Joshua Letta

Joshua.letta@gmail.com

Christopher Newport University
Capital Theory Controversies:
The Impact of the Hayek and Knight Debate

Abstract:
This paper will be an analysis of the debate between Friedrich A. von Hayek and Frank Knight concerning how capital should be viewed within the economic profession. More specifically, the controversy rests on whether capital should be viewed as a homogenous or heterogeneous unit of measure. To Knight, capital was a permanent, homogenous unit of value and interest rates were entirely determined by the technical marginal productivity of capital. In contrast, Hayek emphasized capital as heterogeneous goods that operated within specific periods of production. He saw Knight’s conception of capital as destructive to the economic profession as it purged any analysis of time preference and how specific stocks of capital could limit investment levels within any given economy. Hence, Knight saw the role of malinvestment in macroeconomic models as irrelevant, while Hayek saw malinvestment as a chief underlying cause in business cycles. This analysis will put strong emphasis on how the Hayek/Knight capital controversy greatly mirrored the earlier debates between J. B. Clark and Eugen von Böhm-Bawerk on the nature of capital and how Hayek and Knight’s disagreements influenced the Cambridge capital controversies of the 1960s that reshaped neoclassical theories concerning aggregate production and distribution.

Keywords: Hayek, Knight, Capital, Austrian School, Neoclassicism, Macroeconomics

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Like nearly all academic disciplines, economics has progressed in accumulating knowledge on the inner mechanics of societal functions through controversies and debates. These controversies have yielded new concepts to the field of economics that have lasting consequences on civilization. Adam Smith and David Ricardo’s development of comparative advantage in response to protectionist arguments completely transformed governments’ policies of free trade world-wide. Similarly, the critics of Smith and Ricardo’s labor theory of value also revolutionized price theory when they developed the concept of marginal utility. As controversies are concluded, the ideal process would be that new ideas are incorporated into mainstream economic thought and critic’s questions answered. However, because the economics discipline lacks the solid epistemological foundation seen in other more rigorous academic fields in the natural sciences, sometimes debates often lead to the discovery of problems with core principles of mainstream economic theories. Critics of widely-accepted ideas often have their questions unaddressed because of the threat they pose to the stability of the discipline itself.

One such neglected controversy is concerning capital theory, popularized by the debates between economists Friedrich A. von Hayek and Frank Knight in the 1930s. Hayek and Knight’s debates were over how capital should be viewed either as a homogenous or heterogeneous measure. In other words, the controversy was centered on whether capital should be treated as an abstract, permanent concept or should be treated as different goods with different attributes and properties. This controversy cuts at the heart of how economists perform macroeconomic analysis concerning aggregate production, distribution, interest rates, etc. Knight’s concept of capital ultimately was the one accepted into mainstream economic thought, but opposing factions still voice the same concerns of Hayek and many others before him. For
scholarly importance, it is worthy these criticisms are looked at with an understanding of how economic thought has developed and where it is today.

Understanding the impact of the debate between Hayek and Knight on capital theory requires looking back at what influenced their respective ideals. For Hayek, his roots lie in the early Austrian School, specifically the economists Carl Menger and Eugen von Böhm-Bawerk. Considered to be the founder of the Austrian School, Carl Menger was among the first economists to depart from the classical economic thought of Adam Smith and David Ricardo. The classical economists, when searching for economic insight, attributed the “regularities governing economic phenomena to the objective physical and biological conditions under which societies exist” (Kirzner, 2010, p. 3). Menger, on the other hand, saw the basis of economic activity as individuals making decisions based on their own preferences. Working separately, he was the cofounder of marginal utility alongside the economists William Jevons and Leon Walras in the 1870s (“Carl Menger”). This concept completely revolutionized the field of economics; many post-1870 schools of economic thought incorporated the concept of marginal utility in their teachings by declaring that economic regulations “reflected the interplay of both objective physical conditions governing production and supply and the subjective preferences underlying consumer demand” (Kirzner, 2010, p. 3).

In regard to capital theory, Menger first divided goods into a hierarchy of “orders.” Goods of the lowest order would confer utility directly to the consumer while goods of the higher order would produce other consumer goods. Goods of the higher order are organized into an ascending ranking from raw materials to final consumed goods. For Menger, the economic value of the productive factors perceived as capital are derived “not directly from the objective production potential of those factors, but strictly from the resulting valuations which consumers
and their surrogates, the entrepreneurs, place upon them as being useful in promoting consumption utility” (Kirzner, 2010, p. 4). According to Menger, large economic gain would only occur if goods of the lower order were transferred into goods of the higher order. This means that people would need to put aside the use of goods for “the present or for the near future for the satisfaction of the needs of a more distant time period” (Menger, 2011, p. 155). Menger’s emphasis of time in production would be the foundation for the concept of a “period of production,” which would later be developed by the aforementioned Eugen von Böhm-Bawerk and Hayek (Menger, 2011, p. 155-156).

A student of Menger, Eugen von Böhm-Bawerk developed a capital theory based on the time-preference ideas of his teacher, showing how the value of future goods decreases as their length of time for their competition increases. He firmly believed in the “dual conception of capital,” meaning he saw capital as both “heterogeneous, specific capital goods used in production and as a homogeneous fund of financial value that flows to establish a uniform rate of return” (Cohen, 2008, p. 153). However, there was controversy between him and the American neoclassical economist John Bates Clark over how capital should be viewed within the economic profession. While they both agreed on the dual nature of capital, their disagreements began when capital was integrated into economic models with specific assumptions, and only one side of capital was emphasized over another. Clark stressed a monetary fund of true capital, a “permanent, homogenous, and perfectly malleable stock, over concrete capital goods and attributes interest rates to it” (Cohen, 2008, p. 153). He de-emphasized the characteristic of concrete capital goods and instead attributed interest directly to the productivity of the fund of capital. He illustrated this abstract view of true capital to great effect using the viewpoint of business. He argued that a businessman would look at his capital as an abstract figure of wealth
measured in his nation’s currency. Although the businessman’s buildings, machines, land, etc. are his concrete capital goods, he would look at them as merely the “containers” of his capital or funds that are permanently his, though his capital might not always retain these present forms (Clark, 1888, p. 9-10). He also used a waterfall as a metaphor for his concept of true capital; he argued that concrete capital goods are the particles of water that ultimately vanish as they merge into the sea while the waterfall itself stays constant, “owing its continuance to the constant wasting and replenishing of its substance” (Clark, 1893, p. 308).

In contrast, Böhm-Bawerk emphasized concrete capital goods and objected to Clark’s concept of true capital because it eliminated time, which played the central role in Böhm-Bawerk’s interest theory of explaining why present goods have a premium over equivalent future goods. He did not object to the idea of a fund as money capital, but rather took issue with Clark’s concept of true capital because it was assigned the attribute of permanence (Cohen, 2008, p. 153). He responded to Clark’s waterfall example by stating that while the waterfall itself can be viewed as perpetual, the “physical or mechanical effects produced by the waterfall are still produced by the concrete falling drops of water” (Böhm-Bawerk, 1895, p. 128). He made the point that if a stone ever blocked the waterfall from flowing properly to a nearby millwheel, the millwheel would stop. This illustrated that while Böhm-Bawerk did not object to Clark’s true capital theory by itself, he felt that the traits Clark assigned to it would result in faulty economic analysis that would ignore malinvestment and other potential negative factors to the economy (Cohen, 2008, p. 167).

The economist Mark Blaug called Böhm-Bawerk’s debate with Clark, “one of the three great controversies that have marked the history of capital theory” (Blaug, 1997, p. 547). Böhm-Bawerk and Clark’s discussion on the dual nature of capital helped clarify much of the related
terminology in regard to capital. Capital value was seen as the “sum of the capital values of those capital goods” while money capital was designated “the sum of money necessary to buy a specified stock of capital goods” (Hennings, 1987). However, the debate on capital theory was not concluded. The next great controversy erupted in the 1930s between the Austrian economist Friedrich A. von Hayek and American economist Frank Knight. Unlike the debate between Böhm-Bawerk and Clark, this was not simply a dispute of the semantics of the dual nature of capital, but rather a complete disagreement of whether capital should be viewed as a homogenous or heterogeneous unit of measure. To Knight, capital was a permanent, homogenous unit of value and interest rates were entirely determined by the technical marginal productivity of capital. In contrast, Hayek emphasized capital as heterogeneous goods that operated within specific periods of production. He saw Knight’s conception of capital as destructive to the economic profession as it purged any analysis of time preference and how specific stocks of capital could limit investment levels within any given economy. Hence, Knight saw the role of malinvestment in macroeconomic models as irrelevant, while Hayek saw malinvestment as a chief underlying cause in business cycles (Cohen, 2003, p. 469-471).

Responding to Knight’s criticisms, Hayek did take time to establish where the two of them were in agreement. For example, Hayek conceded that Böhm-Bawerk’s differentiation between primary inputs and intermediate products in the production function was largely meaningless in empirical application. There should be no meaningful distinction between primary and secondary factors of production; only the future time intervals between the moments when the factors are invested and the moment when the product will mature are relevant to his capital theory. Rather, Hayek highlighted that the crux of his disagreement rested in the fact Knight viewed capital as a permanent fund, thereby eliminating time entirely from the analysis
of the capitalist process of production. Therefore, this took away, in Hayek’s view, the basis of researching business cycles by analyzing the historical process of cyclical change caused by specific capital structures. He also countered Knight’s criticism of the immeasurability of the periods of production by pointing out that accepting the notion of capital being kept quantitatively intact will put a severe limitation of any quantitative analysis in economics (Hayek, 1936, p. 199-228).

Knight’s counterarguments largely reiterated his claim there was no understandable meaning of a “period of production,” hence no determinable connections between the quantity of investment and the quantity of capital and its period of production. He also noted that during a depression, liquidation does not destroy physical capital, but simply turns it into money. Most importantly, he claimed that trying to look back at the production period for capital falls into the realm of studying past economic history and looking infinitely backwards to original factors of production, therefore making it unsuitable for any type of present-day economic analysis (Knight, 1935, p. 77-94). Although Hayek had previously told Knight he thought that trying to keep capital quantitatively intact would put a severe limitation of any quantitative analysis in economics, Knight’s response simply stated that Hayek’s method of trying to define and measure production periods of capital leads to infinitely greater problems because it required the “quantity of capital being divided by some arbitrarily selected income flow” (Cohen, 2003, p. 479).

During this debate, Knight also famously established his “Crusonia plant” model to help illustrate Knight’s conception of capital as a permanent, homogenous fund of value. To put basically, Knight imagined an economy, Crusonia, in which all that is consumed is obtained from “the natural growth of some perennial plant which grows indefinitely at a constant rate”
There are no quantities of labor inputs and its “tissue” is cut off from itself for consumption while it grows. Production and consumption are simultaneous and the real rate of interest can only be determined by the marginal productivity of capital. Investment can only be taken as a form of sacrificed consumption. Although this model helped solve much of Knight’s measurement problems when expounding his capital theory, Hayek strongly criticized Knight’s one-commodity as a gross oversimplification because it assumed all investment structures could be boiled down to a “point input–point output” model where “any particular units of output can always be unequivocally ascribed to particular quantities of input” (Hayek, 2007, p. 151). However, Cohen noted that Knight at least used equilibrium analysis when constructing his model. Hayek often abandoned equilibrium analysis entirely when talking about his capital theory and went beyond the boundaries of traditional economic theory to tackle problems relating to the coordination of knowledge (2003, p. 483-484).

By the early 1940s, the debate between Hayek and Knight had largely ended. Both individuals felt they had said all they needed to say in previous exchanges. However, in Hayek’s 1941 treatise of capital theory, *The Pure Theory of Capital*, there are many remarks that implicitly are directed toward Knight’s criticisms of him. For example, Hayek freely acknowledged that he cannot reduce the period of production or investment that he related to the quantity of capital into empirical proof; this was an aspect of his theory that Knight notably criticized. However, he used this failing to note a common problem among all economists when dealing with capital theory: attempting to measure capital independently of the rate of interest. In order to arrive at an aggregate measure with heterogeneous inputs, one must assign definite weights to the different units of input and these weights must be expressed in terms of value. However, these values will depend on the rate of interest, so one has come full circle and failed
to establish an aggregation of capital independent of the interest rate (Hayek, 2007, p. 143). This problem played a major role in the later Cambridge controversies on capital theory, which thought mainstream neoclassical capital and interest theory were in great error because their “explanation of distribution being determined by the conditions of supply and demand (Kirzner, 2010, p. 5).

During the Hayek/Knight controversy regarding capital theory, many other economists voiced their opinions on the debate. The Cambridge economist Nicholas Kaldor wrote to both Knight and Hayek during their debate on capital theory. He did not fall squarely on either Hayek or Knight’s side, but he did agree with the bulk of Knight’s propositions. He agreed with Knight on rejecting Hayek’s production periods and roundaboutness for analyzing business cycles. However, he still defended roundaboutness as useful in providing explanations on the interrelationships between distributive shares and capital intensity. He argued that roundaboutness allows capital to be treated as a factor of production on par with labor and that marginal productivity theory can explain interest as the “marginal productivity of waiting.” Although Kaldor recognized Knight’s criticism of Austrian capital theory, he emphasized that Austrian theory allows capital to be a factor of production and told a more convincing process story than Knight’s views. One can take note of the fact that although Kaldor agreed with Knight on several points, he found Hayek’s overall capital theory to be more appealing (Cohen, 2006, p. 141-145).

The Austrian economist Murray Rothbard spent time looking at Knight’s view on capital and interest. He characterized Knight’s arguments against the Austrian investment theory of Hayek by being based on two fallacies. Firstly, Knight said that Hayek incorrectly viewed production as the production of concrete goods instead of services. Rothbard conceded that
while goods are indeed values for their services, it is undeniable that concrete capital goods structures must be produced before services can be obtained; therefore they are worth analytical consideration. Secondly, Knight placed maintenance and reproduction of capital used in the production of goods as part of the production process itself. Rothbard contended this to be incorrect and that the building up of more capital at a later date to replace used-up capital is really a separate area of choice. Ultimately, Rothbard’s analysis, while some might call insignificant, does illustrate that Knight often painted over production processes with broad strokes, a point Hayek often told Knight would be destructive when constructing macroeconomic models (Rothbard, 2009, p. 535-536).

Another Austrian economist, Israel Kirzner, also argued against Knight’s notion of the permanence of capital and was particularly critical of Knight’s Crusonia model. However, unlike Hayek, Kirzner attacked Knight’s model because its underlying logic failed outright to support Knight’s views. According to Knight, the purpose of the Crusonia model was to show how the arbitrariness of Hayek’s period of production made it completely irrelevant in economic analysis. Knight saw that as long as the equilibrium concept of production is adhered to, there was no need to take notice of the ages of the individual components of the capital stock and the time-structure of this stock is of no significance” (Kirzner, 2010, p. 79). Kirzner responded by saying that Knight failed to understand the epistemology behind the concept of a period of production. The whole point of looking at economic exchanges across time is to notice how individuals “engage in intertemporal exchanges with nature, sacrificing inputs at one date in order to obtain output at a later date” (Kirzner, 2010, p. 76). In Knight’s Crusonia model, economic transactions would still be based on this principle. A society based solely on consuming a perennial plant would still be making the core decision of how much of the plant
should be consumed and how much should be left to grow. All these decisions are based on weighing the current enjoyment of consumption against the future enjoyment promised by the conservation and growth of the plant. Therefore, Kirzner concluded that Knight’s model implicitly was still bound to Hayek’s premise of specific period of productions and failed to demonstrate their irrelevance in economic analysis (Kirzner, 2010, p. 76-83).

Despite the list of criticisms, Knight’s perception of capital was favored in the mainstream neoclassical school of economics. When developing their school, the neoclassical economists had the problem of concrete capital goods shifting from one industry to another when performing static economic analysis. This complication was resolved by adopting the Knightian conception of capital as a homogenous mass that can take on different forms. Adherents of neoclassical thought realized that viewing capital as a homogeneous aggregate was considered an “index number problem” as the price and quantity of various capital goods would change over time. However, they saw this problem as being resolved by updating price indices for capital goods on a continuous basis. Nevertheless, in the 1950s and 1960s, numerous economists began to argue that the Knightian conception of capital had far reaching implications that could simply not be labeled as an index number problem. For example, the post-Keynesian economist Joan Robinson argued that viewing capital as homogenous could not function in macroeconomic models like the Cobb-Douglas production function because the Knightian conception of capital was essentially a monetary measure; macroeconomic production functions are non-monetary because they relate physical inputs and physical outputs and prices and costs are not reflected in the functions. These questions marked the beginning of the Cambridge capital controversies, which challenged the neoclassical school on capital theory (Hennings, 1987).
It is a common misconception that the Cambridge capital theory controversies are often looked at as a tempest in a teapot over anomalies involving the measurement of capital in aggregate production function models and having little long term impact on neoclassical capital theory. Major issues such as the return of capital, visions of accumulation, limitations of equilibrium tools, etc. were explored (Cohen & Harcourt, 2003, p. 211–212). Of these particular issues, the one that raised the most inquiry was the criticism that equilibrium was not the outcome of an economic process and therefore an inadequate tool for analyzing processes of capital accumulation and growth. The aforementioned economist Joan Robinson ardently criticized neoclassical economists for not being able to distinguish between a difference in the parameters of an equilibrium model and the effects of a change taking place at a moment of time; she said that they foolishly believed they could take a number of “still photographs” of economies in stationary equilibrium and trust they could getting a moving picture of a the process of accumulation simply by flipping the stills through a “projector” (Cohen & Harcourt, 2003, p. 204). Joan Robinson’s criticism was very similar to Böhm-Bawerk’s objection to Clark’s ideal of true capital because both argued against the methodological reduction of real historical time to comparative statics; Robinson described it using the phrase “history versus equilibrium” (Cohen, 2008, p. 168). Another complaint by the Cambridge economists was that simple one-commodity models used by neoclassical economists to capture the “essence” of capital growth theory were simply not robust. This harkened back to the Hayek/Knight controversy where Hayek said similar things about Knight’s one-commodity models. It is also important to note that the neoclassical economists’ response was almost akin to Knight’s in that they stated incorporating multiple factors of production added too many layers of complexity to
the models and distracted from the main goal of measuring the respective contributions of capital accumulation in relation to output growth (Cohen & Harcourt, 2003, p. 199–214).

One can look back at Hayek and Knight’s debates on capital theory and develop a multitude of different perspectives. The economist Avi. J Cohen saw Hayek and Knight moving in different directions on the role and applicability of economic theory, with Knight “ruling more and more phenomena out of economic bounds” and Hayek “moving to expand the boundaries of economics to include more coordination knowledge phenomena” (Cohen, 2003, p. 487). However, he felt that neither Hayek nor Knight could sustain their capital conception outside of one-commodity models and that they both fall into simply repeating their claims as truth but without proof (Cohen, 2003, p. 484-485). One could argue that Occam's Razor should be utilized when determining which of Hayek and Knight’s capital conception models should be used. However, it would be a disservice to the economic discipline to declare a winner of a subject that continues to having lingering questions. The Cambridge capital controversies proved that some economists still have doubts on the state of how mainstream neoclassical thought perceives capital. What is more interesting is these doubts seem to transcend boundaries between established economic schools of thoughts. For example, Joan Robinson, a Post-Keynesian economist, would disagree with Böhm-Bawerk on many core economic issues, but they both used the same arguments against the Knightian conception of the permanence of capital (Cohen, 2008, p. 168). Cohen echoes these critics’ opinions on treating capital as homogenous by saying that economists should look at the history of capital controversies as showing the “limitations of equilibrium tools for explaining economic activity where history and path dependence matter” (2010, p. 17). Simple models are bound to have problems with explaining complex phenomenon and no economic school of thought should be exempt from
these difficulties, regardless if they are orthodox or heterodox in economic thought. Cohen and another economist, G. C. Harcourt actually contended that these issues will eventually erupt into future controversies in economics academia when the mainstream neoclassical synthesis is further challenged (Cohen & Harcourt, 2003, p. 211-212). By all accounts, this is an accurate statement; if yet another controversy breaks out concerning the state of capital theory, it is likely the field of economics may see a new synthesis in mainstream thought.
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