion has pervaded the Cambridge Controversy. Much of the disputation led to unjustified conclusions due to failure to recognize a third alternative theoretical approach to the nature of the interest share and its place in modern economic systems. This third, "missing" view is the pure time preference theory (often to be referred to in this paper as PTPT) of interest.

The second purpose of this paper is to present a careful restatement of this neglected alternative position. This restatement will attempt to highlight the elements in the pure time preference view that are most relevant to the modern debate, and to clarify aspects of the view that have, again and again in the history of modern economics, obstructed proper appreciation of it.

In particular we shall find, (a) that the pure time preference theory (PTPT) shares, respectively, important ideas with each of the sides in the Cambridge debate, and that this circumstance has important implications for one's view of the ideological issues at stake; (b) that although Cambridge theorists have deployed the well-known reswitching and capital-reversal "paradoxes" against Austrian capital theory, it turns out that these paradoxes present no problems whatsoever for the pure time preference versions of the

Austrian theory.

The following two sections of this paper will now (i) briefly spell out the two well-known alternative positions recognized in the Cambridge Controversy literature, the neo-classical view and the Cambridge view,<sup>2</sup> and (ii) draw attention to their "ideological" implications. (This statement will, rather than seeking to present a comprehensive review, concentrate only on those features of the debate most affected by the neglect of the third position identified here.) The subsequent section will then set forth the nature of this third ("neglected") view, the Pure Time Preference View.

#### THE INTEREST SHARE - NEO-CLASSICAL AND CAMBRIDGE VIEWS

In capitalist economies a portion of aggregate annual output is regularly received by the owners of capital. (This share has been variously called interest, or profit; in this paper we will, in order to avoid any possibility of confusion with pure entrepreneurial profit, refer to this share as interest.) The existence of this interest share offers a theoretical problem. As Hausman puts it, an "individual's capital...enables that individual to earn interest. If the capital is invested in a machine, the sum of the rentals the machine earns over its lifetime is greater than the machine's cost. Why?" (Hausman, 1981, p. 3). Why, for example, should not the price of the machine (paid by the capitalist at the time when he invests his capital in the machine) be

bid up by the competition of others eagerly seeking to capture this net surplus (of the sum of rentals over the initial cost of the machine) until that price fully reflects the sum of those rentals, leaving no surplus to be received as interest on the invested capital? It is in its attempt to provide an answer to this question that the neo-classical theory has encountered the objections raised by the Cambridge theorists.

The neo-classical view has been couched in a variety of formulations, with these formulations (despite their sharp differences) being, in regard to the central problem at hand, essentially equivalent. The neo-classical view sees the interest received by the owners of capital as revenue obtained through the sale, to producers, of productive services of a special kind. Interest emerges as the price necessary to be paid in order to persuade the owners of capital to make these resource services available; it is able to be offered by producers because the use of these of these productive services (along with the services made available by other resource owners, particularly by owners of labor services) permits an output larger than would have otherwise been possible.

In the versions of this neo-classical theory attributed to J.B. Clark and to F.H. Knight, the services provided by the owners of capital are the productive services of capital itself; interest is thus the productivity return to capital, in exactly the same way as wages are the productivity return

to labor. In the versions of this neo-classical theory attributed to the Austrians, the services provided by the owners of capital are associated with the time, (or "waiting") that separates the date of application of the original inputs (used to produce the capital goods which permit enhanced final output) from the date at which final output is forthcoming. In the Austrian version (of the neo-classical view) interest is thus the productivity return to time, or waiting. For these neo-classical approaches, then, interest is a market-determined revenue that emerges from the interplay of the conditions of demand, (expressed in the bids of producers eager to obtain the additional output generated by application of capital services, time, or waiting), and supply (expressing the disinclination of potential investors to undertake the sacrifices necessary to make available these capital services, time, or waiting).

When interest rates accurately reflect the market equilibrium appropriate to these demand and supply conditions, it is then possible to say that interest is paid by consumers to capitalists in precisely those amounts needed to elicit those productive services of capital (or time, or waiting) which, in the eyes of consumers, it is worthwhile to use (or, put alternatively, the usefulness of which to consumers is sufficient to make the sacrifice of these units worthwhile to investors.) Higher rates of interest might indeed elicit additional services that would increase output, but only by small marginal amounts for which

consumers are not prepared to pay (the necessary increment in interest payment). Lower rates of interest might indeed make it worthwhile for consumers to wish to wish to enjoy the increased output that would be forthcoming with the use of greater volumes of capital services (or time, or waiting), but the associated interest revenues would then not be enough to induce potential investors to undertake the sacrifices needed to make these greater volumes of services available. Looked at in this way interest rates express, in the light of resource availabilities, consumer preferences. They appear to be "justified" (in the same sense as, in the neo-classical system, wages are "justified" by the productive labor services in exchange for which they are received) by the productive services of capital, or time, or waiting, in exchange for which they are received by capitalists.

For the purpose of this paper the important element in the Cambridge view,<sup>3</sup> is its denial of the neo-classical theory of interest as an exchange phenomenon. In particular the Cambridge view denies that the interest share is the expression, through the system of market exchanges, of consumer preferences. (Indeed a central theme running throughout the literature expressing the Cambridge view, is the denial of the doctrine that consumer demand plays a decisive role in determining values of any kind.) In this respect the Cambridge view calls for a return to classical economics in which exchange values are seen as determined by costs of production, technical conditions, and the like, not



by consumer preferences. Viewed through neo-Ricardian eyes, interest receipts are not revenues received for the sale of anything at all. As E.J. Nell put it, "modern Ricardian theory puts a good deal of emphasis on the fact that the payments to capital are dispositions of a surplus and do not involve any kind of exchange. There simply is no corresponding stream moving in the opposite direction." (Nell, 1967, reprinted in Harcourt and Laing, 1971, p. 200).

Put somewhat differently the Cambridge view objects to the neo-classical view that income distribution is merely a matter of the general pricing process, independently of "what Marx called the social relations of production" (Dobb, 1970, reprinted in Hunt and Schwartz, 1972, p. 206).

What Dobb understand by locating "a theory of distribution entirely within the circle of market relations" is exemplified in Menger's derivation of the prices of goods of so-called 'higher order,' and hence prices of factors, by a process of 'imputation' from the prices of goods of 'first order' (products sold to final consumers). By contrast the Cambridge view sees the distribution of income as "determined by the relations between workers and capitalists including possibly their relative bargaining power." (Hausman, 1981, p. 167). In this view the price system is not sufficiently all-embracing to determine the pattern of income distribution merely on the basis of the preferences of consumers. The "system of relative prices (which determines the value of the 'means of production' and, consequently,

distribution) has a degree of freedom, and becomes locked only when either the rate of exploitation or the rate of profit or the real-wage rate is taken as an independent datum...The theory of distribution therefore continues to be a matter of political economy, simply because one has to form one's judgement regarding how this degree of freedom is closed through the functioning of capitalism." (Bhaduri, 1969, reprinted in Harcourt and Laing, 1971, p. 259). From this perspective the various specific competing theories offered within the general Cambridge view differ from one another merely in the particular ways through which they seek to close the system. "A large number of Cambridge growth models 'close' the system through a relation between the rate of profit and the rate of growth...In classical political economy the system was 'closed' through the 'iron-law of wages.' In Marx's writings there is also the notion of a long-run inflexible real-wage rate..." (Bhaduri, *ibid.* footnote 8).

#### IDEOLOGY AND THE INTEREST SHARE

It is not difficult to recognize the ideological implications that can be drawn from each of the two views on interest involved in the Cambridge controversy. We shall dwell briefly on these implications not only because of the further light they throw on the controversy itself, (and upon the reasons for the extraordinary passion, even bitterness, with which the controversy was pursued). These ideological

implications of the Cambridge controversy will be useful, in particular, in underscoring, in subsequent sections of this paper, the nature of the third, neglected, theoretical position that we shall show to have been missing from the Cambridge controversy literature.

It was Mrs. Robinson who was, from the Cambridge side, most insistent upon the extra-scientific implications of the neo-classical view. "The unconscious preoccupation behind the neo-classical system was chiefly to raise profits to the same level of moral respectability as wages. The labourer is worthy of his hire. What is the capitalist worthy of?" (Robinson, 1962, pp. 57f). "Capital must be allowed to create the value that it receives." (Ibid, p. 36). "The hard-headed attitude of the Classics, which recognized exploitation as the source of national wealth, was abandoned. Capital was no longer primarily an advance of wages made necessary by the fact that the worker has no property and cannot keep himself till the fruits of his labour appear. Capital...produces the extra output that a longer gestation period makes possible. Since capital is productive, the capitalist has a right to his portion. Since only the rich save, inequality is justified." (Ibid, p. 58). From the neo-classical side Robert Solow has written of the Cambridge (U.K.) school, that they see the neo-classical theory of interest as "an important part of an apology for private capitalism. It sounds as if capitalists are entitled to their profits..." (Solow, 1975). As Mark Blaug has written,

in the course of his critique of the Cambridge view: "There is no doubt that the conviction that neo-neo-classical theory somehow serves to justify the private receipt of profit in terms of the productive contributions of 'capital' is responsible for much if not all of the venom directed at Cambridge, Mass. by Cambridge, Camb...For the Cambridge critics, any notion...implying that the rate of interest or profit is an index of the scarcity of capital, is taken to be an argument in favour of private property." (Blaug, 1974, pp. 75f).

As we have seen the neo-classical view sees interest as the reward to the capitalist for his making available the productive capacity of his capital, or time, or waiting. This would appear to "justify" interest, as Joan Robinson pointed out, in the same way as wages are seen as "justified" in the course of the marginal productivity theory. Moreover, as we saw, there would appear, in the neo-classical view, to be important efficiency considerations served by the payment of interest: interest serves to elicit the "right" amount of capital investment (taking into account both the sacrifices so involved and the usefulness to consumers of the incremental output that the investment will eventually generate.) Thus interest receipts, from the neo-classical perspective not only seem (at least from the Cambridge, U.K., judgment of that perspective) to possess moral justification, in the sense of the invocation of commutative justice; they also possess direct efficiency justification in terms of the

ideal of consumer sovereignty. To have exploded the analytics underlying the neo-classical view, (a task the Cambridge critics believed themselves to have successfully accomplished), was thus at the same time to have destroyed any claim, on the basis of economic understanding, for the moral or even the strictly economic, justification of interest receipts.

Let us now turn to establish the existence, within twentieth-century economic thought, of a theoretical tradition that views interest in a way which fits into neither of the two analytical boxes provided with the Cambridge controversy kit. This third view, the Pure Time Preference Theory (PTPT) of interest shares, as we shall see, important elements with each of the sides in the Cambridge controversy. It shares with the Cambridge critics (although for entirely different reasons) their rejection of the view of interest as a reward for a productive contribution rendered. On the other hand it shares with the neo-classical view (although, again, on different analytical grounds) their perception of interest as an exchange phenomenon, with the distribution of income between interest and wages seen as understandable entirely within the theory of market prices.

Among the misunderstandings that we shall have to clear up concerning this third view is its relationship to "Austrian" economics. As we have seen, one formulation of the neo-classical view, a formulation that was emphasized in the Cambridge controversy literature, was attributed to an

Austrian tradition stemming from Böhm-Bawerk. It was that Austrian tradition that saw interest as reflecting the productivity, not of capital itself, but of the time, or the waiting, required to engage in "roundabout methods of production." Yet, we shall argue, the third, "neglected", view, missing from the Cambridge controversy literature, is equally entitled to claim Austrian lineage, and, in fact, to be seen as stemming from Böhm-Bawerk. So that we shall have to discuss rather carefully the relationship between the two quite different Böhm-Bawerkian, Austrian, views on interest. The Austrian view of interest that is missing in the Cambridge Controversy literature, is the Pure Time Preference Theory (PTPT).

#### THE PURE TIME PREFERENCE THEORY OF INTEREST<sup>4</sup>

Although it was not introduced into the Cambridge controversy, the pure time preference theory of interest, some may perhaps need to be reminded, is well-established in the history of economic thought. It was articulated most powerfully, over a long period of decades, in the United States by Frank Fetter,<sup>5</sup> who drew his central ideas from the work of Böhm-Bawerk. (Irving Fisher, whose eclectic theory of interest embraced important elements of the time preference view, found it necessary to justify his rejection of Fetter's pure time preference theory.) (Fisher, 1930, pp. 468f). In fact Fetter found such persuasive support in Böhm-Bawerk for the pure time preference theory, that he was

completely nonplussed by Böhm-Bawerk's own notorious defec-  
tions from the pure time preference view (Fetter, 1902,  
reprinted in Rothbard, 1977, pp. 185ff).<sup>6</sup> More recently  
the most consistent exponent of PTPT was Ludwig von Mises  
(1949, chapters 18, 19).<sup>7</sup> In his long 1941 review article  
on Mises' 1940 Nationalökonomie (the work later translated  
and revised by Mises to make his noted 1949 treatise, Human  
Action) Frank Knight devoted virtually his entire space to a  
discussion (and severe critique) of Mises' pure time  
preference theory. (Knight, 1941). Knight recognized that  
the pure time preference theory represented a consistent  
development of the pure subjective Austrian approach to  
market theory in general, - and subjected both to outspoken  
polemical attack, while restating his own view of interest as  
expressing the productivity of capital itself. (Knight's own  
theory, in which time was dismissed as of utterly no  
consequence at all, was thus sharply at variance with  
Austrian theories of all varieties. Hayek, in his celebrated  
controversy with Knight during the 'thirties, had vigorously  
criticized the Knightian theory. Hayek's own approach,  
however, was not the PTPT to be discussed here; it was,  
instead, in the Wicksell-Fisher line of development from  
Böhm-Bawerk, in which both productivity and time-preference  
considerations are deployed.) The pure time preference  
theory of interest rests upon two quite separate sets of  
insights: (a) the necessary invalidity of all productivity  
theories of interest; (b) the possibility of accounting for

interest receipts as emerging from intertemporal exchanges (even altogether without production) in which the time preferences of the participants play decisive roles.

(a) The Invalidity of Productivity Theories of Interest

It was Böhm-Bawerk who had argued the basic Austrian case against productivity theories of interest. In his critical history of earlier theories of interest, Böhm-Bawerk had cited a long list of writers, including Say, Lauderdale, Roscher, and von Thünen, who had offered different variants of productivity theories of interest (Böhm-Bawerk, 1959, Vol. I [1884], chapter 7) Böhm Bawerk rejected all of these explanations of interest, on the basis of the fundamental Austrian (Mengerian) tenet that sees the value of instruments of production ("higher order goods") as being derived from the value of the consumption output ("goods of lowest order") which they produce. The full value of consumption output comes, through a process of imputation, to be attributed to the complex of resources from which they sprang. (It was a central theme of Menger's 1871 Grundsätze that individuals, and thus markets, assign values to "means" strictly because and only insofar as, these means are crucial for the attainment of valued ends. If the achievement of valued ends is held to depend upon command of a complex of specific means, the full value of the former comes to be associated with the latter.)

So that the circumstance that command over capital goods



of any kind appears to assure an enhanced physical output stream, is by no means sufficient to account for a regular stream of net receipts to the owners of capital (after deducting what must be paid to the owners of the "original" resources responsible for the production of these capital goods.) Greater output simply means correspondingly greater value imputed back to capital goods, which greater value will surely come to be fully imputed back, in turn, to the factors of production from which the allegedly "productive" capital goods themselves sprang, and so on. As Schumpeter (citing Bohm-Bawerk) expressed it in a well-known passage:

"Competition...and imputation...must annihilate any surplus of receipts over outlays, any excess of the value of the product over the value of the services of labor and land embodied in it. The value of the original means of production must attach itself with the faithfulness of a shadow to the value of the product, and could not allow the slightest permanent gap between the two to exist." (Schumpeter, 1934, [1911], p. 160).

It was this Bohm-Bawerkian refutation of productivity theories of interest which Fetter cited as the basis of PTPT. Pursued consistently, Bohm-Bawerk's reasoning must seem impossible to reconcile with what we have earlier described as the neo-classical theory, in which interest is seen as a productivity return. (It is true that the Böhm-Bawerkian reasoning might be rendered harmless, for a neo-classical productivity approach, if it were acceptable to introduce

"time" (or "waiting") as a genuine, independent, "original" factor of production, with its own productivity (that is not to be imputed to "earlier" resources). We shall return later to discuss this escape route for neo-classical "Austrian" theories of interest. At this point it suffices to note that Böhm-Bawerk himself explicitly refused to recognize "waiting" as constituting an independent factor of production the services of which are remunerated in the form of interest payments. (Bohm-Bawerk, 1959, Vol. III, [1921], Essay XIII). It is not surprising that Fetter (1977) [1902] found Bohm-Bawerk's own positive theory of interest - in which the technical productiveness of roundabout processes appears as an important building block - to be bafflingly at odds with Böhm-Bawerk's own decisive refutation of the earlier productivity theories.)

Basically Böhm-Bawerk's refutation of productivity theories showed that the phenomenon of capital-using production is not sufficient to account for a net income stream to the owners of capital. In order to deny completely any causal linkage between the process of capital-using production and the receiving of interest, an additional simple step is called for. This is to show that capital-using production is not necessary to account for the phenomenon of interest: time-preference can generate interest in a world of pure exchange, without production processes of any kind. For the sake of completeness, we spell out this simple step.

(b) Interest Payment in the Pure Exchange Economy

Consider a simple world in which daily endowments of consumable goods are available to individual participants in a pure exchange market that permits intertemporal exchanges. Time preferences can, clearly, generate interest receipts in such a world, without production of any kind. Using the very same reasons that account for a rate of exchange between plums and peaches that is other than a one-for-one ratio (viz. for reasons having to do with individual preferences with respect to marginal quantities of peaches and plums), we can readily account for a rate of exchange to emerge between today's plums and the prospect of plums tomorrow, that differs from a one-for-one ratio. Market participations may simply not be indifferent between one plum available today and one plum available tomorrow, that is all. If there is a general tendency to prefer given quantities of today's plums over physically similar quantities of plums promised for tomorrow,<sup>8</sup> intertemporal exchange rates will generate interest receipts. A market participant possessing an initial endowment of plums may, by selling, each day, 100 plums (of that day) for the promise of 110 plums the following day, enjoy a continual net daily stream of ten plum-interest receipts, without diminishing the number of plums available in the revolving loan fund. (Of course, the continuity of the interest receipts stream depends on the plum-capitalist's ability to continually discover some borrowers each day, - who need not, certainly, be the same

ones each day, - willing to consume less in future periods, or expecting future endowments greater than today's.)

With production neither sufficient nor necessary for the generation of interest, the pure time preference theory accounts for interest, in a world of production, by referring, most definitely, to the time consumed by production processes, but without any reference whatsoever to the productivity of roundaboutness, of time, or of waiting. It may be instructive to spell this out.

#### PURE TIME PREFERENCE AND TIME CONSUMING PRODUCTION PROCESSES

In a world of time consuming production processes the PTPT accounts for the interest received by capitalists, in the following way. Production processes take time. This means that inputs must be applied now, in order to command output, not immediately, but only some distance away in the future. In selecting among alternative available productive uses of current inputs, therefore, producers will - because they and the owners of the current inputs are not indifferent as to the dates at which outputs will be forthcoming - take into account, among other things, the prospective lengths of the various processes available. Other things being equal, "longer" processes will be adopted only if they offer output quantities so much greater (than outputs of "shorter" processes) as to overcome the general preference for prospective earlier, rather than later, receipts.

Because entrepreneurs produce by buying resources now

(and cannot, with time consuming production processes, expect to command sales revenues with which to make payments for resource services purchased, until some time in the future) they will regularly borrow capital funds from capitalists (or draw on their own capital resources) in order to carry out their projects. Interest payments will emerge, in competitive markets for borrowed capital, out of the interplay of the demand and supply for loans. Both the demand and the supply sides of this market, however, are similarly governed by time-preference considerations. The supply of loans is governed by the willingness of capitalists to lend capital, but only if a sufficiently attractive interest payment is offered to overcome the preference of the capitalists for prospective earlier rather than later receipts. But the demand side, too, reflects time-preference. An entrepreneur is prepared to offer a positive rate of interest because command over the borrowed capital will permit him to engage in a time consuming production process which, after paying for his inputs, at prices reflecting their time-preference-based discounted future productivities, offers a pure entrepreneurial profit. In other words he has discovered an opportunity to command a large, valuable output in the future, if only he can obtain access to immediate resources. The discovery of this opportunity motivates him to seek immediate resources, for which he is prepared to offer the necessary price in terms of future payments. (It may be perhaps objected that this

demand for immediate resources is motivated by their productivity in the processes to be undertaken: surely only the superior output expected from their use permits the entrepreneur to offer the interest payment. But we have already seen how the PTPT would dismiss this objection. In the absence of time preference the prospect of the superior output would have led to the bidding up of the prices of the relevant resource services until there would be no source from which any interest payments might emerge. What permits borrowers to offer interest is the time-preference-based discounting of the expected future output.) We should notice a number of important features of this way of looking at time-consuming, capital-using, productive processes.

(a) Ex-Ante Time

Time enters into the PTPT only in the prospective sense.<sup>9</sup> In this respect the theory is to be sharply distinguished from neo-classical theories that see interest as the payment for the superior productivity of allowing the use of more time. In the latter view it is the greater productive output attributed to the elapsed passage of a longer period of time ("clock-time") that is the source of interest. In PTPT, on the other hand, interest is offered or insisted upon only because, at the moment at which the intertemporal transaction is struck, the trading parties assess the availabilities of resources at alternative times in the future prospectively. It is this prospective

valuation of future receipts that is the source for intertemporal rates of exchange on anything other than a one-for-one basis. As time passes, what used to be seen as the distant future becomes the near future and eventually the immediate future. So that given receipts expected at a particular future date are subject to changing valuation as time passes. Interest emerges because at each date at which funds are loaned and borrowed, there are choices being made in which more immediately future receipts are being compared prospectively with receipts in the more distant future. It is not the actual passage of time that generates interest, but the circumstance that loans do involve the prospective delay in receipts. The terms at which, given the latter circumstance, loans are granted, therefore means certainly that, after the passage of specific periods of time, fulfillment of the loan contract term provides the lender with interest receipts. But these receipts, although they may seem to be "yielded" by the passage of time, are in fact to be explained, it is clear, purely in terms of the valuations that, at the moment of the loan, governed the decisions made and embodied in the loan contract.

(b) Interest as the Market Expression of Consumer Preferences

In the PTPT view interest emerges in the course of intertemporal exchanges. Since production involves, necessarily, intertemporal exchanges, interest indeed

emerges in the context of production processes, but does not (as do the prices of resource services) express the market evaluation of the usefulness to consumers of the productive services of anything. We cannot say, therefore, that interest receipts, as a distributive share, represent a portion of total output "produced by capital." We cannot pronounce interest payments to be expressive of the intensity of desire by consumers for the additional output produced by capital resources (the availability of which depends upon provision of such interest payments.) Yet it must be emphasized that on this pure time preference theory, too, (just as was the case with the neo-classical theory), interest payments are (like all market payments) to be seen as the market expressions of relevant consumer preferences.

On the pure time preference view the circumstance that a portion of current output is, in each period, paid out as interest, reflects a continual series of evaluations made, at respective earlier dates, when (what are now) current outputs appeared only as prospective future receipts. At the moment of output emergence, the value attached to current output is of course simply its total current value. Were that value to be imputed now to the factors of production that produced the output, payments to those factors would exhaust the total current output; there would be nothing left for any interest payments. But, because production takes time, the purchase of the input services responsible for today's emerging output occurred at an earlier date (when the prospective output,



properly discounted in time-preference context, permitted only a smaller value to be imputed to those input services.) Similarly the input services purchased today (and paid for today out of today's emerging output) are valued at the time-preference-based discount of their future output. The difference between the total value today of today's output, and that portion of it paid out to today's input services (for their contribution to future output) constitutes, in the steady state, the source of interest paid today on last period's borrowed capital funds. This interest payment therefore is a reflection of intertemporal market prices, and thus of the intertemporal preferences of market participants, in the very same way as all market payments reflect relevant market preferences. There is no arbitrary, non-price-determined distributive procedure at work here. All payments have their origin and their determination as part of the intertemporal market process.

(c) Interest and the Time-Structure of Production

An important element in the Böhm-Bawerkian tradition has been the understanding it has conveyed concerning the time-structure of production, and the role played by interest rates in determining this structure. In the Wicksell-Fisher-Hayek stream within this tradition (that responsible for the view that interest is a payment for the productive contribution of roundaboutness) this determining role was an obvious one. It was the array of time-consuming processes

adopted that generated the additional output from which interest was forthcoming; it was the willingness of potential savers to postpone consumption in order to obtain greater subsequent consumption that provided the investment capital that in fact permitted the additional outputs resulting from the chosen degrees of roundaboutness. The time profiles of inputs and outputs, the chosen degrees of durability of capital goods, the levels of "higher order" capital goods that were selected in implementing the preferred intensity of capital usage in production - all were reflections of the market rates of interest, while these rates were themselves, of course, determined in the market process within which these temporarily-relevant production decisions were being made.

In the pure time preference theory, too, it should be noted, the time structure of production is determined in the course of the very same market processes in which interest rates emerge. Although, in the PTPT interest is not generated by any additional outputs arising out of roundaboutness, we have already seen that the degree of roundaboutness chosen certainly depends upon the time preferences of market participants as expressed in market rates of interest. We can still conceptually identify a structure of production as "too long" -- not, notice, in that (because of diminishing marginal productivity of time) increments of roundaboutness have generated additional output too small to produce the interest payments needed to elicit

the necessary "waiting", but instead simply -- in that the production processes in question happen to involve so long a delay in the generation of output, that the necessary interest charges render the process too costly. (Put differently, the time-preference-discounted values of the inputs fall below the value of those same inputs in alternative, less time-consuming, uses.) What is important is that in the PTPT, too, the selected time-consuming processes of production tend, under the impact of the market process in which interest rates are determined, to reflect the willingness of the market participants to sacrifice earlier consumption for expected greater consumption in the future.

#### AUSTRIANISM, THE PTPT, AND THE CAMBRIDGE VIEW

It may be helpful, in assessing the consequences for an understanding of the Cambridge controversy, of recognizing the existence of the neglected PTPT option, to dwell briefly on the role of "Austrianism" in the theory of interest. In many accounts of the Cambridge controversy the neo-classical view is presented in Austrian garb. In this sense of Austrianism, a neo-classical view is "Austrian" if it focusses attention, as we have seen, on the Böhm-Bawerkian emphasis on the productivity of roundaboutness. On the other hand, we have seen, Knight identified the PTPT of interest as quintessentially Austrian because it appears to emphasize exclusively the purely subjective factors (i.e., Böhm-Bawerkian time-preference factors) that operate on the

intertemporal market. Clearly both offshoots of the Böhm-Bawerkian theory, both the Wicksell-Fisher synthesis of productivity and time-preference elements, and the Fetter-Mises pure time-preference theory, are "Austrian" in significant respects. But there is yet a further sense in which specifically Austrian insights are relevant to a theory of interest - a sense associated not so much with the name of Böhm-Bawerk as with that of Menger. To appreciate this can, I believe, be useful in clarifying the nature of the Neo-classical-Cambridge-PTPT triangle.

The Mengerian insight we wish to emphasize is that, mentioned earlier in this paper, which assigns economic significance to resources only insofar as they contribute to final consumption output. At the level of the individual this insight sees means as deriving their value from ends. At the economy-wide level this insight translates into the thesis that distributive shares of aggregate income to the owners of factors are to be understood as the market-determined expression of the ways in which consumers evaluate the productive usefulness of the different resources. It seems appropriate to label this latter insight as "Austrian". It has been recognized by historians of thought that this thesis, that emerged in neo-classical economics generally (in the form of the marginal productivity theory of distribution), only about twenty years after the initial marginal revolution - was already stated by Menger as an integral element in his original 1871 Austrian contribution

to that revolution. And Marxist critics of this consumer sovereignty theory of distribution from Bukharin (1927) to Dobb (1973, pp. 33-35) in fact emphasized its Austrian credentials.

From a perspective that emphasizes the Austrian character of the thesis (that incomes reflect consumer evaluation of the productive contributions of resources), therefore, it is, clearly, against the Austrian character of neo-classical views on interest that the Cambridge critics have objected so strongly. And, as we have seen the PTPT would seem to escape the wrath of the Cambridge critics on this score - since the PTPT denies, as the Cambridge critics deny, that interest payments reflect any such valuation of productive contribution. So that one might be tempted to pronounce the PTPT, unlike the neo-classical view, as not being dependent upon this Austrian insight that we have attributed to Menger. But this would be quite incorrect. The truth is that the PTPT depends on this Mengerian insight even more fundamentally than does the "Austrian" version of the neo-classical view. (So that the PTPT may be considered Austrian not only in Knight's sense - in that it emphasizes the subjective factors overwhelmingly - but also in the sense of its radical dependency upon the Mengerian insight.)

That the PTPT does so depend on the Mengerian insight is seen immediately from the basis upon which it rejects all productivity theories of interest. It will be recalled that the way in which the PTPT severs any possible causal linkage

between interest and productivity is one which invokes, indeed, precisely this Austrian insight into the relationship between factor-service values and the value of output. All final output value, Fetter (following Böhm-Bawerk) had argued, must be swept back by the market to the original factors of production from which that output proceeded. Once one denies, as the PTPT (again following Böhm-Bawerk himself) denies, that time (or waiting) constitute independent, "original", factors of production, the Mengerian insight yields the inescapable refutation of all productivity theories.

So that while the PTPT indeed escapes the Cantabrigian wrath (insofar as it denies that interest is paid in return for productive service rendered), the PTPT can be seen, most emphatically, as depending on precisely those Austrian insights that the Cambridge view is most concerned to demote, viz. that consumer preferences are sufficient to set in motion market tendencies towards correspondingly definite income shares, and that these shares do tend to express these valuations of the consumers.

PURE TIME PREFERENCE THEORY, RESWITCHING PARADOXES, AND ALL THAT

Perhaps the most effective way to convey the extent to which the PTPT does indeed differ from the neo-classical position (even in the most "Austrian" versions of this neo-classical position) -- will be to point out how irrelevant,

and especially, of course, by Cambridge theorists. "If capital is an input into production whose value measures its quantity and whose marginal product decreases with its quantity, and if the rate of interest is proportional to the marginal product of capital, then the rate of interest and the value of capital must be inversely related. How can one regard capital as a factor of production if...firms find it profitable to use less capital when its price (the rate of interest) declines? When an input becomes cheaper one should expect firms to find it profitable to use relatively more of it. Something is drastically awry." (Hausman, 1981, p. 76). "The doctrine that incomes are paid in approximate proportion to the productive contributions of persons and their property is", Professor Yeager reports Cambridge theorists as believing, "crumbling under the criticism of the Cambridge School." (Yeager, 1976, p. 315). Capital-reversal erodes the notion of a demand curve for capital, and thus the view of interest as "a true scarcity price." (Harcourt and Laing, 1971, p. 23). "The initial result of no general relationship between rate of profit and value of capital goods per man came to contradict the marginal-theory interpretation of the rate of profit as a selector of capital-intensity, i.e., as an 'index of scarcity' of the 'quantity of capital'" (Pasinetti, 1971, [1969], p. 283). These difficulties do not depend on which variant of the neo-classical view is being considered. Treating interest as the reflection of the marginal productivity of time, or waiting, or roundaboutness,

offers no escape from the problems identified in the above citations, - (in which quantities of capital, rather than time, or waiting, were referred to).

For our purposes it is worthwhile to underscore the fact that these difficulties in the neo-classical position arose entirely from its view that the demand curve for capital (or time, or waiting, or roundaboutness) expresses the demand for the productive services of capital (or of time, etc.). It is only because the rate of interest is seen, in the neo-classical view, as an index of the scarcity of these productive services, that the possibility of capital-reversal appears to play havoc with the notion of a well-behaved, downward-sloping demand curve playing a conventional role in the market determination of the interest price. From the perspective of a pure time-preference approach to interest, therefore, a demonstration that a lower rate of interest might make it more profitable to employ an apparently less time-consuming technique of production, would seem to present no direct challenge. Interest is not offered, in this view, in order to command the productive services of time; the shape attributed to the curve of marginal productivity of time is thus of no relevance to the market determination of interest. What may be a problem for productivity views of interest can create no difficulty for the pure time-preference view. It must be pointed out that these observations, while correct as far as they go, are in themselves not quite enough.



It may, after all, be properly objected that while the PTPT indeed escapes the particular problem posed for productivity theories by the possibility of capital-reversal, it must nonetheless confront an altogether parallel difficulty. Surely a reduction in the rate of interest must, on the PTPT view too, be expected to lead to the employment of more time-consuming methods of production (even if for reasons having nothing to do with the productivity of time). On the PTPT view there are likely, at any given rate of interest, to exist possible time-consuming processes of production that are not adopted because the necessary outlays, including interest, are too large to be justified by the prospective output. Surely a reduction in the rate of interest must tend to transform some of these (hitherto "too long") processes of production, from unprofitable to profitable projects. So that a demonstration that a fall in the rate of interest leads to the adoption of less lengthy processes of production must seem to be as much a puzzle for the PTPT view as it was, for other reasons, for the neo-classical view. To see that this objection is in no sense damaging to the PTPT position it is necessary to reconsider the very possibility of capital-reversal in terms of the prospective waiting relevant to time-preference considerations.

In the literature that applies the capital-reversal notion to the Austrian temporal context, it is taken for granted that the input-dating requirements for a given

production process, together with the associated date of output availability, unambiguously define the quantity of time (or waiting, or the degree of roundaboutness) required for that process. It is then shown, for example, that with given prices of inputs, the relative profitability of one technique as compared with a second, depends upon the rate of interest -- with, say, the first technique being more profitable than the second at very low rates of interest (say, less than  $r_1$ ) and at very high rates of interest (greater than  $r_2$ ), but less profitable at a range of intermediate rates of interest. With such a "reswitching" situation it is clear that at one or other of the two switch points (i.e., either at  $r_1$  or  $r_2$ ) we are confronted with the paradox that a fall in the rate of interest is associated with increased relative profitability of the technique that calls for less "waiting". (Thus, in terms of our example, if the first of the two techniques happens to involve the more waiting, a reduction in the level of interest rates from above  $r_2$  to below  $r_2$  seems to bring about a paradoxical switch from the more time-consuming to the less time-consuming technique.)

But reflection should convince one that the basic premise upon which this reasoning depends is by no means to be accepted without question. This premise is that each technique of production involves a simple, undimensional "quantity" of time, such that different techniques can be unambiguously ranked as involving greater or lesser

quantities of time (or waiting). In fact there is no reason at all to accept this premise. The cases that yield the capital-reversing paradoxes all arise from production processes involving more or less complicated dating patterns for inputs and outputs. (For example in the text-book example made famous by Samuelson (1966), a given quantity of output can be obtained in year 4 from one technique that calls for the input of 2 units of labor in year 1, and 6 units of labor in year 3, or alternatively by a second technique of production calling only for the input of 7 units of labor in year 2.) It appears to be obviously mistaken (or at least to involve an arbitrary and possibly misleading oversimplification) to wish to collapse the possibly incommensurable quantities of time associated with individually-dated input components of a given complex production technique, into a single simple undimensional quantity of time. The fact that economists ever since Bohm-Bawerk have argued about the "correct" formula through which to square this particular circle, should not mislead us into failure to recognize that such a task can hardly be anything but an arbitrary, "simplifying" undertaking. We shall see below why, for economists such as Bohm-Bawerk, attaching significance to the productivity of roundaboutness (or of time, or waiting), there may perhaps seem to be reason to believe this undertaking to be necessary. But for a PTPT view such reasons, as we shall see, simply do not exist, and the confusions generated by the capital-reversal paradoxes that

arise from insisting on pursuing this undertaking, clearly demonstrate how unfortunate this insistence can be.

The truth surely is, of course, that, with positive time-preference assumed, we simply cannot entertain the possibility that, with respect to a given quantity of physical input, a decision maker might, merely as a result of a decrease in the rate of interest (that he must pay for the use of borrowed funds, with which to advance payment for the input), choose to assign that input to a shorter time-consuming process of production. If then we find that, as interest falls from very high levels to below  $r_2$ , technique A is replaced by technique B, while when interest continues to fall even lower and reaches below  $r_1$ , technique b is replaced, in turn, by technique A (which had been preferred at the very high rates of interest) we should not, surely, conclude that at one of these two switch points the reduction in interest has perversely brought a change to a less time-consuming technique. Rather we should understand that comparing the complex, multidimensional waiting requirements for different techniques simply does not permit us to pronounce one technique as involving unambiguously less waiting than a second technique. (In the case of the Samuelson example, for instance, the one technique involves a long wait for the marginal output of the 2 units of labor and a short wait for the output of the 6 units, while the second technique involves an intermediate wait for the output of 7 units of labor. There is no need (and there need not be in

fact any way) to rank the two techniques in terms of their overall waiting requirements.) They involve different patterns of waiting, such that both very low and very high rates of interest might make technique A seem the more profitable, while at intermediate rates it is technique B that is the more profitable. There is nothing perverse about this, unless one insists, mistakenly, that one or other of these two techniques involves the greater quantity of time, or of waiting.

Professor Leland Yeager seems perhaps to have sensed something similar to this in his exhaustive and lucid discussion of the issues (Yeager, 1976, 1979) in which he sought to dissolve the "paradoxes" by insisting that "waiting" should not be measured in physical clock-hour terms, rather than "the amount of it required in physically specified production process does depend partly on its own price." (Yeager, 1976, p. 345). In this way Yeager argues that, appropriately measured in terms of the relevant rates of interest, lower interest rates do always stimulate the use of techniques involving "more" waiting. But the point made in the preceding paragraphs does not revolve around the particular measurement technique to be used in measuring waiting,<sup>10</sup> rather we argue that there is no need (and may well be no way) to measure waiting, for the relatively complicated production cases in which reswitching and capital-reversal paradoxes have their habitat.

It should be pointed out that it is altogether under-

standable that theorists from Böhm-Bawerk to Yeager, who attach significance to the productivity of roundaboutness, or of time or of waiting, do feel it necessary to insist on being able, in principle, to rank different techniques in terms of the quantities of waiting they respectively involve. After all, if time, or waiting, is being treated as a factor of production, it seems reasonable to ask which of the two techniques calls for use of the greater quantity of this additional resource. (In fact from this perspective it is possible to sympathize with Hausman who finds Yeager's refusal to measure waiting in physical terms "unpalatable" - quite apart from other difficulties (Hausman, 1981, p. 79). What moves Hausman to find Yeager's view unpalatable is presumably the circumstance that productivity is indeed ordinarily assessed in terms of physically measured inputs. From this perspective it does seem reasonable to assume that, somehow, the one technique does unambiguously call for a greater "physical" quantity of this resource called "time", or waiting.)

What should be emphasized is that, from the PTPT perspective, there is absolutely no need to assume any possibility for such unambiguous ranking. In the PTPT view time is not viewed as an input. A technique of production calls for a specific pattern of dating for its inputs, thus confronting the producer with a correspondingly complex pattern of prospective delay before the output is to be forthcoming. Different techniques involve different patterns of prospective delay, that is all.

SHEEP, RICE, AND AUSTRIAN HOCUS-POCUS

We have described the PTPT as concurring in the Cambridge rejection of interest as a productivity return. And we have seen how the PTPT arrives at this rejection by applying - relentlessly and consistently - the Mengerian insight that significance is to be assigned to productive resources only insofar as they contribute to final consumption output. It was this insight that convinced the pure time preference theorists that all final output value must tend to be swept back by the market to the original factors of production from which that output proceeded. Critics of the PTPT have, again and again during the past century, argued that simple stylized examples demonstrate irrefutably that "productivity" considerations must indeed play an important role in accounting for the phenomenon of interest. Very recently Samuelson has once again concisely raised a closely similar difficulty (in the context of his discussion of a different doctrinal issue).

Samuelson's observation came in the course of his recent critical reconsideration of Schumpeter's zero-interest-rate doctrine (Samuelson, 1981). Schumpeter had argued on the basis of what we have described as the Mengerian insight, that in a world in circular-flow equilibrium, the rate of interest must be zero, with all output value decomposable into land rent and labor wages, with nothing left for any interest share. Samuelson objects that a possible technological case refutes Schumpeter's argument. The case

Samuelson identifies is that of 100 units of rice ripening into 110 units of rice during the period of one year, without the input of any labor or any scarce land. This case shows, Samuelson claims, that final value need not necessarily be swept back to labor and land; apparently we have 10 units of rice ("real interest income") that can be attributed only to the productivity of the initial rice stock. Samuelson hastens to anticipate the Schumpeterian response. Schumpeter had emphasized that, with interest zero, "the greater magnitude of the forest is already imputed back in value to the saplings." So that today's 100 units of rice already have the value of next year's 110 units: "these foreseen changes...only conserve the already calculated value of the process", without involving any creation of new value. But Samuelson finds this response "pure deception. Real rice is being produced net. Kuznets can measure it. You can eat 10 rice every year and still not impair your circular-flow income...No hocus-pocus of backward imputation - of forest to sapling, or rice grain to rice grain - evades the naive fact of productive interest." (Samuelson, 1981, p. 23).

Samuelson's rice-example-grounded protest against what he calls the "hocus-pocus of backward-imputation", (i.e., the consistent application of what we have called the Mengerian insight), echoes the lessons asserted by productivity theorists over the decades as being evident from similar examples, and reminds us of the subtle and tantalizing conundrums that have complicated the apparently never-ending



debates. Irving Fisher, despite his acceptance of the Mengerian refutations of "naive" productivity theories of interest, nonetheless insisted on the importance and independence of a productivity component in the determination of interest rates. A sheep economy, Fisher argued, in which 100 units of today's mutton-and-wool can yield, in one year's time, 110 units of mutton-and-wool, is an economy in which the rate of interest cannot systematically remain below the 10 percent level (Fisher, 1930, p. 193). H.G. Brown repeatedly referred to an island economy in which a choice must be made between (a) importing 1000 fruit today, or (b) importing today trees that can, in a year's time, provide 1100 fruit (Brown, 1914, 1926)<sup>11</sup> arguing that the case did establish the role of productivity. Frank Knight, undoubtedly the most uncompromising productivity theorist of interest ever, wrote (Knight, 1944) of a Crusonia economy in which "all human wants are supplied by a species of vegetation that grows at a rate unaffected by human endeavor except as tissue is cut away for consumption." (Dewey, 1965, p. 52).

What is common to all these examples is that they appear (and have sometimes been deliberately constructed so to appear) to escape the Böhm-Bawerkian refutation of the naive productivity theories. By permitting direct "physical" measurement of the "rate of productivity", they appear to escape the charge that what seems to be a rate of productivity in fact depends upon use of a value for the

capital base that implicitly involves an already-assumed-time-preference-generated rate of discount. These "physical quantity" examples demonstrate that genuine productivity does occur, since they involve no valuation of the capital base at all (and hence no implicit rate of discount already assumed). H.G. Brown was quite explicit on this as his purpose in developing his example, (and expressed dismay that Fetter yet accused him of the same fallacy committed by the refuted naive productivity theorists) (Brown, 1914; 1926, p. 125, ftn. 13). Yet it must be pointed out that, from the perspective of the PTPT, these demonstrations of genuine physical productivity are not yet quite sufficient to establish the case for productivity-generated interest. Fetter saw this quite clearly in his response to H.G. Brown's expression of dismay.

Brown had, Fetter pointed out, believed himself to have accomplished his goal by limiting productivity theory as dealing "with quantities of goods instead of with values." But in so doing, Fetter observes, Brown's "proposition speaks a different language from that of an interest-theory, and concerns a different question...A theory of interest must be essentially a value-theory. The thing to be explained is the ratio between the value of the income and the value of the income-bearer." (Fetter, 1977, [1914], p. 257) Surely this insight of Fetter's can go far to resolve some of the perplexing confusions surrounding physical productivity and its relevance for the phenomenon of interest.

Some of the above examples (in particular that of Knight's Crusonia plant) explicitly involve a single-good economy. Dewey (1965, p. 80) has, in fact, claimed that this feature of the example has the outstanding merit of avoiding all measurement problems. Rates of productivity can be arrived at directly, since "capital stock" and "income" consist of the same physical entities. No resort need be had to calculation in "value terms", with all its attendant pitfalls. So that those productivity examples, from sheep to rice, do indeed demonstrate that, even with zero rate of time preference, present rice exchanges for future rice at a rate that expresses the physical productivity of rice. And it can readily be agreed that, with this demonstration, productivity theorists may well have in fact achieved their apparent purpose: physical productivity has been shown to affect (or even to "determine") the intertemporal exchange rate (the own-rate) on sheep, on rice, and on Crusonia. But surely, as Fetter saw, the PTPT refutation of the productivity argument cannot, insofar as concerns the broader purposes of a theory of interest, be dismissed quite so simply.

If 100 of today's rice will, next year, become 110 rice, then, for any individual contemplating 100 rice today, what he sees is in fact the potential promise of 110 rice to be available next year. To state that individuals will be prepared today to promise to deliver 110 rice next year in exchange for 100 rice today (or that they will refuse to give up 100 rice today for a promise of less than 110 rice of next

year), may if one wishes, be described in terms of an own-rice-interest rate of 10 per cent -- but in fact such an intertemporal rate of exchange is, in way, hardly a rate of interpersonal exchange at all. Rather the 100/110 rate merely describes the technological equivalency relating present rice to the promise of future rice. To put it somewhat differently, since 100 present rice yields 110 of next year's rice it is, in a definite sense, inappropriate to treat a unit of today's rice as "the same" as a unit of rice promised for the future. In the sense relevant to the Mengerian insight the relevant comparable units are either 100 present rice or 110 future rice. From this perspective (a "value" perspective?), to discover that 100 rice today, trades in the intertemporal market today for 110 rice of next year is to discover a zero rate of interest. That is, 100 units of today's rice is found to be exchanging for an exactly equivalent (physically equivalent!) quantity of future rice. (Moreover, if it be objected that there would then seem to be no reason at all, given zero time preference, for any exchanges to be occurring at all at this "zero" rate of interest between equivalents (after all, we do not find 100 rice today exchanging for 100 rice today), the response would then be a triumphant "Exactly! The 100/110 rate is in fact not an exchange rate at all. It is a rate of technological equivalency; exchange will occur only if the market offers rates of exchange differing from this equivalency ratio. Market exchanges and market rates of

exchange emerge from (diverse) judgments of preference, they do not reflect universally recognized ratios of technological equivalence".) <sup>12</sup>

Böhm-Bawerk demonstrated the fallacy of the "naive" productivity theories of interest. A tree costlessly yields an annual income of desirable fruit. With zero time preference, however, this situation offers no example of the interest phenomenon: the value of the tree should rise to reflect, exactly and arithmetically, its full expected fruit yield, for all future time. One does not escape this insight by replacing the tree (which can obviously be compared with its fruit only in value terms, leading directly to the above Böhm-Bawerkian demonstration) by today's fruit (which will somehow change into greater quantities of fruit in the future). Some may have thought (as Dewey thought, in regard to Crusonia) that this device neatly avoids the quicksands of value measurement and permits one to plant one's feet securely on the terra firma of quantity comparisons. But what underlies the tree-fruit demonstration is not so much a matter of the measurement of value, as it is the insight into the essential (technological) equivalence of the tree with its fruit. To have a tree is to have its future stream of fruit crops. (Expressing tree and fruit as values must of course directly reflect this equivalency. But even where quantity comparisons are made, the equivalency itself need never, and should never, be lost sight of.)

Samuelson sees Austrian "hocus-pocus" as somehow

denying that when 100 rice ripen into 110 rice next year, this constitutes the production of real rice. "You can eat 10 rice every year", he protests, "and still not impair your circular-flow income". But no one would deny that real fruit grow on trees, and that that fruit crop can be eaten each year without impairing the health and fruitfulness of the trees. To recognize, as Samuelson knew that Schumpeter would have recognized, that the full value of next year's 110 rice must be imputed (without discount in a zero-time-preference world) to today's 100 rice, is not to deny either that 10 new units of rice have come into existence, or that this ensures (in a zero-time-preference world) a positive own-rate of rice interest. Instead this Austrian recognition permits us to filter out from any real-world rates of intertemporal exchange that we may encounter, elements that purely and strictly express technological equivalence. To be sure the ownership of a capital stock of 100 rice gives command over an annual crop of 10 units of new rice. But this represents a zero rate of return on this capital stock, appropriately considered. A zero rate of return does not mean that nothing is being consumed each year; it merely means that what is being consumed each year was in effect fully paid for, without discounting, when the capital stock was acquired in the past. Examples that, like Knight's Crusonia case, involve economies with but a single good, appear not to have room for this interpretation of physical productivity as consistent with a zero of interest (since in a one good world

there is nothing else in terms of which a stock of it can be valued.) But, as we have seen, these examples do not affect the basic economics of the situation in the slightest.

#### TIME AS A FACTOR OF PRODUCTION?

At a number of earlier points in this paper it was remarked in passing that the PTPT denial that interest is a productivity return, ultimately depended, in turn, for its validity, upon the denial that time (or waiting) can be considered to be a factor of production. The Mengerian insight assures us that the full value of output will come to be swept back as factor incomes to the "original" inputs, leaving no residual from which any interest share might be forthcoming. But this assurance carries conviction only insofar as it is assumed that the list of "original" factors does not include time (or waiting). Were one to maintain that in roundabout, capital-using, methods of production we in fact deploy not only land and labor (directly as well as in the form of produced instruments of production), but also the services of a distinct "original" productive factor called "time" (or "waiting"), then one would be able, clearly, to account for an interest share as a simple marginal productivity remuneration to the capitalist for lengthening the productive process (i.e., for allocating more time, or for waiting). Not all the final output value comes to be swept back to land and labor; some of it is swept back to "time". There is no doubt that many ("Austrian")

variants of the neo-classical position have indeed adopted this latter view of things.<sup>13</sup> (A critic of the PTPT might then argue that, by flatly ruling out, by assumption, consideration of time as a possible factor of production, PTPT is engaged in question-begging: it ensures its refutation of productivity theories of interest by commencing with the unexamined premise that time is not to be considered itself as productive. Such a charge is in fact unmerited. It is true that the refutation of the productivity theory of interest is based implicitly on the denial of time as an independent factor of production. But this denial by itself, unaccompanied by the economic reasoning advanced by Böhm-Bawerk and Fetter, is not at all sufficient to ensure that interest cannot be seen as having its origin in the additional physical output associated with longer processes of production.)

We have already remarked in an earlier section of this paper that Böhm-Bawerk himself indeed explicitly refused to consider time, or waiting, as a factor of production. In the literature it has been pointed out that whether or not we wish to treat time as making an independent contribution to a process of production, or to treat it as a background framework within which the services of genuine factors of production generate output, is a matter of "philosophy" (Haavelmo, 1960, p. 47). The PTPT has, obviously, begun from the philosophical position that treats time as something other than an active ingredient in production processes.



Where a process of production is time-consuming, and results in greater output (than alternative processes of production using the same quantities of inputs but consuming less time), the PTPT does not see this additional output as marginal product attributable to the services of the additional time. Rather the PTPT sees the additional output as forthcoming from a different (and possibly a superior) technique of production - which happens, however, to be able to deliver its larger output only at a later date. (So that, in the economic sense, it may not in fact be a superior technique at all. The situation is similar to one in which a particular production technique produces a physically larger volume of output, but of output which is somehow perceived as being of lower quality.) Output is always produced by the cooperation of current labor, land services, and instruments of production (that were themselves produced in earlier production processes). But some techniques promise results with greater delay than do other techniques, that is all. These delays are themselves not causal ingredients in bringing about the resulting output.

Certain kinds of production processes certainly do seem plausibly to fit the PTPT view that time is itself not a causal ingredient. Others fit perhaps less obviously (or even less plausibly), but can nonetheless be seen as not necessarily inconsistent with the philosophical position adopted by PTPT. Consider, first, a simple example of time-consuming productive process in which it seems intuitively

bizarre to consider time as fulfilling any causal role. Two competing vending machines each yield, in exchange for the insertion of two quarters, quantities of a cold, canned soft beverage. Machine A yields a can containing 8 ounces of the drink, two seconds after the insertion of the coins. Machine B, perhaps because it is an older vintage machine, yields its contents only after a longer delay, let us say, of five seconds. The owner of machine B, fearing that the high time-preference of hot, thirsty customers may cause them to avoid his machine for that of his competitor, stocks his machine with larger cans (say, 10 ounce cans). Consumers thus have a choice of converting their coins into 8 ounces with a delay of two seconds, or into 10 ounces with a delay of five seconds. To any consumer the additional "output" is obtainable only if he is prepared to wait an additional three seconds. In this example, at least, it seems bizarre to maintain that the additional output is (except in a metaphorical sense) "produced by" or "attributable to" the additional three seconds. Much more plausibly, surely, we would say that for both machines, the production process is (as seen from the consumer's perspective) that coins inserted into a stocked machine produce cans of beverage, with Machine B being slower than Machine A, that is all. If one wishes to enjoy the larger can obtainable from Machine B, one must be prepared now to undertake to hold one's thirst in check a little longer. The additional time is an unmitigated prospective nuisance from the consumer's point of view. He

may be prepared to put up with this nuisance in order to get the larger can; but he will hardly see this nuisance as (again, except as a matter of metaphor) actually causing the size of the can to be larger (than the size of the cans in Machine A.)

To be sure, for other kinds of production processes it may appear far less bizarre to treat time as a causal ingredient. In the textbook cases of maturing wine, for example, it does not appear intuitively objectionable to see the passage of time as itself "causing" the enhancement in the quality of the wine. But, on the other hand, even examples of maturing wine do not compel us to accept time as an active ingredient. A PTP theorist may simply assert that the "correct" way to see a five-year maturing process is that young wine plus five years of the services of suitable storage facilities, results in mature wine. Except that, of course, time enters into the specification of the quantitative dimensions of the necessary storage services, the PTP theorist might maintain, the only way in which the five years is to be perceived in regard to the matured wine is, once again, as a necessary nuisance. The mature wine is available only after a delay.

Clearly it may be difficult, other than in terms of intuitive, "philosophical" plausibility, either to reject or to affirm a causal role for time in time-consuming productive processes in general, or in any of them in particular. This observation is emphasized because it is thoroughly consistent

with our earlier discovery that, in terms of how it "sees" interest, the PTPT is, at least in part, in agreement with the Cambridge theorists in their denial that interest is a payment for a productive service rendered. In being unable (or unwilling) to "see" time as playing an independent, causal role in processes of production, PTPT is pointing to its refusal to "see" interest as remuneration for the productive services of time, or of waiting. If time is not seen as itself causally responsible for anything, but merely as part of the background against which the material inputs are combined in processes of production, it becomes difficult to "justify" interest (in a Clarkian sense of distributive justice), as the reward for the provision of a useful service.

It is perhaps necessary to point out a certain possible confusion that may inadvertently be permitted to complicate the linkage between (a) the philosophical view that, with zero time-preference assumed, no share of final output is to be attributed and therefore imputed to time, or to waiting, and (b) the view that, with time preference positive, interest is to be ascribed entirely to time preference, with no independent role assigned to possibly superior productivity of time-consuming processes.

The source of the possible confusion is as follows: Let us, for the sake of discussion, accept the PTPT view that in a world of zero time-preference, time does not itself enter into production processes as a causal ingredient. It would

be a mistake to conclude immediately that in a world of positive time-preference, too, this same "philosophical" rejection of time as a causal agent necessarily follows. It need not. After all, in a world blessed with abundant, free air, air is not usually considered a productive factor.<sup>14</sup> No part of final output is imputed to it in the market. The entire output is swept back to the scarce factors. Nonetheless we can be sure that, were air indeed to become scarce, it would very soon assume all the economic characteristics of a productive factor. Quite similarly, surely, it may be argued that time may not be treated as a factor in zero-time-preference models simply because, in such models, time is treated as a free good, it does not have to be economized, later is as attractive as sooner, producers, consumers and owners of inputs all have the time in the world. What is relevant for such a world of free time may not hold, either economically or "philosophically", for a world in which time does matter, in which time preferences are positive. For such a world, it may be held, time may be treated as causal agent; where larger output is associated with greater (and thus more irksome) waiting, that increment in waiting may be credited with the associated increment in output.

For the PTPT view, it should be clear, the philosophical denial that time is a factor of production does not depend on its being a free good. Although its demonstrations that productivity is not sufficient to generate interest are

presented in the context of assumed zero time-preference, this latter assumption is not, for the PTPT view, the basis upon which it rejects the notion of time being itself productive. For PTPT when we say that a process of production "takes time" we mean no more than that we must wait before being able to enjoy the availability of output.

#### PTPT, AND THE CAMBRIDGE CONTROVERSY

In concluding the paper it may be useful to draw together the principal ideas it has presented.

1. In the debate between the Cambridge theorists and the neo-classical theorists regarding the nature of the interest share, the existence of a third view, the pure time-preference view of interest, has been unfortunately ignored.
2. What is particularly noteworthy about this third view, is that on the sensitive ideological issues involved in the Cambridge controversy, the third view shares respectively important common ground with each of the two other views.
3. The pure time preference view shares with the Cambridge view, its rejection of interest as a reward for productivity. For the pure time preference theory interest is not explained as part of a theory of distribution in which factors receive marginal-productivity shares. (It was because of this, it turned out, that the pure time preference view is not

threatened at all by the reswitching and capital-reversal paradoxes that have been deployed with such great effect in the Cambridge controversy, by the Cambridge theorists.)

4. The pure time preference theory shares with the neo-classical view the insight that the interest share is a market determined share, a share expressing the interplay of supply decisions and demand decisions of individual market participants. Interest is to be understood in price-theoretic terms. In particular the pure time preference view shares with the ("Austrian" variant of the) neo-classical theory, its understanding of how interest rates govern the time-structure of production, as a reflection of individual preferences expressed in markets.

This latter point of agreement asserted to exist between pure time preference theorists and neo-classicals is, however, a little more complicated than may appear at first glance. It happens to be the case that, with respect to certain of the key arguments used by the Cambridge theorists to attack the neo-classical view of the market economy, pure time preference theorists have in fact appeared to side with the Cambridge theorists. This point seems sufficiently important to call for brief discussion, and, indeed, its significance makes it entirely appropriate for it to serve as the concluding theme of this paper.

The pure time preference view is, as has been discussed in

this paper, firmly rooted in the "Austrian" tradition. The Austrian view of the market economy differs in important respects from the view that has dominated in the neo-classical orthodoxy. In particular Austrians refuse to accept the neo-classical emphasis on market equilibrium with given, known prices facing all market participants, as providing the central explanatory insight for an understanding of market phenomena, (focussing attention, instead, upon the pure-profit-seeking activities of market participants operating in a world of differential ignorance and open-ended uncertainty). Now it happens that these latter ("Austrian") considerations are closely parallel to some of the grounds upon which Cambridge theorists have rejected neo-classical general equilibrium economics. (Joan Robinson writes, for example, that the "recognition of uncertainty undermines the traditional concept of equilibrium." (Robinson, 1978, p. xi)) So that, in emphasizing that the pure time preference theorists find themselves in agreement with the neo-classical view of interest as a price-theoretic, market determined phenomenon, we should certainly not deny that many "Austrian" pure time preference theorists find themselves sympathetic to many of the Cambridge criticisms of neo-classical economics in general. The point is, however, that whereas Cambridge theorists have seen these criticisms as supporting their rejection of price theory as providing understanding of market economies, Austrian economists have reached quite



different conclusions. Austrians have used their dissatisfaction with equilibrium economics, not to reject price theory, but to develop a price theory in which equilibrium concepts occupy a wholly peripheral, rather than central role. There is, therefore, no paradox involved in our discovery that Austrian pure time preference theorists (such as, say, Ludwig von Mises) while fully as critical of many aspects of neo-classical microeconomics as are the Cambridge theorists, must, nonetheless, be counted emphatically together with the neo-classicals in their understanding the interest share to be a market-determined, supply-and-demand generated, phenomenon.



FOOTNOTES

1. An important work, lucidly presenting and exploring the issues involved is (Hausman, 1981).
2. Although the Cambridge Controversy was, of course, between Cambridge, U.S.A. and Cambridge, U.K., we follow the normal jargon, referring to the former position as included under "neo-classical", and the latter simply as "Cambridge".
3. Although we refer, throughout the paper, to the Cambridge view, there have, of course, been a number of different "Cambridge" views, by no means always in agreement with each other. (See Blaug, 1974).
4. The following pages lay no claim to originality. They emphasize those aspects of the pure time preference theory that hold greatest relevance to the Cambridge Controversy.
5. Frank Fetter, one of the two or three most outstanding U.S. economists during the first quarter of this century, has recently been "rediscovered". See Gerald P. O'Driscoll (1980); see also Rothbard's comprehensive introduction to a recently published volume of Fetter's papers (Fetter, 1977).
6. For a discussion of the two separate traditions in interest theory that derive from Böhm-Bawerk, see Hayek, 1941, Appendix I.

7. Recent pure time preference expositions following Mises are Rothbard, 1962, chapters 6, 7; and Baird, 1982, chapter 11. Both works reflect the current revival of interest in Austrian (especially Misesian) economics.
8. For the purposes of this paper it is not particularly important to discuss the grounds upon which a general presumption to positive time preference is held to be justified. For the present exposition of PTPT such universal positive time preference is simply taken as if it were an accepted fact.
9. On this see Kirzner, 1966, pp. 79-80.
10. Hausman, 1981, p. 79, challenges Yeager's claim that his particular measurement technique successfully resolves the capital-reversal paradoxes.
11. H.G. Brown's 1926 discussion is a virtually verbatim repetition of the bulk of his 1914 paper. His discussion was approvingly referred to by Fisher (1930, p. 193).
12. See Menger, 1981, [1871], pp. 192f, for a critique of the older views that saw price as expressing equivalence.
13. See, for example, Dorfman, 1959.
14. See Hicks, 1960, pp. 673-675.

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