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THE MYTHOLOGY OF CAPITAL OR OF STATIC EQUILIBRIUM? THE BÖHM-BAWERK/CLARK CONTROVERSY

BY
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> *[Clark's true capital] is the means of avoiding all waiting. It is the remover of time intervals—the absolute synchronizer of labor and its fruits.*
>
> Böhm-Bawerk (1907a, p. 267, quoting Clark 1899, p. 311)

I. OVERVIEW

Eugene von Böhm-Bawerk's debate with John Bates Clark is "one of the three great controversies that have marked the history of capital theory" (Blaug 1997, p. 547).[1] It has been briefly summarized by many authors (Ahmad 1991, Blaug 1997, Zuidema 1988) and often received passing mention because of similarities to two other great controversies: the 1930s debates between Friedrich von Hayek, Frank Knight, and Nicholas Kaldor,[2] and the more recent Cambridge controversies transpiring between the mid-1950s and mid-1970s (Cohen and Harcourt 2003, Kurz 1987, Solow 1963, Valiente 1980, Weston 1951). But not a single book and precious few articles or book chapters (Niehans 1991, Perlman 1991, Skousen 1990, Chapter 2) have focused on the Böhm-Bawerk/Clark controversy. This paper provides a detailed analysis of their 1893-1907 debate, supplementing the published record with correspondence in the

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[1]According to Solow (1963, p. 9):

> A more learned reader of the literature than I could probably show that the capital theory pot has been simmering steadily every since Ricardo's chapter on Machinery. At intervals it has boiled over on a heroic scale: in the polemics between Böhm-Bawerk and J. B. Clark in the 1890's, between Hayek and Knight—going over much the same ground—in the 1920's and 1930's, and between Mrs. Joan Robinson almost everyone else outside of Cambridge, England in the present.

It would be fair to describe my research agenda as an attempt to become that "more learned reader."

[2]See Cohen (1998, 2003, 2006) for detailed analyses of the 1930s debates.

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J.B. Clark Papers from Böhm-Bawerk to Clark (Cohen and Drost 1996) and correspondence in the Giddings Papers about Böhm-Bawerk between Clark and Franklin H. Giddings (Tanaka 2000a).[3] Böhm-Bawerk's papers, with any letters from Clark, were destroyed during World War II (Beach and Bostaph 1982).

The controversy begins not long after each author publishes major works on capital theory. Clark's theory of capital appears in a series of articles (1888, 1889a, 1890a, 1891a, 1891b, 1892) which were later consolidated in *The Distribution of Wealth* (1899). Böhm-Bawerk's *Positive Theory of Capital* first appears in German in 1889. Clark and Böhm-Bawerk immediately begin reading each other's work and corresponding, seeing much in common. In a letter (16 February 1889) to Giddings, Clark writes:[4] "I am getting deeply interested in Böhm-Bawerk. He has a style more like a French rather than any German I have read. His thought is very clear-cut, and his theory, if I rightly judge it, will help to put mine in a clear light. I can, I think, considerably strengthen the case for my Capital, also Wages-and-Interest theories by a reference to his work." A month later Böhm-Bawerk (March 26, 1889) writes to Clark:[5]

> Please receive my sincere thanks for your kind letter as well as your articles [Clark 1889a, probably also 1888]. I have read them immediately with great interest. I have the impression that our analyses of capital and labour have many similarities. We are both convinced that the problem of interest and wages have to be solved *simultaneously*; we both have the same theoretical starting point, the theory of final utility; and our approaches are similar in many other respects . . . [including] the extension of the law of diminishing returns to the field of production.

Clark writes two brief and relatively approving reviews of Böhm-Bawerk's work (Clark 1889b, 1890b).[6] The critical debate begins with Clark's (1893) attack on Böhm-Bawerk, then moves to private correspondence and the pages of the *Quarterly Journal of Economics* (*QJE*). With two articles each in 1895, agreements and disagreements become clearly focused, but the disputants then temporarily withdraw from debate with key differences unresolved.[7] Böhm-Bawerk's energies shift to his

[3]Giddings's (1855-1931) and Clark's lifelong friendship began in 1886. Giddings served on the Committee on Theory of the AEA, edited the *Publications of the American Economic Association* (1891-1893), and was a founder of the American Academy of Political and Social Science. He taught sociology, political economy, administration, and political science at Bryn Mawr College and in 1894 became the first full professor of sociology at Columbia University, where he remained for the rest of his life (Tanaka 2000b). Giddings engaged in a separate capital theory controversy with Böhm-Bawerk (see Cohen and Drost 1996, p. 92n), which is the subject of much of the correspondence published by Tanaka (2000a).

[4]All of the Clark and Giddings letters can be found by date in Tananka (2000a) and will not be cited individually.

[5]All of the Böhm-Bawerk letters can be found by date in Cohen and Drost (1996) and will not be cited individually.

[6]Clark (letter to Giddings, March 7, 1889) was under time and space pressure from the *Political Science Quarterly* editor, who "asks me to make the review short, [so] I shall do some skipping of non-essential parts."

[7]Böhm-Bawerk (1906, p. 3) says that the 1895 *QJE* debate "removed some misunderstandings, but left neither contestant convinced."

work for the Austrian Finance Ministry. He rejoins the debate in the 1906 *QJE* with a delayed response to Clark's *Distribution of Wealth*. After four articles between 1906 and 1907, the debate ends without resolution.[8]

The Böhm-Bawerk/Clark controversy, like other great capital controversies, has its origin in the dual nature of capital. Economists (including Böhm-Bawerk and Clark) have long conceived of capital both as a heterogeneous collection of specific capital goods used in production, and as a homogeneous fund of financial value that flows among alternative uses to establish a uniform rate of return. Controversies begin when the dual conceptions of capital are integrated into economic models with specific assumptions, and one conception is emphasized to the *relative* neglect of the other (Cohen and Harcourt 2005).[9]

Clark emphasizes a monetary fund of "true capital"[10] over concrete capital goods. Böhm-Bawerk emphasizes concrete capital goods in most of the *Positive Theory of Capital*, but in his quantitative model of interest rate determination (Book IV of the 1959 Libertarian Press edition[11]) capital takes the form of a homogenous subsistence fund consisting of one wage good commodity, denominated in money. Their controversy centers around Clark's concept of "true capital."[12] In Clark's static equilibrium model, the physical productivity of concrete capital goods plays a significant role, but Clark ultimately attributes interest (the return to capital) to the power of the abstract fund of "true capital" which is permanent, homogeneous, and perfectly malleable.[13]

Böhm-Bawerk objects because "true capital" eliminates time, which plays the central role in his *agio* theory of capital explaining why present goods command a premium over equivalent future goods. Because Clark's static equilibrium model of true capital avoids time issues, Böhm-Bawerk refers to it as a "mythology of capital." In line with Hicks's (1976, p. 140) observation that a state of equilibrium "is a signal that time . . . has been put to one side," I will argue that it is more accurate to characterize Böhm-Bawerk's objection to Clark's capital theory as a "mythology of static equilibrium."

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[8]A complete chronology of the published debate, together with translations into English of the Böhm-Bawerk/Clark correspondence, appears in Cohen and Drost (1996).

[9]While Clark criticizes Böhm-Bawerk's relative emphasis on capital as "concrete instruments of production" to the neglect of "capital as a permanent fund," he adds:

> In one view this is a welcome advance, as compared with the wavering course pursued by older economists, who have used two different conceptions of capital interchangeably, and have continually passed from one to the other, in seeming unconsciousness, in the same argument. This course has entailed confusion in the writings of each one who has adopted it, and it has caused needless controversies between different writers (1893, p. 306).

[10]Clark originally termed the concept "pure capital," shifting later to "true capital" or just "capital." The three terms are interchangeable, and I have consistently used "true capital" to avoid confusion. For Clark's explanation of why he shifted terms, see (Clark 1899, pp. 120-21n).

[11]All references to Böhm-Bawerk's *Positive Theory of Capital* are to the Libertarian Press edition.

[12]I am omitting a few minor skirmishes over periods of production and comparisons of present and future goods.

[13]Hicks's (1974) taxonomy of capital theories mistakenly categorizes Böhm-Bawerk as a fundist and Clark as a materialist. Böhm-Bawerk and Clark each have both fundist and materialist elements to their theories. If pressed to use Hicks's categories, I would label Böhm-Bawerk the materialist and Clark the fundist, but Hicks's categories are simply not sharp enough to capture fully their differences.

II. BACKGROUND AND AGREEMENTS

In order to focus discussion of the controversy, it will be helpful to sketch each author's capital theory and clear away areas of agreement.

Clark's Theory of Capital

Clark's capital theory is well described by the title of his famous *QJE* article (1891a), "Distribution as Determined by a Law of Rent." In contrast to the Ricardian method of eliminating rent to focus on the principles accounting for wages and profits, Clark eliminates pure profit "by reducing society to a static state" and then uses the rent law's principle of marginal productivity to account for both wages and interest.[14]

Clark's static state is an "equilibrium of forces," a "balanced condition that excludes internal changes" (1891a, p. 289). By assumption, Clark excludes changes in wants, technology, industrial organization, and quantities and locations of capital and labour to create a static, or stationary state "having life, but not growth" (1899, p. 60).

For Clark, "the purely static state . . . deals with realities. It is imaginary only by its omissions; for it presents an essential part of the forces that act in the real, dynamic world" (1899, p. 401). The final stage of economic analysis should "restore the dynamic forces that our earlier hypothesis removed and . . . note the special effects of their action" (1899, p. 722). Clark notes a "striking relation" between his stage of dynamic analysis and historical economic studies: "The present state of the world, it is obvious, differs from the conditions of fifty years ago and from those of fifty years hence. Historical economics records and measures such differences, while the theory of economic dynamics accounts for them" (1899, p. 73).

Without the restoration of dynamic complications, Clark describes the static results as "seriously incomplete." Nonetheless, he firmly believes that static forces dominate complications introduced by dynamic forces. The last sentence of his 1899 opus reads, "Yet, whatever movements the dynamic division of economic science may discover and explain, static laws will never cease to be dominant. All real knowledge of the laws of movement depends upon an adequate knowledge of the laws of rest" (1899, p. 442).

Clark's loose notion of dynamics includes what we would call comparative statics, dynamics, as well as stability analysis. With the exception of a sketchy foray into economic dynamics in *Essentials of Economic Theory* (1907b), Clark's work excludes all of these techniques, focusing only on explicating static laws.[15]

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[14]A referee pointed out that Clark did not appear to be aware that his argument about diminishing returns was slightly different from Ricardo's. Ricardo assumes equal quantities of heterogeneous land on which equal quantities of labor and "capital" are applied. Clark assumes substitutability among inputs that are all homogenous, but where factor proportions change continuously.

[15]Tanaka (2000b, pp. 18-19) suggests convincingly that Clark's small nods to "dynamics" were due to "the distinct influence of Giddings, a sociologist who had the concept of dynamics as an essential methodology, and of Edwin R. A. Seligman, an economist and historian who had his major intellectual influence from the German historical school." Tanaka quotes a letter from Simon N. Patten (a close colleague of both Giddings and Clark) to Giddings: "I have just reread Clark's article in the last Harvard *Quarterly* ["The Statics and Dynamics of Distribution" (Clark 1891b)]. I see that he developed the distinction between static and dynamic quite fully. Have you been pounding that into him? I cannot imagine where else he got it as it makes a break in his way of theorizing . . . Who but you could revolutionize him?"

Within the static state, Clark (1891a, p. 300) analyzes capital both as concrete capital goods and as true capital, an abstract fund of wealth. Concrete capital goods earn rent and true capital earns interest.[16] He further asserts, without explanation, that the sum total of all interest earned by true capital is equal to the sum total of all rents earned by concrete instruments of production (Clark 1888, p. 29). Clark also analyzes labor from two perspectives, making a parallel distinction between concrete working acts and a fund of pure labor energy.[17]

Returns to both capital and labor are determined by marginal productivity. ''The last unit of social capital . . . fixes by its product the general rate of interest, as . . . the last increment of labor fixe[s] by its product the rate of wages'' (Clark 1891a, p. 312). The sum of the surpluses created by the earlier, more productive units of capital (labor) equal the total income paid to labor (capital).

Böhm-Bawerk's Theory of Capital

Böhm-Bawerk treats interest as an intertemporal price, determined, like all prices, by scarcity and utility. Böhm-Bawerk adds time to Menger's atemporal theory of value, to create an intertemporal value theory (Hennings 1997, p. 2). This addition is the key to his explanation of interest, ''the influence of *time* on the value that man places upon goods'' (Böhm-Bawerk 1959, Vol. I, p. 354).

His explanation of interest is linked to the two concepts of capital. For production, capital is a concrete tool, a source of physical productivity. For distribution, capital is a fund producing income, the source of interest. These two concepts—capital is productive and capital bears interest—are conflated by many (including Clark) into the argument that ''capital bears interest *because* it is productive'' (Böhm-Bawerk 1959, Vol. II, p. 22). Böhm-Bawerk rejects all such productivity theories of interest because they lack a subjective explanation:

> There is no power in any element of production . . . which can infuse value immediately or necessarily into its products. A factor of production can never be an ultimate source of value. . . . [V]alue . . . has its ultimate cause in the relation of human needs to the means of satisfying them. Any tenable explanation of interest must go back to this ultimate source (Böhm-Bawerk 1959, Vol. I, p. 94).

It is easy to show that a capital good yields additional physical output and even revenue, but why is the *value* of the capital good not bid up to eliminate any payment of interest? What must be explained is not the gross return, but the *net* return to capital.

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[16]''*Rent is the aggregate of the lump sums earned by capital-goods; while interest is the fraction of itself that is earned by the permanent fund of capital*'' Clark (1899, p. 124).

[17]Clark says:

> Abstractly regarded, labor is [a] fund of pure energy . . . kept intact by the young generation of workers who come upon the scene and take the places of the older ones who depart. Laborers are perishable, but social labor is continuous. This permanent fund of human energy, ready to take shape in such concrete working acts as the needs of industry may require, is the second generic element with which a philosophy of distribution has to deal. The parallelism between capital pure and concrete, on the one hand, and labor pure and concrete, on the other, is a fact of primary importance'' (1891a, p. 303).

Böhm-Bawerk provides both a qualitative explanation of why interest exists and a quantitative model explaining the level of interest. The qualitative explanation consists of the famous three reasons for the premium of present over future goods: (1) relative underprovision of present versus future income, (2) perspective undervaluation of the future, and (3) the increased productivity of more ''roundabout'' or time-using methods of production.[18] Böhm-Bawerk integrates concrete capital goods and roundabout production into the supply (scarcity) side of Menger's value theory to create a temporal structure of production, and integrates time-preference into the demand (utility) side to create an intertemporal preference structure. Blaug (1997, pp. 487-88) provide the most incisive account of how the interaction of these intertemporal structures determines the interest rate:

> Since any further roundaboutness always promises a further increase in the value of the total product, a zero rate of interest would encourage an unlimited increase in the period of production. This would mean a scarcity of present goods, leading via the first or second reason to the reemergence of interest and the reversal to direct methods of production. The true function of a positive rate of interest then is to act as a brake on the tendency to neglect present wants by overextending the period of production. The interest rate rations the limited supply of present goods among individuals in accordance with the community's estimation of the relative value of present and future goods.

Although it does not enter directly into this controversy, Böhm-Bawerk's quantitative model determining the interest rate assumes (Lutz 1967, p. 12): a given subsistence fund, homogeneous labor as the only factor of production, no durable production goods, only one (consumption) commodity, even-flow production, unchanged technology, and increased roundaboutness increasing productivity at a decreasing rate. The model determines simultaneously four unknowns; the wage rate, period of production, quantity of output, and interest rate. The assumptions of a fixed subsistence fund together with competition between workers for jobs and between capitalists for workers simultaneously determines the wage and the optimal period of production. The combination of the level of employment, the production function, and the length of the period of production determines output and the interest rate (*agio*).

Agreements

While previous brief summaries of the controversy have focused on disagreements, there are many agreements and theoretical similarities between Böhm-Bawerk and Clark. Besides the shared dual conception of capital, they both hold a subjective utility theory of value. Both authors accept the diminishing marginal productivity of concrete capital goods, but attribute it to different abstract concepts.

[18]The first reason applies to the extent that people expect to have more income in the future, so they value a dollar of (relatively scarce) income today more than a dollar of (relatively plentiful) income tomorrow. The second reason is pure psychological time preference attributable to underestimation of the intensity of future want, limited will power to delay gratification, and concerns about the shortness and uncertainty of life.

In supporting his third reason as to why interest exists, Böhm-Bawerk develops the concept of the period of production as a measure of capital, and claims it is inversely related to the marginal productivity of capital. Time, or roundaboutness, increases productivity at a decreasing rate. Clark emphasizes the physical productivity of capital goods, but does not address the question of why competition does not bid up the price of capital goods to eliminate a net value return. Instead, Clark attributes interest to effects of true capital, which is a permanent, timeless fund of wealth.

On issues of time preference, the authors have minimal difference in practice, despite, as we shall see, real theoretical differences. Böhm-Bawerk's first two reasons for interest are seminal contributions to the concept of positive time preference. Nonetheless, he explicitly omits time preference from his quantitative model of interest rate determination, then smuggles it in implicitly. Clark explicitly denies any role for time preference in his static model, but also smuggles it in implicitly.

In a letter to Clark, Böhm-Bawerk (May 9, 1889) writes, ''Over the last months I have received numerous expressions of approval regarding my new theory of interest; but very few have given me as much pleasure as yours.'' Later that year Böhm-Bawerk (September 13, 1889) writes, ''that our opinions are the same on so many points, not only regarding 'capital and interest' and 'final utility,' but also regarding the correct research methodology.'' On the concept of marginal productivity, Böhm-Bawerk (1907a, p. 248) says, ''I am in entire accord with Professor Clark.''

Böhm-Bawerk (1895a, pp. 128-29) opens the *QJE* debate by stating ''I believe we very nearly agree on most concrete questions connected with the theory of capital,'' and goes on to describe Clark as ''the writer among all my critics whose doctrine differs perhaps least from mine in its consequences.'' Clark (1895b, p. 101) agrees that ''The two theories under consideration have a large area of coincidence.'' These agreements did not disappear as a result of the controversy. In commenting on Clark (1907b), Böhm-Bawerk's last letter in the Clark papers (1 March 1908) reads: ''there is much more in common in our approaches to analyzing economic phenomena than there are differences. Certainly, progress in science almost always requires that one discusses those matters on which one does not agree rather than those on which one holds a common view!''

III. FUNDAMENTAL DISAGREEMENTS OVER TRUE CAPITAL

Clark's concept of true capital is the source of unequivocal disagreement between the authors. Clark sensed this as soon as he began reading for review *The Positive Theory of Capital*. After hearing that Böhm-Bawerk will be reviewing his work, Clark (March 7, 1889) writes to Giddings:

> I am wondering what tone his review will take; for he speaks very slightingly of people who ''reduce capital to an abstraction,'' and in general of those who ''dematerialize economic elements in order to go around difficulties.'' I am not conscious of having done that; but I do insist that our necessary way of viewing capital is as a fund. While this view for the time loses sight of the form in which the fund is embodied, it does not ignore in any way the fact of material embodiment. Prof. B.B.'s tone is quite opposed to this whole view; and I do not think the question can be fairly tried 'til the action of this fund as an element in production and

> distribution is thoroughly analyzed. It seems to me to be directly essential in wages and interest theory. It is such a point as this that I hope to cover in some fashion in the Quarterly article (Tanaka 2000a, p. 131).

Clark's premonition was accurate. In responding to Clark's (1893) first published attack in the controversy, Böhm-Bawerk pulls no punches in writing to Clark (December 15, 1893): "What separates us, in a nutshell, is your distinction between 'true capital' and 'capital goods,' which I personally consider as superfluous and indeed dangerous."

Böhm-Bawerk's and Clark's mutual admiration end over Clark's true capital explanation of interest. Clark de-emphasizes the characteristics of concrete capital goods, and directly attributes interest to the productivity of the fund of capital, without addressing the intertemporal value theory question of why the value of capital goods is not bid up to eliminate any payment of interest. Clark identifies sharply and concisely the fundamental differences between their theories (although ignoring Böhm-Bawerk's subsistence fund of capital):[19]

> [Böhm-Bawerk's theory] studies only concrete instruments. It measures the period that their action defines, and reduces interest to an *agio* due to the particular intervals of time that are thus measured. [Clark's own theory] recognizes these instruments and their qualities, but gives a cardinal place to the study of that permanent capital which the endless succession of instruments constitutes. It defines the interest problem in terms of that fund, and makes the rate to be the fraction of itself that the fund annually creates. It is a productivity theory; and it relegates the separate periods of production to a subordinate place (Clark 1895a, p. 258).

These disagreements were focused through their interchanges in print and correspondence.

Clark transforms his abstract concept of true capital into an effective debating weapon through appeals to experience and the use of persuasive metaphors. Clark's first description of the concept uses a business viewpoint to great effect.

> Ask a manufacturer, "What is your capital?" and he will probably express his answer in dollars. Ask him, "*In* what is your capital invested?" and he will specify the buildings, machines, land, materials, etc., in which his productive fund now chances to be embodied. These concrete things will figure in his thoughts as the containers of his capital; while the content itself will appear to him to be a value, an abstract quantum of wealth. He will think of it as a fund that is permanently his, though it may not retain for a single day its exact present form of embodiment . . . Capital is, in this view, an abstract fund, the destiny of which is to migrate thru an endless series of outward forms (Clark 1888, pp. 9-10).

[19]Despite a shared conception of the dual nature of capital, Clark ignores completely Böhm-Bawerk's treatment of a subsistence fund of capital. Throughout the debate, it is as if Clark never read Book IV of Böhm-Bawerk's work, even though Clark's (1889b, p. 344) first review mentions that "A special feature of [*Positive Theory*] is its treatment of capital as a fund for future consumption." Clark's "oversight," perhaps related to the pressure he was under to quickly supply a short review, exaggerates their differences, creating the impression of a polar opposition between Clark's emphasis on the fund of true capital and Böhm-Bawerk's emphasis on concrete capital goods.

Böhm-Bawerk does not object to this concept of a fund of money capital. His own concept of the subsistence fund of capital shares most of the characteristics of Clark's true capital. ''I, too, believe that capital is a 'fund' or 'quantum' of matter'' which must be measured ''in terms of . . . money'' (Böhm-Bawerk 1906, p. 5). Böhm-Bawerk takes issue not with the concept of capital as a fund of value, but with the characteristics Clark attributes to true capital which are not attributes of concrete capital goods—permanence, synchronization, and putty-mobility.

Permanence

Clark contrasts the permanence of the fund of true capital with the transitory nature of capital goods. Once created, true capital has, Clark argues, an infinite life span as ''a perpetual social fund of productive wealth'' (1893, p. 304). Abstracting from the dynamics of capital losses caused by mistaken investments or business cycles, Clark (1893, p. 308) believes that ''Goods have periods of production. Capital has no periods, but acts incessantly.''

Capital goods, which embody true capital, must be constantly worn out for the fund of true capital to persist and generate interest. To illustrate the *permanence* of true capital, Clark uses a famous waterfall metaphor, which becomes a focal point of future controversy:

> A water-fall consists in particles of water. Can one say the same things of the fall that he does of the water? The water moves; the fall stays where it is. The water appears in globules condensed in the atmosphere, and it ultimately merges itself in the sea. The fall does not appear nor disappear. Capital goods are, like particles of water, vanishing elements. True capital is like the fall; it is an abiding element, owing its continuance to the constant wasting and replenishing of its substance (Clark 1893, p. 308).

Again, Böhm-Bawerk agrees with the description. He identifies that, in Clark's theory, ''the goods which constitute capital are being constantly replaced, whereas the sum total of capital abides,'' and, Böhm-Bawerk (1895a, p. 121) adds, ''My theory, too, recognizes and states this fact.'' Böhm-Bawerk's objection is that while true capital, like the waterfall, may abide, all of the ''physical or mechanical effects produced by the waterfall'' are ''produced by the concrete falling drops of water.'' By counterexample, he argues that if a falling stone splashed away water temporarily ''so that no 'concrete water' strikes the . . . millwheel, . . . the mill stops, although the waterfall as a whole has been neither moved from the place nor dried up, nor even lessened in volume'' (Böhm-Bawerk 1895a, p. 128).

Synchronization

In distinguishing specific capital goods from the permanent fund of true capital, Clark claims that while individual goods have periods of production, true capital eliminates all roundaboutness or waiting between the beginning and end of a production process. ''True capital in effect annihilates [the roundabout] intervals created by capital goods. It causes the fruit of industry to be gained instantly on the performing of the industrial act'' (Clark 1893, p. 309).

This is Clark's notion of synchronization, a term that he uses for the first time here: ''[T]he fund of true capital synchronizes all industry and its fruition . . . [I]t is the

whole fund of capital, rather than particular articles that transiently are component parts of it, that must be considered primarily, if capitalistic production is understood'' (Clark 1893, p. 311). The best illustration of synchronization appears in Clark (1899, pp. 313-14), again as an important metaphor, a forest furnishing firewood:

> A tree will mature in twenty years; and the forest must be kept intact . . . or the supply of wood will fail. Each year we plant a row of trees along one side of the forest, and cut a row from the other. The planting and the cutting are, in a way, simultaneous. We do not burn to-day the tree that we plant to-day; but we do burn a tree, the consuming of which is made practicable by to-day's planting . . . The forest is a synchronizer of labor and its virtual fruit. The fact that is of practical consequence is, that if we have once secured the permanent forest, we need do no waiting for fuel.

Clark (1893, p. 313; 1895a, p. 258) admits the legitimacy of studying concrete capital goods, which have periods of production. But once the fund of permanent capital has been created and the economy is in a stationary equilibrium, Clark claims that waiting is eliminated by synchronization, and the period of production becomes irrelevant. Once the forest is established, it makes no difference if it takes a tree twenty years to mature or ten years. Thus, ''no one has to wait for his income through the so-called periods of production, so that . . . [Böhm-Bawerk's] comparison of present and future does not need to be made at all'' (1895a, p. 261). This emphasis on the primacy of true capital and its synchronizing characteristics, leads Clark to dismiss Böhm-Bawerk's key concepts—periods of production, the productivity of roundabout methods using concrete capital goods, and positive-time-preference-induced compensation for waiting—as irrelevant for determining the rate of interest.

Böhm-Bawerk is adamant in rejecting Clark's arguments, labelling synchronization as the concept where ''Professor Clark wanders most dangerously far from the truth'' (Böhm-Bawerk 1907a, p. 265). Böhm-Bawerk's rebuttal contains two main points. First, he correctly points out that Clark's concept applies only in the stationary state: ''In dynamic cases we have to do with capital goods, with periods of production and waiting. The proposition as to the synchronizing effect of true capital holds good only in static conditions, where, by supposition, disturbing causes do not appear'' (1907a, pp. 270-71).

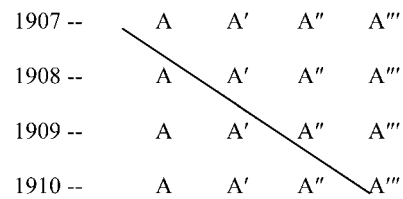
Böhm-Bawerk (1895a, p. 126; 1907a, p. 270) provides dynamic examples of the start-up of a new industry, increases in demand, and labor strikes where synchronization will fail and waiting will be necessary. While down-playing the importance of these exceptions to synchronization, Clark (1893, p. 312n) acknowledges their existence.

Second, Böhm-Bawerk argues that even in the stationary state the synchronization of inputs and outputs is an illusion, due not to true capital, but to previous investments in concrete capital goods. The wood burned today in exchange for the labor of planting, is the product of the sapling planted twenty years ago:

> [T]he fact that one is at once provided with commodities whose own production-periods, because begun earlier, are sooner brought to an end than the production-periods of the unfinished products given in exchange, is the happy consequence of the existence, not of any mystical permanent fund, but of those very concrete capital goods whose periods expire early (Böhm-Bawerk 1895a, pp. 124-25).

The illusion behind synchronization was brilliantly exposed by Frank Taussig (1908). He declares himself to be "in complete accord . . . with what has been said by . . . Professor Böhm-Bawerk" (1908, p. 337). Taussig uses Clark's own simplified schematic representation of synchronization, where A, A′, A″, A‴ represent time-using stages of production: for example, growing wool, constructing looms, manufacturing cloth, and making garments, where each stage takes one year (Clark 1895a, pp. 268-69; 1899, chapter 20).

Figure 1.



In any one period (for example, 1907) all four stages of production operate simultaneously. The actual course of production is "the oblique line that runs through all four periods." Clark's claim is that, once we are in stationary equilibrium, the horizontal line describes the synchronization effected by the permanent fund of capital. There is no waiting between the labor of growing wool and the receipt of garments in exchange:

> Probably Professor Clark would say . . . it makes no difference which [lines] we consider. Both lines—the horizontal and the oblique—show the same series of A, A′, A″, A‴ . . . [I]t is *as if* the present work of A brought an immediate consumable product in the garments to which A‴ is now giving the finishing touches. But it is not *as if*. There are essential differences. There is not, in fact, any "synchronizing" of production or any "instantaneous" clothing of the people (Taussig 1908, pp. 338-39).

Taussig and Böhm-Bawerk argue that synchronization obscures the temporal scheme of production. Clark substitutes the *equilibrium* condition of synchronized production and distribution, for the dynamic, historical sequence of stages of production. But this substitution does not eliminate periods of production—the oblique line does not disappear. Clark's claims are misleading. His defense is that the stationary-state equilibrium conditions make it appear *as if* periods of production are eliminated.

Even within the confines of the stationary state, the permanence and synchronization characteristics of the fund of capital have serious shortcomings. Part of what makes Clark's description of the fund appealing is the image of the *value* of the capital abiding despite changes in the stock of concrete capital goods. In the stationary state, there can be no changes other than the exact replacement of existing goods. So for the analysis of any change in the capital stock, through growth, factor substitution, or technological change, Clark's conception is incomplete. Even just a quantitative change in the fund of pure capital will, as Clark admits, change the concrete characteristics of the capital stock, so that synchronization disappears.

Putty Capital with Perfect Mobility

The fund of true capital purges time from the analysis not only through synchronization but also by allowing the physical metamorphosis of concrete capital goods. In a famous passage, Clark describes the changing form of true capital through a sequence of different capital goods.

> As we take away laborers, we leave the capital everywhere unchanged in amount; but we change the forms of it in every one of the industries, so as to make it accurately fit the needs of the slightly reduced working force. There must be, if our test is perfect, no disarrangements caused by the withdrawal of the unit of social capital . . . The abandoned pick and shovel become, by a miracle of transmutation, an improvement in the quality of a horse and cart. There are fewer men digging; but they have as much capital as ever, and they have it in a form in which, with their reduced numbers, they can use it (Clark 1899, p. 170).

He sums up this sequence by saying that "capital is perfectly mobile . . . There is, indeed, no limit to the ultimate power of capital, by changing its forms of embodiment, thus to change its place in the group-system of industry" (Clark 1899, p. 118).[20]

If Clark had confined himself to the analysis of the stationary state, he would have had no need for a concept describing the changing forms of the capital stock. But Clark did not so confine himself. His marginal productivity theory of interest is based on comparative statics exercises involving changes in the quantity of the permanent fund of capital: "[C]hanges in the amount of capital itself, and not a lengthening or shortening of productive periods, are the causes that affect the rate of interest. Make the social fund larger, and you make the rate of interest smaller" (Clark 1895a, p. 277).

Clark recognizes that transitions between equilibria create analytical problems because they violate his basic assumptions about the permanence of capital and the static state. The mobility and transfer of true capital may not be easy in practice and can rarely "be done without some waste of capital" (Clark 1899, p. 278).[21] Thus, transition problems between stationary states make the fund of capital less than permanent.

Clark's explicitly static analysis excludes by assumption changes in quantities and forms of resources. Nonetheless, Clark understands that if the quantity of true capital increases while labor remains fixed, the forms that capital and labor take in the new static state must change to those that are most efficient for working with the increased quantity of capital. A change in the quantity of factors between two static states entails a change in the qualitative, concrete characteristics of the factors.[22] In Clark's words, such simultaneous change:

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[20]Elsewhere Clark (1895a, p. 265) says, "A whaling ship cannot be made to spin cotton; but capital has, in fact, transferred itself from the whale fishery of New England to cotton spinning. Ships were allowed to decay, and mills were built in place of them."

[21]Clark (1899, p. 278) makes the same point for the transfer of labor. "The cases are few in which a workman can change his occupation with absolutely no waste of productive energy."

[22]"That the relative amounts of labor and capital should change, means that the forms of both should change: it means that each agent must fit itself to the other's requirements. Mutual adaptations are the rule, wherever the two agents are combined" (Clark 1899, pp. 159-60). Clark first makes this point in (1891a, p. 311n).

> makes the study for the moment dynamic, since, in addition to the change in the number of the workers, it involves changes in the forms that the fixed fund of capital assumes. .... Such a dynamic study is, however, admissible as an introduction to a study of a static condition. We more readily see how interest and wages are determined in a stationary state by noting the way in which the condition is reached (1891a, p. 305).

It is not clear what Clark means here by the term ''dynamic,'' since elsewhere he performs comparative statics analyses and labels them as statics. He seems, however, to recognize that the change in quantity of factors requires an explanation—whether it is called dynamics, comparative statics, or stability analysis—of the process of adjustment of factor form, ''the way in which the condition is reached.''[23]

Clark deserves credit for recognizing that he is fudging statics, dynamics, and stability analysis. But despite his claim of insight into the convergence to the new equilibrium, he provides no dynamic story about the transition process from one static state to the other. We know that the transition and outcome are path dependent, but Clark's technique ignores these complications and makes the unsubstantiated claim that the outcome of the dynamic process will be the same as the new static equilibrium. Once again, it is *as if* the changes will result in the new equilibrium. Of course the power of Clark's technique (which is consistent with his belief that static forces dominate complications introduced by dynamic forces) is in providing a simplified story that explains how changes in a key variable, the quantity of capital, cause changes in the interest rate.[24]

Böhm-Bawerk (1906, p. 19; 1907a, p. 278) gives Clark credit for recognizing these analytical problems but presses the critical implications of Clark's simplifications. He again objects to giving true capital qualities not possessed by capital goods, such as perfect mobility, as having a ''dangerous consequence'' (Böhm-Bawerk 1906, p. 16). Then Böhm-Bawerk uses the first (to the best of my knowledge) *putty capital* metaphor to describe the consequence of mobility: ''Clark thinks of capital as

[23]Six months after the article ''Distribution Determined by a Law of Rent'' (Clark 1891a) appeared, Clark offered a clarification on ''The Statics and the Dynamics of Distribution'' (Clark 1891b, p. 114). He describes what we would today call comparative statics, but uses the term ''imaginary dynamics'' to describe alternative static states:

> the Ricardian way of demonstrating the nature of . . . rent would be to introduce a bit of imaginary dynamics. Introducing men into a field one at a time is going through a rapid succession of imaginary changes in this industrial group, for the sake of understanding the character of that static condition to which such a series of changes would lead. It is the static element, the rent that the field affords when tilled by the full number of workers, that is from the first the subject of the study. The imaginary changes that reveal the nature of this income are not be confounded with the actual enlargements of population that take place in the world.

[24]W.E.G. Salter (1965, p. 268) provides the most incisive statement about the power of putty capital assumptions like Clark's: ''one consequence of the assumptions of fluid capital and instantaneous adjustment is that they prevent analysis of the actual time path of an economy . . . the assumption of fluid capital effectively cuts off an economy from its own past history. At each point of time, the economy is assumed to start off, as it were, with a clean slate independent of its past history and techniques.'' In comparing equilibrium positions, the assumption of putty capital avoids any path dependence. The existing capital stock can be costlessly and timelessly remoulded to the form most appropriate for the new equilibrium conditions. As time progresses and conditions change, making the initial stock of capital goods non-optimal, putty capital restores optimality, so that there is no need to resort to a historical, out-of-equilibrium dynamics story.

a quantum of value 'imputed' in material goods. He strips off everything which may suggest material existence, and retains only a *value jelly*, existing eternally, never destroyed'' (Böhm-Bawerk 1907a, p. 280 emphasis added).

Böhm-Bawerk agrees that there is mobility between sectors through the wearing out of old capital goods and investment in new and different capital goods. But he registers two objections. First, that this process is limited and could not take place on a massive scale all at once, contradicting Clark's claim of perfect and absolute mobility. Second, while accepting Clark's statements about mobility and transferability of capital, he has ''nothing to object, so long as it is clearly borne in mind that [they are] nothing more than a figure of speech. But it is not to be supposed that the understanding of the actual situation is thereby promoted, still less that anything is understood which before was not understood'' (Böhm-Bawerk 1906, p. 18).

Böhm-Bawerk's concern is that the costless transitions between static equilibrium states associated with the concept of true capital do not allow one to understand the historical time path from the old equilibrium to the new. It would allow one to make a prediction that might be consistent with the data (an increase in wages leads to more capital intensive production; a steam shovel substituted for twenty workers with shovels). But in order to trace or understand the dynamics of the transition, Böhm-Bawerk (1906, p. 18) claims that ''The whole subject of the transfer of capital must be studied with reference to capital-goods.'' True capital creates path independence and purges history (in the form of a particular sequence of concrete capital goods) and path dependence from the analysis.

IV. ABSTINENCE AND THE GENESIS OF TRUE CAPITAL

In Clark's view, interest is the return on true capital.[25] In his static model, the characteristics of true capital—permanence, synchronization, and putty-mobility—eliminate issues of time. With no waiting between investment and return, the only remaining explanation of interest is the productivity of true capital. But issues of time preference and abstinence do enter into the debate, through Clark's dynamic theory of the *origin* of capital.

While others (Senior 1836, Mill 1848) had explained interest as a return for the abstinence that created the fund of capital, Clark does not. He views abstinence as the act that originates or generates the fund of capital, but he separates the dynamic explanation of the genesis of capital from the static explanation of interest.

''Abstinence . . . *originates* new capital; it diverts . . . expenditure that would secure goods for consumption to that which secures instruments of production'' (Clark 1899, pp. 133-34). A consumption utility has been foregone forever, and the abstainer receives interest forever as ''an offset.''[26] But Clark never identifies

[25] ''Interest is paid not for concrete things, but for pure capital'' (Clark 1890a, p. 55).

[26] ''The particular enjoyment that the man might have had, if he had spent his money for consumers' goods, he will never have if he saves it. He has abandoned it forever; and, as an offset for it, he will get interest. In the absence of disaster, the new capital will create its outflowing product thenceforth forever'' (Clark 1899, p. 134).

abstinence as the source of interest,[27] and relegates explanations involving abstinence to the realm of economic dynamics.

Clark claims, incorrectly as we shall see, that once abstinence has created true capital, the capital perpetually replaces itself and generates interest without any additional abstinence. "[T]he *genesis of new capital* . . . requires abstinence. The maintenance of it . . . does not require abstinence" (Clark 1899, p. 133). Since interest exists in the static state without abstinence, Clark concludes that abstinence cannot be the cause of interest.

Clark's (1899, p. 135, emphasis in original) explanation of interest lies solely in the technical productivity of capital: "The laws of matter, in short, make capital productive . . . Paying interest is buying the product of capital, as paying wages is buying the product of labor. *The power of capital to create the product is, then, the basis of interest*."

The flaw in Clark's analysis surfaces in defending the lack of abstinence in the static state: "In the static state there is no abstinence or creation of new capital; because, with the capital now on hand, men would lose more by foregoing pleasure and making their fund larger than they would gain by doing so. The whole subject of creating capital belongs . . . in the dynamic division of the science of economics" (Clark 1899, p. 136).

In assuming zero saving in the static state, Clark is implicitly assuming that the existing rate of interest is exactly offsetting time preference for present pleasure. If individuals were to save, he is implying that the foregone pleasure would be less than the additional interest "gained." The assumptions of his static state smuggle in positive time preference, vitiating his claim that interest is determined by productivity alone. But Clark never explicitly addresses the issue of time preference and its relation to abstinence.

What makes Clark's surreptitious inclusion of time preference interesting is that Böhm-Bawerk falls prey to exactly the same problem in claiming (wrongly) that his third reason for interest—the productivity of roundabout methods of production—alone is sufficient to justify a positive rate of interest.[28]

Böhm-Bawerk's quantitative model for determining the interest rate assumes a fixed subsistence fund. The model clearly involves Böhm-Bawerk's third reason for interest (productivity of roundabout production), but makes no explicit mention of his first two subjective reasons for positive time preference. Those subjective reasons are implicit in the *fixed quantity* of the subsistence fund. A fixed fund implies that capital is neither being used up nor is saving occurring. Time preference, at the margin, must be equal to the interest rate. Thus, the fixed subsistence fund smuggles in positive subjective time preference, and the roundaboutness of production is *adjusted to* that time preference (Lutz 1967, p. 17).

This central role of time preference in both Clark's and Böhm-Bawerk's models is never raised in their interchanges. It was left to Taussig (1908) to call attention to the significance of the problem for Clark's work. Taussig demonstrates that Clark is

[27]Clark (1895a, pp. 262-63) explicitly denies the connection, although he confuses things by using the same word "offset" in a quote that contradicts the previous quote. "Interest is not . . . an equivalent offset for the sacrifice entailed by mere delay."

[28]See Cohen (1994) for a discussion of Irving Fisher's debate with Böhm-Bawerk over Böhm-Bawerk's infamous erroneous claim that his third reason—the productivity of roundabout production—was *alone* sufficient to explain interest.

wrong in claiming that abstinence is only involved in the dynamic genesis of new capital and not in the maintenance of existing capital in the static state.

Clark's error stems from his assumption of the permanence of true capital—that, once created, capital permanently generates both funds for its own replacement and a stream of interest. Taussig cites Clark (1899, p. 133) to demonstrate the error:

> The loom in the factory that is worn out and is about to be replaced has, during its career, earned its share of dividends for the stockholders of the mill, and, besides this, *has earned for them a sum that will buy a new loom*. It is not necessary, therefore, to take the cost of the new loom out of the stockholders' incomes. That would impose on them the necessity for a genuine act of abstinence (Taussig 1908, p. 342n, Taussig's emphasis).

Taussig points out that the sum for buying a new loom does not *have to* be reinvested. The stockholder has "precisely the same freedom as to what he will do with this as he has with his other income" (Taussig 1908, p. 342n). The decision to reinvest in the static state involves the same abstinence as the original investment decision. Therefore, Clark's claim of "the replacement of capital without abstinence" is "quite untenable" (Taussig 1908, pp. 343-44).

Having overlooked the role of time preference in his static state, Clark views the perpetual reinvestment of capital that would occur in stationary-state equilibrium as independent of abstinence. Once again, Clark substitutes the equilibrium outcome for the historical decision-making process, and precludes an analysis of factors relevant to the decisions—in this case, time preference. As we have seen previously, the synchronization and putty-mobility characteristics of pure capital prevent Clark from analyzing other aspects of actual, historical processes. We now must add permanence to the list of history-obscuring characteristics of true capital.

Why did it take a third party like Taussig to identify the illegitimate excision of time preference from Clark's analysis? First, Böhm-Bawerk made the same error of excision in his subsistence fund model, leading to the infamous erroneous claim that his third reason—the productivity of roundabout production—was *alone* sufficient to explain interest. Second, Böhm-Bawerk, like Clark, downplayed the role of abstinence in the explanation of interest. He agreed with the Lassalle/Marx critique of abstinence theory that "the existence of interest and its rate do not exhibit the slightest degree of correlation with the existence and the degree of the 'sacrifice of abstinence'" (Böhm-Bawerk 1959, Vol. I, p. 183).[29] Böhm-Bawerk also argued that capitalists, unlike laborers, did *not* have positive time preference, and therefore did not have to be rewarded for waiting.[30] This minimization of time preference in his

[29] "The servant girl's hard-earned dollar deposited in the savings bank earns, both relatively and absolutely, lower interest than the easily spared hundred thousand which a millionaire banker loans out on call. These hard facts of everyday life fit badly into a theory which makes the broad assertion that interest is the 'wage of abstinence'" (Böhm-Bawerk 1959, Vol. I, pp. 183-84).

[30] "[C]apitalists do not forego any personal indulgence when loaning or investing productively their present goods" (Böhm-Bawerk 1895b, pp. 381-82). Böhm-Bawerk (1959, Vol. 2, p. 310) had explicitly made this point earlier: "Of the three factors which [cause] the preference for present over future goods, the first two *do not affect the* great majority of capitalists at all." He argues that if capitalists were to be concerned with present "momentary pleasures and excluding all concern of the future, their wealth would rapidly be dissipated" so that "they do not remain [capitalists] very long."

subsistence fund model allowed Böhm-Bawerk to "agree fully with Professor Clark that interest is a 'static income'" and that the dynamic genesis of new capital can be separated from the explanation of interest. Böhm-Bawerk (1895b, p. 383) also agreed to "let pass as true" Clark's "thesis that 'no true abstinence is practised' in the mere preserving of capital unimpaired." These omissions of time preference left the door wide open for Irving Fisher (1907) to add the missing link to what was to become the modern theory of interest—the interaction of subjective impatience and objective investment opportunity.

V. CONCLUSION

Despite the explicit omission of positive time preference from Böhm-Bawerk's interest rate model, his qualitative explanation of interest was ultimately rooted in the influence of time—the premium placed on present goods and productivity of roundabout processes of production. In contrast, Clark eliminates all vestiges of time through his static assumptions and his concept of true capital with its time-removing characteristics of permanence, synchronization, and putty-mobility. What is left as the ultimate explanation of interest for Clark is the productivity of capital, based on the laws of matter. If we ask the question: What is productive, time or tools? Böhm-Bawerk's and Clark's answers obviously differ. But their analyses lead to remarkably similar conclusions, as this passage from Clark reveals:

> Tools are productive, but time is the condition of getting tools—this is the simple and literal fact. The round-about or time-consuming mode of using labor insures efficient capital-goods. Granting that time be used for this purpose, we may say that "time is productive;" but we must be careful to keep in view the fact that it is the tools secured by time which do the producing (1899, p. 309).

This passage contains remarkable ironies. Böhm-Bawerk mercilessly criticized Clark's abstract concept of true capital and its associated characteristics that were not characteristics of concrete capital goods. Böhm-Bawerk called true capital a mere abstraction, and "An abstraction cannot spin yarn or yield interest" (Böhm-Bawerk 1906, p. 10). Yet Clark's explanation of interest is rooted ultimately in the productivity of concrete capital goods that embody the fund of true capital. Böhm-Bawerk tirelessly emphasized the importance of concrete capital goods for improving productivity by making production processes more roundabout. Yet Böhm-Bawerk's explanation of interest is rooted ultimately in the productivity of an abstract concept like time, which operates through concrete capital goods and subjective preferences.

While each author had problems with time, the 1893–1907 Böhm-Bawerk/Clark controversy focused on Clark's concept of true capital. In summarizing his objections, Böhm-Bawerk (1907a, p. 282) says: "Professor Clark's true capital abides with no . . . facts . . . Hence, with every respect for the intellectual quality of my opponent, I must oppose his doctrines . . . in order to defend a solid and natural theory of capital against a mythology of capital."

But the characteristics of true capital to which Böhm-Bawerk objects—permanence, synchronization, and putty-mobility—are those characteristics that eliminate the effects of time and preserve stationary-state equilibrium. The permanence of true

capital abstracts from mistaken investments or business cycles. The synchronization of inputs and outputs, which holds only in stationary-state equilibrium, makes it appear *as if* periods of production have been eliminated. Synchronization substitutes the equilibrium coordination of production for the dynamic, historical sequence of production. The assumption of putty capital with perfect mobility, by eliminating path dependence and transition problems, allows the extension of stationary-state analysis to comparisons of different static equilibrium states, so that changes in the interest rate can be explained *as if* they were generated by the simplified static model. The net effect is, as Böhm-Bawerk observed in the opening quotation, the removal of time. But the mythology is not of capital, but of the assumptions involved in static equilibrium states which purge time from the analysis.

The Böhm-Bawerk/Clark controversy must be understood on its own terms. Given those terms, it may be tempting to dismiss the controversy as the unsophisticated, early confusions of both authors about capital theory and comparative statics analysis. Before so doing, keep in mind that the other great capital controversies also developed into controversies over how actual dynamic processes of accumulation and distribution can be analyzed within essentially static equilibrium frameworks.

Using Böhm-Bawerk's phrase, ''The Mythology of Capital,'' as a title, Hayek (1936, p. 222) attacks Knight's J.B. Clark-like concept of capital (a homogeneous, malleable, and permanent fund of value) because it purges time from the analysis of the *process* of production and fails to explain how the existence of specific, heterogeneous capital goods ''limits the possibilities of current investment.'' In the Cambridge controversies, putty capital, one-commodity, and other assumptions were used to avoid time-related reswitching and capital reversing phenomena associated with heterogeneous capital goods (Cohen 1989, Cohen and Harcourt 2003). In Paul Samuelson's (1962, p. 194) words, his quest was to ''provide some rationalization for the validity of the simple J.B. Clark parables'' explaining interest. Bypassing the role of time through such assumptions collapses the tension between the dual conceptions of capital. Specific capital goods acquire the ability of financial capital to flow costlessly between investment opportunities, avoiding Wicksell effects and path dependence, thereby preserving the clear-cut results of simpler, static equilibrium models. Joan Robinson, like Böhm-Bawerk, objected to the methodological reduction of real historical time to comparative statics, using the phrase ''history versus equilibrium.''[31] While detailing the connections between the three great capital controversies is far beyond the scope of this paper (see Cohen and Harcourt 2005 for a start), a complete understanding of the Böhm-Bawerk/Clark controversy must eventually be situated in the historical continuum of capital theories and capital controversies.

[31]Robinson argued:

> The real source of trouble is the confusion between comparisons of equilibrium positions and the history of a process of accumulation. We might suppose that we can take a number of still photographs of economies each in stationary equilibrium; ... This is an allowable thought experiment. But it is not allowable to flip the stills through a projector to obtain a moving picture of a process of accumulation (1974/1980, p. 57).

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