Austrian Capital Theory and "Dynamic" Analysis of Schumpeter vs. Hayek*

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Following the Austrian approach, both Schumpeter and Hayek view capital as advance. However, Schumpeter is more interested in the equilibrium breaking process due to technical innovation, whereas Hayek concerns about the equilibrating process toward stationary state. Schumpeter avoids applying the dynamic analysis in the usual sense to capitalist development, which is basically unstable. On the other hand, Hayek tries not only to analyze the adjustment process but also to refine the intertemporal equilibrium concept.

I. Introduction

Both Schumpeter and Hayek seemed to construct their theoretical frameworks in the tradition of Austrian economics, but they were critical of Böhm-Bawerk's theory of capital and interest on different grounds. Schumpeter thought that Böhm-Bawerk's explanation of the interest rate was not useful in analyzing the process of economic development, although it might not have serious drawbacks as an equilibrium theory of interest. Schumpeter considered any equilibrium model of the interest rate to be inapplicable to the understanding of real development of capitalism, since the essential engine of progress was the technological innovation initiated by an entrepreneur and the technological innovation could change all economic parameters which were regarded as data in equilibrium model. In his famous book, *The Theory of Economic Development* (1912), Schumpeter argued that the interest rate had to be reduced to zero in the state of what he called "the circular flow" where the amounts of consumption and production were kept

constant, to emphasize how the equilibrium model fell short of being an appropriate explanation of the capitalist development.

On the other hand, Hayek (1941) tried to develop more sophisticated equilibrium model of capital and interest in the tradition of Böhm-Bawerk and Wicksell, since he accepted the limited usefulness of equilibrium model for the explanation of the economic structure. He also found that Böhm-Bawerk's capital theory had many serious problems as an equilibrium model, since the average production period which Böhm-Bawerk suggested as an aggregate measure of capital was not a sensible measure at all. As the extension of the equilibrium analysis, he went on to suggest the "intertemporal general equilibrium" model, which belonged to the intermediate field between stationary equilibrium analysis and true dynamics.

To see the similarity and difference between Schumpeter and Hayek, this paper examines four specific issues, i.e. i) the relationship between each author and Böhm-Bawerk, or other contemporary economists; ii) each author's attitude toward equilibrium analysis; iii) the usage of the term "statics" and "dynamics"; and iv) the effect of the increase in money supply. The next section deals with Schumpeter's attitude towards Böhm-Bawerk's theory and equilibrium method. It also examines his usage of the term "dynamics" and "development". Especially, it tries to place Schumpeter's conception of technological innovation in his theoretical structure. The third section examines Hayek's theory of capital, especially his criticism of Böhm-Bawerk's model. It also contains Hayek's analysis of invention and adjustment process. The fourth section concludes the paper with the comparison between Schumpeter and Hayek.

II. Schumpeter's Theory of Interest and Profit

A. Schumpeter, Walrasian or Austrian?

In *The Theory of Economic Development* (1912), Schumpeter starts his analysis of economic mechanism with the state of "circular flow" in which "year in and year out, every recurring employment of permanent sources of productive power endeavors to reach the same consumer" and "the sellers of all commodities appear again as buyers in sufficient measure to acquire those goods which will maintain their consumption and their productive equipment in the next economic period at the level so far attained." (*TED*, p.8)[1] This state of "circular flow" which amounts

to the state of stationary equilibrium is a theoretical construction to show how the routine behaviors of economic agents are conducted under the same "known" data of preferences, technology, and initial endowments.

Schumpeter thinks that the theoretical apparatus of the marginalists, such as Menger's or Walras's, is suitable for the analysis of "circular flow". Later in the preface to the Japanese edition of *The Theory of Economic Development*, he mentions that he owes much to L.Walras "who for the first time in the history of our science effectively embraced the pure logic of the interdependence between economic quantities."[2] As Samuelson (1951) notes, Schumpeter's ranking of the French economists over the Austrian economists continues throughout his later works. In this light, Samuelson regards Schumpeter as "surprisingly un-Austrian" and "much more Walrasian". Some other interpreters also stress the influence of Walras on Schumpeter in different aspects. For example, Morishima and Catephores (1988) take note of the similarity in the role of entrepreneur in Walras's and Schumpeter's economics, and Goodwin (1990) stresses the same unified account of "an idealized market solution that simultaneously yielded the behavior of very many individual market tightly embedded in a single, whole economy."[3]

However, other interpreters emphasize the Austrian influence on Schumpeter. For example, Kirzner (1983) notes that "the most significant and valuable features of the Schumpeterian system are precisely those that seem to flow most naturally from his own Austrian heritage," as is exemplified by "central role played in Schumpeter's economics" by the entrepreneur, and by Schumpeter's dismissal of the model of perfect competition."[4] März (1988) reiterates that "the initial stimuli that prompted Schumpeter to undertake his arduous theoretical life work came from Böhm-Bawerk and Marx rather than from Walras."[5]

Then, the question arises to what extent Schumpeter belongs to the Austrian tradition or to the Walrasian framework, and if Schumpeter's

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[1]Hereafter *TED* in the parenthesis denotes the English version of *The Theory of Economic Development* published in 1934, whcih is translated from the second German edition (1926).

[2]Schumpeter (1937) reprinted in Clemence (ed.), *Essays of J.A.Schumpeter*, 1951, p. 158.

[3]Goodwin (1990, p. 39).

[4]Kirzner (1983, p. 1502).

[5]März (1988, p. 56).

admiration of Walras's general equilibrium model is a mere lip service
to the economic orthodoxy or his scientific conviction with regard to
the applicability of the Walrasian general equilibrium model to the eco-
nomic reality. The clue to the answer can be found in the distinction
between "science" and "ideology" in Schumpeter (1949a), or between
"analysis" and "vision" in Schumpeter (1954). He defines science as
"tooled knowledge", i.e. "any field of knowledge that has developed spe-
cialized techniques of fact-finding and of interpretation or inference
(analysis)". (*HEA*, p. 7).[6] In light of this distinction, we can interpret
that Schumpeter admires Walras's equilibrium model, because it is the
most rigorous explanation of the interdependence of the market mecha-
nism. Schumpeter also finds that as a static analysis, Walras's model
is superior to Böhm-Bawerk's, although Schumpeter does not disre-
gard Böhm-Bawerk's achievement. As a matter of fact, in his article
written on the occasion of Böhm-Bawerk's death, Schumpeter (1914)
praises Böhm-Bawerk for establishing the correct relationship between
interest and wages. Schumpeter further argues:

> The theory of the socio-economic process is, in Böhm-
> Bawerk's pages, unfolded for the first time as an organic whole
> of valuations and 'objective' facts. Nowhere do we find the
> stature of the master so clearly illuminated by the rays of
> genius as in the last section of his work. ... It is striking with
> what sureness and correctness he employs essentially mathe-
> matical forms of thought, though never using a single symbol
> or adopting mathematical techniques.[7]

In his later book, *History of Economic Analysis*, Schumpeter gives
such a harsh appraisal on Böhm-Bawerk's work, that, at a first glance,
readers would be surprised to see how drastically Schumpeter's atti-
tude changes over time:

> Böhm-Bawerk's work had not been permitted to mature: it is
> essentially (not formally) a first draft whose growth into some-
> thing much more perfect was arrested and never resumed.
> Moreover, it is doubtful whether Böhm-Bawerk's primitive
> technique and in particular his lack of mathematical training
> would ever have allowed him to attain perfect. Thus, the work,
> besides being very difficult to understand, bristles with inade-
> quacies that invite criticism—for instance, as he put it, the

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[6]Hereafter *HEA* stands for *History of Economic Analysis* published posthu-
mously in 1954.

[7]Cited from the abridged English version of Schumpeter (1914) in *Ten Great
Economists* (1952, p. 189).

'production period' is next to being nonsense—and impedes his
reader's progress to the core of his thought. (*HEA*, p. 847)

Schumpeter's criticism of Böhm-Bawerk's work is legitimate, because
the basic errors of Böhm-Bawerk's capital theory were revealed after
the two heated controversies over the concept of capital, i.e. one
between Böhm-Bawerk and other contemporary economists in the
1890s, and the other between Hayek and Knight in the 1930s.
However, we should note that Schumpeter's attack is geared toward
Böhm-Bawerk's technical deficiency, not his vision. In the same page
which I cited above, Schumpeter places Böhm-Bawerk over his prede-
cessors, Menger or Jevons:

> It is Böhm-Bawerk's model of schema of the economic pro-
> cess adumbrated above which makes him one of the great
> architects of economic science, and this schema was quite out-
> side Menger's as well as Jevons' range of vision. (*HEA*, p. 847)

In the same vein, we should read Schumpeter's final verdict on
Böhm-Bawerk's achievement very carefully, having Schumpeter's dis-
tinction between analysis and vision in mind:

> But, so the reader might well ask, if we recognize all this and
> if we introduce all those correction, what is left of Böhm-
> Bawerk's capital theory and in particular of his period of pro-
> duction. Well, nothing is left of him except the essential idea.
> And this keeps on proving its vitality by every piece of criticism
> and every piece of constructive work it evokes. (*HEA*, p. 909)

Now it is clear that Schumpeter criticism of Böhm-Bawerk is mainly
focused on the lack of rigorous technicality in Böhm-Bawerk's presen-
tation, not on the vision of the Austrian approach. In this light,
Schumpeter's vision or his view of economic process is closer to the
Austrian than to the Walrasian camp, although Schumpeter admires
Walras's mathematical rigorousness.

B. The "Circular Flow" and Static Equilibrium Method

As is well-known, in the second chapter of *The Theory of Economic
Development*, Schumpeter mistakenly asserts that the interest rate
would remain at zero in stationary equilibrium by denying the possibil-
ity of time preference:

> In the normal course of an economic system in which year in
> and year out the process of production follows the same route

and all data remain the same, would there be a systematic
undervaluation of means of production as compared with prod-
uct? (*TED*, p. 34)

Schumpeter's answer to his self-raised question is in the negative,
because "if the productive process turned out its results in periodic
intervals there would still be no waiting, because consumption could
adapt itself and run on continuously and at an equal rate per unit of
time, so that there would be no motive for underestimating future
products." (*TED*, pp. 36-7) Schumpeter's position reminds us of Clark
(1899)'s erroneous negation of the production period at the stationary
state, in his controversy with Böhm-Bawerk.[8]

Schumpeter's proposition on this matter evoked the criticism, not
only from his teacher, Böhm-Bawerk (1914) who thinks that time pref-
erence and production period matter, but from later economists like
Robbins (1930) who asserts that people would dissave at the zero inter-
est rate. After a series of researches, the paper of Negishi (1989) being
the most recent one, Schumpeter's strong assertion that the interest
rate would be be zero at the stationary state appears to be implausible,
because the interest rate could be positive even at the stationary state,
if there is the time preference of present over future consumption.
Schumpeter's conception of the "circular flow" could be saved by inter-
preting that Schumpeter holds the less extreme version that there
would exist a positive rate of interest in the stationary economy, as
Haberler (1951) suggests. In the defence of Schumpeter against Ro-
bbins, the position of Samuelson (1943) also seemed to be in line of
this interpretation:

> It is clear that Professor Schumpeter's theory of a zero rate of
> interest in a stationary circular flow economy could be dis-
> pensed with, and no great harm would be done to his theory of
> the cycle or of development. Instead of tending to rebound to a
> zero rate, the interest rate would tend, after a period of innova-
> tion, to return to some other rate, alledged to represent an
> intrinsic rate of time preference or impatience, or any other
> broad margin with the ingenuity of an economist can devise.[9]

Samuelson may be logically right, but there is something more in
Haberler's suggestion and Schumpeter's original argument. In *The
Theory of Economic Development*, Schumpeter is concerned with the

[8]For the logical re-interpretation of this controversy, see Dorfman (1959). For
the ingenious survey of contemporary literature, see Niehans (1991).
[9]Samuelson (1943, p. 204).

effect of credit expansion on technological change which is the basic factor to disturb the "circular flow". He focuses on the creation of interest out of equilibrium, and explains interest as occurring from profit. He thus makes a distinction between interest on consumptive loans and interest on productive loans, the latter of which he wants to elaborate on. Lengthy as it is, the often quoted passage writes:

> Interest is a premium on present over future purchasing power. This premium has several causes. Interest on consumptive loans is a case in point.... There have always been such cases of interest, and obviously they could also exist in the circular flow in which there is no development. But they do not constitute the great social phenomenon that needs explaining. This consists of interest on productive loans (Produktivzins). It is to be found *everywhere* in the capitalist system and not only where it originates, that is in new enterprises. I merely want to show that productive interest has its source in profits, that it is by nature an offshoot of the latter, and that it, like that which I call the "interest aspect" of returns, spreads from the profits incident to the successful carrying out of new combinations over the whole economic system and even forces its way into the sphere of old businesses, in whose life it would not be a necessary element if there were no development. This is all I mean by the statement: "the 'static' economy knows no productive interest"—which is certainly fundamental to our insight into the structure and workings of capitalism. (*TED*, pp. 157-8)

Schumpeter proceeds to summarize his exposition in three propositions "that interest as a great social phenomenon is a product of development, that it flows from profit, and that it does not adhere to concrete goods". (*TED*, p. 175) In other words, interest is generated from profit which is transitory income due to technological advantage.

It is now certain that Schumpeter devise the concept of "circular flow" as the imaginary state to show that the applicability of static equilibrium method is very limited and the fundamental nature of capitalist development has to be explained as disequilibrium phenomenon. This line of approach is similar to the Classical or the Austrian, rather than to the Walrasian. Thus, he does not want to engage into a serious quarrel with any equilibrium economics, including Böhm-Bawerk's, as he says that "our analysis fulfills the requirements of Böhm-Bawerk's theory of value throughout, and at no point is it exposed to any of Böhm-Bawerk's objections so far advanced." (*TED*, p. 159) He actually want to "put aside for the moment all other factors which may give rise to interest even where there is no development" (*TED*, p. 189) and focus on the

development due to technological innovation.

Schumpeter's attitude toward equilibrium method is more explicitly expressed in the first volume of *Business Cycles* (1939), in which he regards the usefulness of equilibrium concept only as a point of reference:

> ... when we observe that readjustment sets in which we interpret as a movement toward equilibrium, then and only then the ideal equilibrium becomes the goal of an economic process, the nature of which can be elucidated by reference to it. Then and only then equilibrium becomes what we have called it before, the "theoretical norm" of the economic variables. Hence, we will, for our purpose, recognize existence of equilibria *only at those discrete points on the time scale at which the system approaches a state which would, if reached, fulfill equilibrium conditions.* And since the system in practice never actually reaches such a state, we shall consider, instead of equilibrium points, ranges within which the system as a whole is more nearly in equilibrium than it is outside of them. Those ranges, which are the operational form to which we shall apply properly modified equilibrium considerations, we call *neighborhoods of equilibrium.*[10]

The above often-quoted passage explains why Schumpeter does not want to be seriously involved with the controversy with any equilibrium method adopted by either Böhm-Bawerk or Walras.

C. Statics, Dynamics, and Development

As is noted by Machlup (1951), Schumpeter adopted the terms "statics" and "dynamics" in his earlier works, such as *Das Wesen und Hauptinhalt der theoretischen Nationalökonomie* (1908), although he thinks that there could be no clear-cut distinction between two methods. In the first edition of *The Theory of Economic Development* (1912) published in German, he also distinguished "static" or hedonistic conduct from "dynamic" or energetic behavior of an entrepreneur.[11] In *The Theory of Economic Development*, what Schumpter meant by "statics" was equilibrium system not only with given data but also with the effects of small and continuous change, whereas "dynamics" is about discontinuous changes.

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[10]Schumpeter (1939, pp. 70-1).

[11]For the usage of these terms in Schumpeter's early works, see the article of Santarelli and Pesciarelli (1990).

However, by 1926 when its second edition was published, he found that the terms had been used by many economists with different meanings, he gave up his private meanings, and adapted Frisch's usage of dynamics to distinguish theorems which include "values of variables which belong to different points of time" from statics where all variables refer to the same point of time.[12] In the English edition based on the second German edition, in which he deleted the term "dynamic", he identified the "development" as a distinct phenomenon. He adds that "revolutionary" change would baffle not only "static" method in the usual sense, but also analysis of continuous adaptation which can be analyzed by static method:

> But "static" analysis is not only unable to predict the conse-
> quences of discontinuous changes in the traditional way of
> doing things; it can neither explain the occurrence of such pro-
> ductive revolutions nor the phenomena which accompany
> them. It can only investigate the new equilibrium position after
> the changes have occurred. It is just this occurrence of the
> "revolutionary" change that is our problem, the problem of eco-
> nomic development in a very narrow and formal sense. The
> reason why we so state the problem and turn aside from tradi-
> tional theory lies not so much in the fact that economic
> changes, especially, if not solely, in the capitalist epoch, have
> actually occurred thus and not by continuous adaptation, but
> more in their fruitfulness. (*TED*, pp. 62-3)

In the footnote to this passage, Schumpeter notes that not only prob-
lems of capital, credit, entrepreneurial profit, interest on capital, and
crises, but also the problem of increasing return, multiple equilibria,
and the time can be included in the "fruitfulness" or complexities of
changes.

He also stresses the difference between the problem of "development"
and the mere growth of the economy:

> Nor will the mere growth of the economy, as shown by the
> growth of population and wealth, be designated here as a pro-
> cess of development. For it calls forth no qualitatively new phe-
> nomena, but only processes of adaptation of the same kind as
> the changes in the natural data. Since we wish to direct our

[12]Schumpeter (1939, Vol.1, p. 48). For the different usage of the terms, see
Machlup(1951, p. 98). Frisch's distinction between statics and dynamics seems
to be most widely used, as Schumpeter (1954) and Hicks follow the terms.
However, many other different meanings can be attached to their expressions in
economics literature.

> attention to other phenomena, we shall regard such increases
> as changes in data. (*TED*, p. 63)

Shumpeter adds that such changes in data do not stand in the way of
the applicability of the "static" method. In the 1935 article on "The
Analysis of Economic Change," Schumpeter also defines "innovation"
as "changes in production functions which cannot be decomposed into
infinitesimal steps," whereas the "growth" is defined as continuous
change.

Schumpeter's view that the technical innovation should be dealt dif-
ferently from other changes in the data of "static" model can be con-
trasted with the view of Clark (1899) who treats equally the five causes
of economic progress, i.e. the change of population, capital, production
method, industrial establishments, and preferences.

What Schumpeter calls development or carrying out of new combina-
tion is comprised of now well-known five cases, i.e. i) the introduction
of a new good; ii) the introduction of a new production method; iii) the
opening of a new market; iv) the conquest of a new source of supply;
and v) the carrying out of the new industrial organization. The thing to
be emphasized is that these five cases are not within the reach of the
information set of any ordinary economic agents, and the change of
these will affect the economic behavior by changing the data entirely.
For example, the technological innovation will change the preferences,
so that the static equilibrium analysis is not applicable to this phe-
nomenon, since by the change of one of data, other datum is affected
more fastly than variables, such as prices or quantities:

> Yet innovations in the economic system do not as a rule take
> place in such a way that first new wants arise spontaneously
> in consumers and then the productive appratus swings round
> through their pressure. We do not deny the presence of this
> nexus. It is, however, the producer who as a rule initiates eco-
> nomic change, and consumers are educated by him if neces-
> sary; they are, as it were, taught to want new things, or things
> which differ in some respect or other from those which they
> have been in the habit of using. (*TED*, p. 65)

Schumpeter thinks that, due to the dependence of preference forma-
tion on technological innovation, neither static nor dynamic analysis in
the sense of Frish or Hicks is applicable to economic development. In
his last work, he writes:

> Dynamics means exclusively analysis that links quantities
> pertaining to different points of theoretic time ... and not the

theory of evolutionary processes that run their courses in historic time: it is practically coextensive with sequence analysis and includes period analysis as a special case, but it is not coextensive with the theory of economic growth or development, or 'progress'. (*HEA*, p. 1160)

Thus, Schumpeter keeps on emphasizing the importance of historical analysis in the explanation of business cycles, although he does not belittle the importance of equilibrium analysis in the understanding of market economy.

D. Money, Credit and Capital

Schumpeter underlines the role of money and credit expansion in the process of development, because a producer gets income just enough to keep the production level constant in the circular flow, and does not have new resources to embark upon innovation. Thus, Schumpter defines capital as "the level by which the entrepreneur subjects to his control the concrete goods which he needs, nothing but a means of diverting the factors of production to new uses, or of dictating a new direction to production." (*TED*, p.116) Schumpeter's definition of capital is similar to Menger's or Böhm-Bawerk's, because they all view "capital" as advance for starting production process.[13]

Wolfson (1958) argues that Schumpeter's definition of capital is different from that of Böhm-Bawerk (1889), since the former is the sum of means of payment and the latter is a group of intermediate products. However, the seemingly different usage of word "capital" should not be exaggerated, because both authors agree that the supply of advance is needed to start the production process. The crucial difference does not lie in the usage of term, but in the role of the advance in theoretical framework of each author. The increase of the amount of advance will bring about the prolongation of production process within the known techniques in Böhm-Bawerk, whereas it will result in technical innovation in Schumpter. Schumpeter is not dissatisfied with Böhm-Bawerk's description of technology in terms of roundabout methods of production, but with the static analysis of technical choice among known

[13]Blaug (1985) aptly names two contrasting views of the production process, one as "advance economics" which insists on the importance of time structure and the other as "synchronization economics" which denies its importance. Both Schumpeter and Böhm-Bawerk belong to the former, and their difference in the conception of capital is minor, as Wien-Claudi (1936) calls Schumpeter's theory as "monetary form of Böhm-Bawerk's theory".

alternatives.

Defining capital as the purchasing power for starting a new production process, Schumpeter emphasizes the importance of bank-credit for further development:

> Thus the main function of the money or capital market is trading in credit for the purpose of financing development. Development creates and nourishes this market. (*TED*, p. 126-7)

As is noted by Tichy(1983), Schumpeter keeps on stressing the initiative of banks to create credit not necessarily out of saving. Schumpeter argues that the theory of "credit creation" constitutes definite advance in analysis.[14]

He also emphasizes that the effects of an increase of money depend on the pattern of its use. Thus, he is very critical of the quantity theory of money:

> Wicksell was the first to see the problem clearly and to coin the appropriate concept, Neutral Money. In itself, this concept expresses nothing but the established belief in the possibility of pure 'real' analysis. But it also suggests recognition of the fact that money *need* not be neutral. So its creation induced a hunt for the conditions in which money is neutral. And this point eventually led to the discovery that no such conditions can be formulated, that is, that there is no such thing as neutral money or money that is a mere veil spread over the phenomena that really matter... (*HEA*, p. 1088)

One of the effect of money increase which Schumpeter focuses on is a discontinuous technical change to bring about the disturbance of real economy. This phenomenon cannot be captured by a traditional static analysis.

III. Hayek's Analysis of Equilibrium and Business Cycle

A. Hayek and the Austrian School

Many interpreters from the Austrian camp argue that Hayek is one of the most truthful followers of the Mengerian approach, in which the individual's economizing behavior under uncertainty and the role of price signal in the adjustment process are emphasized. They go further

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[14]*HEA*, p. 1114. Schumpeter does not see credit as coming from saving, because banks are treated as independent agents.

to say that this position of Hayek explains why he is very critical of using the aggregate measure, such as Böhm-Bawerk's average production period, as well as of the equilibrium method of other contemporary economists.

McCloughry (1984) argues that Hayek would be sharply critical of the Walrasian tradition of general equilibrium theory in that it assumes the market information to be given, although Hayek's thought was dominated by general equilibrium theory before the publication of famous 1937 paper on 'Economics and Knowledge'. Butos (1985) argues that Hayek's discomfort with the equilibrium method is evident even in the works of the early 1930s, and Hayek tries to redirect economic analysis away from equilibrium analysis toward the process by which the knowledge is acquired and communicated.

These secondary sources confirm that Hayek's own intention is different from Böhm-Bawerk or Walras. However, it should also be noted that Hayek blames Böhm-Bawerk mainly for failing to construct a proper equilibrium model:

> Böhm-Bawerk in many respects simply developed the ideas propounded by Jevons and made them intelligible to wider circles by elaborating them: but at the same time he gave the impetus to a movement away from what seems to me to be the most fruitful approach on Jevonian lines. His effectiveness, although I think mistaken, critique of the earlier productivity theories of interest had the effect of causing later development to centre increasingly round the "psychological" or "time-preference" element in his theory rather than the productivity element. (*PTC*, p. 42)[15]

In the same vein, Hayek argues that Böhm-Bawerk's assumption of the general lower valuation of future wants is not needed, because the utility of a larger quantity of the good to be produced in the more time-consuming process is to be compared with the utility of the good produced in the shorter process, in the 1927 paper.[16]

In addition, Hayek points out the defects of Böhm-Bawerk's measure of the average production period:

> All attempts to reduce the complex structure of waiting periods, which is described by the input functions *and* the output

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[15]Hereafter, *PTC* denotes the shortened title for *The Pure Theory of Capital*, and *PP* for *Prices and Production*.

[16]"On the Problem of the Theory of Interest," the English version published in McCloughry (1984, pp. 58-60).

> functions, to a single aggregate or average investment period,
> which could be generally substituted for these functions in the
> discussion of the productivity of investment, are bound to fail,
> because the different waiting periods cannot be reduced to a
> common denominator in purely technical terms. This would be
> only possible provided we had to deal with only one homoge-
> neous kind of input, and provided the value of product were
> always directly proportional to the amount of this input that
> was used. (*PTC*, p. 141-2)

It is well-known that Hayek's criticisms of Böhm-Bawerk's concept of
average production period or subsistence fund, which precede the
modern capital-theoretic criticism of Sraffa against Solow, are compara-
tive static propositions about equilibrium states. Thus, Hayek's contri-
bution in the area of equilibrium models should not be ignored.

B. Long-run Stationary and Intertemporal General Equilibrium

In his debut work in English speaking academia, *Prices and Pro-
duction* (1931), Hayek explains an economic crisis as the correction
process of misdirections of capital followed by the credit-induced boom.
At that time, Hayek's book inspired disputes, not only over the rele-
vance of his explanation of economic crisis, but over the applicability of
the Austrian capital theory to a dynamic analysis. These disputes
somewhat blurred Hayek's contribution to general equilibrium eco-
nomics, until the research of Milgate (1979) and the testimony of Hicks
(1979) which confirm that Hayek was the originator of the term "inter-
temporal general equilibrium".

In the 1928 paper on the "Intertemporal Price Equilibrium and
Movements in the Value of Money," Hayek suggests that the difference
in the price of a particular good at different points in time be consi-
dered on the same footing with the price of a good at different loca-
tions. He goes on to argue that equilibrium analysis is applicable to the
consideration of the intertemporal price structure:

> It is in the analysis of the effects of the changes in external
> conditions which naturally recur in relatively short periods of
> time that it is most obvious that only by conceptually reducing
> them to an equilibrium system can they be understand. But
> this also shows how unjustified and inappropriate are all
> attempts to restrict the applicability of the equilibrium concept
> exclusively to systems which extend through periods of time
> within which all external conditions remain constant. Rather,
> to enable the use of equilibrium analysis, it is only necessary to

assume, as we have done, that no deviation from the expected course of events takes place during the period.[17]

In the same vein, Hayek basically identifies "equilibrium theory" with "modern theory of the general interdependence of all economic quantities, which has been most perfectly expressed by the Lausanne School of theoretical economics."[18] In the 1933 paper on "Price Expectations, Monetary Disturbances and Malinvestments," Hayek summarizes the state of equilibrium as is envisaged by Wicksell, who absorbed both the Walrasian and Böhm-Bawerkian approach:

> The starting point of a fully developed theory of this kind would be (a) the intentions of all the consumers with respect to the way in which they wish to distribute at all the relevant dates all their resources (not merely their "income") between current consumption and provision for future consumption, and (b) the separate and independent decisions of the entrepreneurs with respect to the amounts of consumers' goods which they plan to provide at these various dates. Correspondence between these two groups of decisions would be characteristic of the kind of equilibrium which we now usually describe as a state where the idea of an equilibrium rate of interest is connected.[19]

While sophisticating the concept of intertemporal general equilibrium, Hayek suggests that the concept of investment function with multivariate arguments be used instead of Böhm-Bawerk's average production period:

> It is for this reason, too, that it is impossible to substitute any one-dimensional magnitude like the "average period of production" for the concept of the investment function. For there is no one single average period for which a quantity of factors could be invested with the result that the quantity of capital so created would be the same as is the same quantity of factors had been invested for the range of periods described by a given investment function, whatever the rate of interest. The mean value of these different investment periods which would satisfy this condition would have to be different for every rate of interest.[20]

For the same reason, Hayek points out the absurdity of Böhm-

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[17]The English translation of Hayek (1928) in McCloughry (1984, p. 85).
[18]Hayek (1933b, p. 42).
[19]Hayek (1933a) reprinted in Hayek (1939, pp. 154-5).
[20]Hayek (1934, p. 217).

Bawerk's assumption of given subsistence fund, or the value of capital stock:

> This stock of non-permanent resources in the form in which it exists as a datum is not some definite quantity of capital; for it can be expressed as a single magnitude only after the relative values of the items of which it is composed have been determined. And these values are clearly a resultant of the same equilibrating forces as determine the investment periods. The initial datum from which we have to start is simply an enumeration of all the items of which this stock of non-permanent resources is composed, and of all their technical attributes. (*PTC*, pp. 191-2)

Hayek also recognizes the existence of multiple-rates of interest at the state of intertemporal general equilibrium, in his reply to Sraffa's denial of the recovery mechanism of credit-induced boom:

> I think it would be truer to say that, in this situation, there would be no single rate which, applied to all commodities, would satisfy the conditions of equilibrium rates, but there might, at any moment, be as many "natural" rates of interest as there are commodities, *all* of which would be *equilibrium rates*; and which would all be the combined result of the factors affecting the present and future supply of the individual commodities, and of the factors usually regarded as determining the rate of interest. There can, for example, be very little doubt that the "natural" rate of interest on a loan of strawberries from July to January will be even be negative, while for loans of most other commodities over the same period it will be positive.[21]

Although Hayek certainly knows the concept of intertemporal general equilibrium in the early 1930s, his analysis of business cycle in *Prices and Production* (1931) starts with the state of stationary equilibrium. It also uses on Böhm-Bawerk's average production period:

> The proportion between the amount of intermediate products which is necessary at any moment of time to secure a continuous output of a given quantity of consumers' goods, and the amount of that output must grow with the length of the roundabout process of production. As the average time interval between the application of the original means of production and the completion of the consumers' goods increases, production becomes more capitalistic, and vice versa. In the case we are contemplating in which the original means of production

[21]Hayek (1932, p. 245).

> are applied at a constant rate throughout the whole process of production, this average time is exactly half as long as the time which elapses between the application of the first unit of original means of production and the completion of the process. (*PP*, pp. 41-2)

The reasons why Hayek uses stationary equilibrium in presenting his model of business cycle are twofold. The first is that the concept of stationary equilibrium is the simple device to get his ideas across, in the lecture to economics students out of which the book, *Prices and Production*, is produced. In other words, this device is one typical example of what Stigler (1965) calls "strong cases" which are designed for the convenience of easy presentation.

The more important reason, however, is that Hayek thinks that anyhow there exists a tendency towards full stationary equilibrium as an "ideal final equilibrium". although the tendency is very slow and gradual. In his earlier work, Hayek writes:

> an adequate explanation of the 'natural rate' is the indispensable starting point for any realization of the conditions necessary to the achievement of equilibrium, and for an understanding of the effects which every rate of interest actually in force exerts on the economic system. It is true that it does not suffice to explain all empirically observed rates since it takes into consideration only one of the factors determining those rates; but any consideration of ruling interest rates which did not relate its analysis to that of the imaginary interest rate of static theory would hang entirely in the air.[22]

As is noted by Colonna (1990), this line of thought is evident even in his later work, *The Pure Theory of Capital*, where he suggested the concept of intertemporal general equilibrium. In this book, Hayek at least thinks that the explanation of the uniform rate of return in terms of real factors of the economy is logically prior to the monetary explanation of interest rate, although the stationary equilibrium is unlikely to be the case in the real world:

> in so far as we are justified in speaking of a tendency towards an equilibrium, that tendency is due to the fact that all those who could, directly or indirectly, command ready consumers' good which they do not want to cosume immediately, will be guided in their investment by the single consideration of obtaining the highest percentage return. And their endeavor to distribute investment in such a way as to bring the highest

[22]Hayek (1933b, p. 201).

> return will necessary bring about a uniform rate of return.
> This will be so quite independently of any possibility of lending
> money, and consequently of obtaining interest on money loans.
> (*PTC*, pp. 265-6)

Certainly Hayek thinks that, in the market economy, the tendency towards
a stationary long-run equilibrium exists, although the adjustment may take
long. Thus, the analysis based on stationary equilibrium is a good starting
point for presenting his view.

C. Statics and Dynamics

In his earlier works, Hayek seems to identify static method with equilibrium analysis, and dynamics with disequilibrium analysis or the analysis of
transition from one equilibrium to another. In the 1926 paper on "The
Problem of the Trade Cycle," Hayek writes:

> For the essential means of explanations in static theory, which
> is, at the same time, the indispensable assumption for the explanation of particular price variations, is the assumption that prices
> supply an automatic mechanism for equilibrating supply and
> demand.[23]

The same distinction between statics and dynamics also applies to the
framework in *Prices and Production,* in which the business cycle is
explained as the reverse movement followed by the credit-induced boom in
the transition period.

In the 1933 paper on "Price Expectations, Monetary Disturbances and
Malinvestments," Hayek makes the same distinction between statics, "pure
theory of equilibrium", and dynamics, "an analysis of the processes resulting from any change in the data."[24] However, Hayek adds that the traditional equilibrium analysis requires a certain amount of revision to deal with
economic dynamics, crises and economic fluctuations:

> What we all seek is therefore not a jump into something entirely
> new and different but a development of our fundamental theoretical apparatus which will enable us to explain dynamic phenomenon. Not very long ago I myself still believed that the best way
> to express this was to say that the theory of the trade cycle at
> which we were aiming ought to be organically superimposed upon
> the existing theory of equilibrium. I am now more inclined to say
> that general theory itself ought to be developed so as to enable us
> to use it directly in the explanation of particular industrial fluctua-

[23]Hayek (1933b, p. 43).
[24]Hayek (1933a) reprinted in Hayek (1939, p. 138).

tions.[25]

In other words, Hayek thinks that the effort should be directed toward bridging the gulf between statics and dynamics.

Finally, in *The Pure Theory of Capital,* in which statics is defined as the logical analysis of the different plans existing at one moment and dynamics as the analysis of a process in time, Hayek points out the ambiguity of the concept of dynamics:

> When it is used in contrast to equilibrium analysis in general, it refers to an explanation of the economic process as it proceeds in time, an explanation in terms of causation which must necessarily be treated as a chain of historical sequences. What we find here is not mutual interdependence between all phenomenon but a unilateral dependence of the succeeding event on the preceding one. This kind of causal explanation of the process in time is of course the ultimate goal of all economic analysis, and equilibrium, analysis is significant only in so far as it is preparatory to this main task. But between the concept of stationary state and the problems of dynamics in this sense, there is an intermediate field through which we have to pass in order to go from one to the other. The term dynamics is sometime also applied to this intermediate field, but here it refers to phenomina which still come within the scope of equilibrium analysis in the wide sense. (*PTC,* p. 17)

The intermediate field in this cited passage is the intertemporal general equilibrium analysis which Hayek has developed since 1928. This analysis is regarded as the intermediate step toward true dynamics. Although Hayek's final goal of economic analysis is dynamics, the larger part of *The Pure Theory of Capital* is about comparative static arguments, especially when he deals with the change of data, such as tastes, initial resources, or capital accumulation, and technical change. The dynamic process which Hayek seriously considers is the effect of money and competition. At the start of Part III, Hayek writes:

> We are, in other words, deliberately discussing changes which can be brought about only through the mechanism of money and competition, yet disregard for our present purposes the exact role these two factors play. The reason for this is that we are here really not interested in the process which brings about equilibrium, but merely in the conditions of a state of equilibrium, and when we are considering positions other than equilibrium positions it is merely to show why they are not

[25]Hayek (1939, p. 137).

> equilibrium positions. And the approach to equilibrium of
> which we shall occasionally speak is not meant as a descrip-
> tion of a process but merely as a conceptual tool which leads
> us, as it were, as spectators from positions which are more
> removed from equilibrium to positions which are closer to it,
> and finally to the equilibrium position itself. (*PTC*, p. 248)

As is clear from the above passage, Hayek thinks that the change of
data in equilibrium model can be adequately dealt with by the static
analysis. Actually all changes in data, such as preferences, endow-
ments and techniques, are treated on an equal footing:

> It may be added here that what has been said about inven-
> tions as a typical example of unforseen changes in the condi-
> tions of production, applies equally well to unforseen changes
> in the supply of pure input, or to unforseen changes in tastes.
> Both might be treated on exactly the same lines and classified
> according to their capital-saving or labor-saving tendencies.
> (*PTC*, p. 320)

Hayek thinks that the static analysis can be applied to the change of
data, whereas the effects of money would be better treated by the
dynamic analysis.

D. Money and Equilibrium Business Cycle Theory

Hayek explains the business cycle as the correction process of exces-
sive investment guided mistakenly by the money creation. The crucial
factor to bring about the reverse movement is what is called "Hayek's
Ricardo effect" due to the decrease of real wage in the transition period.
In his latest elucidation of the "Ricardo effect," Hayek writes:

> When, however, the inflow of money through investment
> spreading of its effects will continue and will tend to restore
> something similar to the initial position. ... Prices of invest-
> ment goods at this stage will fall; prices of consumer goods
> will, for some time, continue to rise. This will make some of the
> investment which has been taking place less profitable than it
> was before, at the same time that the flow of investable fund is
> reduced. The result will be that some of the factors which dur-
> ing the boom will have become committed to producing very
> capital-intensive equipment will become unemployed.[26]

This effect is explained, first by using Böhm-Bawerk's average produc-
tion period in *Prices and Production*, and later by either investment

[26]Hayek (1969, pp. 281-2).

function or triangular diagram in the 1934 paper "On the Relationship between Investment and Output" or by the turnover period in 1939 paper, entitled "Profits, Interest and Investment." Through these various versions which were presented in the course of the controversy with Hayek's contemporaries over the issue of the validity of "Ricardo effect", it becomes certain that it has nothing to do with comparative static arguments, but with a phenomenon which can occur during the one equilibrium to another. In other words, due to the existence of lag between the initiation and completion of investment, the relative price structure will change to thwart entrepreneur's efforts to increase the capital stock.

Then, the question arises why Hayek treats the effects of money creation by using dynamic analysis. It is because Hayek thinks that "money by its very nature constitutes a kind of loose joint in the self-equilibrating apparatus of the price mechanism which is bound to impede its working." (*PTC*, p. 408) For Hayek, money is a general reserve of command over resources in the uncertain future:

> It is clear that to the individual the holding of money is one form of holding his assets and will compete with other forms of investment for the resources at his command. Although holding money yields no direct return, it may, by enabling the holder to take advantage of unforeseen opportunities, be as much a means of reaping a return as any factor of production. ... he will also distribute his assets between investment in goods, in money loans, and in cash balances in such a way as to equalize the advantage he expects to derive from these kinds of assets. (*PTC*, pp. 357-8)

Thus, a change in the distribution between money and other real assets is bound to affect the rate of interest and the rate of profit. Hayek further goes on to argue that the problem of the relationship between the various rates of interest and profit, unlike the existence of long-run profit-rate, is "very definitely a problem which belong more to the field of monetary theory or economic dynamics generally than to the field of general equilibrium analysis." (*PTC*, p. 397) The diffusion of money is treated like the diffusion of knowledge about which equilibrium analysis can tell us nothing, as is emphasized in the famous 1937 article on "Economics and Knowledge."

However, Hayek never forgets to warn against too excessive concentration on short-run effects or purely monetary factors:

> It used, however, to be regarded as the duty and the privilege

> of the economist to study and to stress the long effects which
> are apt to be hidden to the untrained eye, and to leave the con-
> cern about the more immediate effects to the practical man,
> who in any event would see only the latter and nothing else.
> The aim and effect of two hundred years of continuous devel-
> opment of economic thought have essentially been to lead us
> away from, and "behind", the more superficial monetary mech-
> anism and to bring out the real forces which guide long-run
> development. (*PTC*, p. 409)

In Hayek's theoretical framework, the level of money may disturb the
economy in the short-run, but only the real factors determine its long-
run position.

IV. Concluding Remarks

Although both Schumpeter and Hayek are in the tradition of Aus-
trian economics, their theoretical systems are more dissimilar than
they apparently look. The difference between them lies in their main
theoretical concern and their view of the major movement of capita-
lism.

Schumpeter's theory of economic development is about equilibrium-
breaking process which cannot be adequately dealt with by the equilib-
rium analysis, because the innovation changes other data, such as
preferences. Schumpeter does not seem to seek a serious controversy
with any equilibrium economics of any kind, either Böhm-Bawerk's or
Walras's, although he values Walras more highly than Böhm-Bawerk
due to the technical rigorousness. The "circular flow" which he pre-
sents as the starting point of his explanation of development is nothing
but the imaginary state from which the reality tends away. For
Schumpeter, capitalism is inherently instable due to the very nature of
its development, which is generated by innovation, or creative destruc-
tion. He also emphasizes the role of credit in bringing about the inno-
vation, and denies the neutrality of money. Thus, he avoids using the
distinction between statics and dynamics, since his development
theory is about evolutionary process.

On the other hand, Hayek is concerned with the equilibrating pro-
cess of the market economy. Thus, he seriously develops the static
analysis, not only of stationary equilibrium, but also of intertemporal
general equilibrium. He also criticizes the fallacy of Böhm-Bawerk's
capital theory from the perspective of rigorous equilibrium models. He

uses the stationary state as the "strong case" to get his message across. Hayek believes in the basic stabilizing mechanism of the market economy, and focuses on the real factors in explaining its long-run position. Although he admits that the distinction is not clear, he is using the concept of statics and dynamics in the usual sense, and emphasizes statics.

In this light, the contribution of Hayek is closer to the Walrasian economics than the truthful Austrians allege, and that of Schumpeter seems to be not much absorbed by the mainstream economics, although Schumpeter evaluates Walras highly for his technicality.

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