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HOW DID WICKSELL'S THEORY OF CUMULATIVE PROCESS INFLUENCE KEYNES AND HIS CONTEMPORARIES? *

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I. INTRODUCTION

Monetary economics came to the fore with Wicksell (1898), a century after Thornton (1802).[1] The theory of cumulative process proposed by Wicksell was to have great influence on economic theory in the 1920s-30s through critical interpretations.

The purpose of the present paper is to examine this strand of thought by taking in Keynes, Myrdal and Hayek as well as Wicksell. How did Wicksell's theory of cumulative process influence them? How did they evaluate Wicksell's theory as monetary economics, and in so doing take a critical stance on the neoclassical orthodoxy? To what degree did they accept and criticize Wicksell's theory? What precisely are their theories? And what are the similarities and differences between them? To borrow from Robbins (1955, 58-59), "[w]hat is relevant in this connection" is not "whether [their theories] followed [Wicksell] in all respects but whether [they] conformed to the type of analysis of which [Wicksell's theory is] the archetype".[2]

We will address these questions, which are of fundamental importance to: (i) understand how monetary economics developed in the inter-war period (one of the most significant developments in modern economics); (ii) understand how Keynes accepted and then rejected Wicksell's influence, or to trace out the

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Keynesian Revolution; (iii) understand recent developments in monetary economics.[3]

II. INTERPRETATIONS OF WICKSELL'S INFLUENCE

To prepare the ground for this paper, let us see how Wicksell's influence has been so far understood.

We shall begin with the scholars evaluating Wicksell's influence positively, although for different reasons.

Leijonhufvud (1981) points to a maladjustment of the rates of interest as the core of Wicksell's influence, taking the essence of the Keynesian Revolution as either "the *Treatise* plus the quantity adjustment" or "the *General Theory* minus the theory of liquidity preference" (so called the "Z theory").[4] In other words, he supports the loanable funds theory, rejecting the theory of liquidity preference as a theory of interest, and the "dual decision hypothesis" as a theory of effective demand. From this viewpoint he criticizes the "Neoclassical Synthesis".

Shackle (1967, Chapter 9) takes Wicksell's influence as working against the general equilibrium theory although his definition is too broad in scope. He regards both the *Treatise* and the *General Theory* as manifestations of Wicksell's influence, both the *General Theory* and Myrdal (1939) as "one and the same theory" (1967, 126. Hession (1984, 287) follows Schackle), and both the *Treatise* and Hayek (1930) as two sides of the same coin.

Akashi (1988, 28-29) defines the "Wicksellian Paradigm" as consisting of the real system and a theory of cumulative process, seeing it as casting doubt on the quantity theory of money and yet still keeping the remnants of the classical dichotomy. In the line of succession to the paradigm he saw, on the one hand, Hayek, bringing the focus on the process of real fluctuations, and, on the other hand, the Stockholm School (Lindahl and Myrdal) and the Cambridge School (Robertson and Keynes), with the focus on the process of monetary fluctuations. Akashi (1988, 202-204) logically explains the "Keynesian Paradigm" in terms of the IS-LM formula.

Hishiyama (1990; 1993) sees Wicksell's cumulative process theory as a challenge against the classical dichotomy and the quantity theory of money, and as a denial of the capacity of the rate of interest to adjust the economy. The *Treatise*, in contrast with the *General Theory*, is regarded as exemplifying the "Wicksellian mode of adjustment".

Chiodi (1991, 39) rates Wicksell's theory against Ricardo's classical (and neoclassical) monetary theory while, in the same text (Chapter 8), seeing the

younger generation as set on the wrong path. Examining Lindahl and Ohlin, Chiodi (1991, Chapter 8) takes a somewhat critical position on the concept of the Wicksell's influence. He also maintains that Wicksell's monetary theory has been so far misinterpreted, criticizing Patinkin and Leijonhufvud. Maintaining that Wicksell's theory is coherently critical of the quantity theory, Chiodi (1991, 1) describes Wicksell's attitude toward the quantity theory as "schizophrenia".

Laidler (1991, 119) agrees with an observation made by Ohlin in 1936 in deeming Wicksell's theory "an amplification" of the old quantity theory (Gootzeit (1999), Ebeling (1999), Humphrey (1999), and Ascheim=Tavlas (1999) share this view), recognizing that Wicksell's followers rejected the quantity theory. Laidler focuses on Wicksell's softening attitude towards the quantity theory between Wicksell (1898) and Wicksell (1915), from which he concludes that Wicksell was a persistent exponent of the quantity theory.

The Horizontalists and Circuitists such as Graziani (2003) and Rochon (1999) rate Wicksell's influence highly solely in terms of money endogeneity or a circuit point of view.[5] They reject the theory of cumulative process and the loanable fund theory as Wicksell's influence, accepting the *Treatise* while tempted to reject the *General Theory* (especially the theory of liquidity preference).

Let us now go on to the scholars who view Wicksell's influence negatively.

Milgate (1982, 76) and Garegnani (Eatwell=Milgate, 1983, Chapter 7) criticize Wicksell's influences, arguing that Wicksell's theory [inclusive of Hawtrey (1913; 1923), Robertson (1926) and Lavington (1922)] marks the "embellishment" rather than overthrow of neo-classical economics.

Amadeo (in Davis, 1994) regards the Wicksellian analysis found in Lindahl, Hayek and others as the "sequence of static finite periods" method, as opposed to Keynes's "dynamic equilibrium method".

Rogers (1989) criticizes Wicksell's monetary theory as no more than an extended version of the quantity theory of money pertaining to "real analysis" which is in sharp contrast with long-term "monetary equilibrium" as expressed in chapter 17 of the *General Theory* (genuine "monetary economics"). His concern is exclusively with Wicksell, paying little attention to other Wicksellians such as Myrdal, Hayek and others.

Before taking up the main topic, we might as well clarify our stance.

i) Wicksell greatly influenced Keynes and his contemporaries, who criticized neo-classical orthodoxy and endeavored to put forward their brand of monetary economics.

ii) We are in no position here to rate these theories. What we set out to do

is to examine how they were influenced by Wicksell's theory..

iii) There exist two types of theories in the *Treatise*. 'Keynes's own theory' is more important than Wicksellian theory, for Keynes abandoned the latter soon after the *Treatise*. Furthermore we regard the *General Theory* as quite independent of Wicksell's influence.

III. WICKSELL

1. Wicksell's View

On the one hand Wicksell is a neoclassical economist who argues that a successful economic theory should comprise a theory of relative prices and one of absolute prices, the two being separable. On the other hand, he holds that the theory of absolute prices has serious flaws.[6]

Concerning the theory of relative prices, Wicksell (1893) regards Walras' general equilibrium theory as accurately describing the system of production, distribution and exchange, except its capital theory.[7]

As for the theory of absolute prices, Wicksell (1898) sees the quantity theory as erroneous and puts forward his theory of cumulative process.[8]

Wicksell criticizes the quantity theory on three points:

(i) It assumes the constancy of the velocity of money: in fact, it fluctuates greatly in the actual economy, and is theoretically unlimited.

(ii) It assumes that the medium of exchange consists of notes and coins only, so that the quantity of money is inelastic if the quantity of currency remains constant. In fact, numerous instruments of credit are used, so that the quantity of money is elastic. This is especially true of an "organized credit economy".

(iii) It holds that an increase in the quantity of money induces an increase in money prices and a fall in the money rate of interest. In fact it accompanies a rise in the money rate.[9]

2. Wicksell's Theory[10]

Wicksell's theory[11] explains changes in money prices in terms of the relation between the natural rate and the money rates of interest. The quantity of money is assumed to adjust to changes in money prices and trade.[12]

The natural rate of interest is defined as "the rate of interest which would be determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods" (Wicksell, 1898, 102). It fluctuates incessantly due to technical progress, belonging to the theory of

relative prices. Any change in the natural rate triggers a change in the price level. Wicksell (1898, 119) states that the market rate of interest "usually follows … [the natural rate] very slowly and with considerable hesitation"

Wicksell supposes that the banking system has no rapid access to information on changes in the natural rate while industry has. He also assumes that it can lend out money at a certain rate of interest whatever the demand for money might be.

Thus the divergence between the natural rate of interest and the market rate can persist over an appreciable period. It is only as a result of the movement of prices that the two rates of interest become equal.

Suppose that in an organized credit economy the market rate of interest is kept lower than the natural rate for a certain period of time. The entrepreneurs borrow money from the banking system, using it as a "wage-rent" fund, and advance it to laborers, landlords and so forth, who, in turn, purchase consumption goods from the capitalists by spending their income. The capitalists earn interest by depositing the sale proceeds which they made at the beginning of the period. The entrepreneurs engaged in production in the current period sell their output (consumption goods) to the capitalists, and repay borrowed money to the banking system. As a result, the entrepreneurs obtain excess profits equal to [the natural rate - the market rate] × advanced capital.

If the entrepreneurs continue to reap excess profits, their desire to expand production grows (no actual expansion occurs, the structure of roundabout production being assumed to remain constant). The demand for labor, raw materials, durable investment goods and so forth increases, which induces rises in money wages and rent (full employment is assumed). The entrepreneurs need to borrow more money from the banking system. This is advanced to laborers and landlords, and the same process as above proceeds.

Once the entrepreneurs conduct their business taking rising prices into account, prices rise at an accelerated pace due to the "law of continuity and inertia" (Wicksell, 1898, 135). Eventually this process comes to an end as the market rate of interest catches up with the natural rate with the stability of prices at a new equilibrium.

At the root of the theory of cumulative process lies the determination of the price level of consumption goods by aggregate supply and aggregate demand. Aggregate supply is assumed to remain constant while aggregate demand depends on the entrepreneurs' willingness to expand production.

With regard to the argument that incomes determine the price level of consumption goods, Wicksell refers to the first half of Tooke's thirteenth proposition.[13]

We may formulate Wicksell's theory as follows:

$$D_t = D_t\ (\pi_{t-1}) \qquad (1)$$
$$M_t = D_t \qquad (2)$$
$$\pi_{t-1} = D_{t-1} \cdot (n - r) \qquad (3)$$
$$C_{t-1} = D_{t-1} \cdot r \qquad (4)$$
$$S_t = Y_{t-1} - (\pi_{t-1} + C_{t-1})/P_{t-1} \qquad (5)$$
$$D_t = P_t \cdot S_t \qquad (6)$$
$$Y = Y_{t-1} = f_{t-1}(T) = \text{constant} \qquad (7)$$

where D is the amount of money required by entrepreneurs, π excess profit, M the amount of money supplied by the banks, Y the volume of output of consumption goods, $f(\cdot)$ the production function, n the natural rate of interest, r the money rate, C the amount of money obtained by capitalists, S the supply of consumption goods, P the price level of consumption goods, and $_t$ time.

Here n and r are exogenous variables, D_{t-1} and P_{t-1} predetermined variables. The system contains six endogenous variables (D_t, π_{t-1}, M_t, S_t, C_{t-1}, P_t) and six equations, so it is soluble.

Entrepreneurs determine how much money is required based on π_{t-1} ((1)). This amount of money is financed by the banking system ((2)). π_{t-1} is equal to the amount of money required in the previous period (advanced capital) multiplied by the difference between the two rates of interest ((3)). The amount owed in interest in the preceding period is equal to the money rate multiplied by the amount of money required in the previous period (((4)). The amount of consumption goods supplied in this period, S_t, is equal to Y_{t-1} minus the sum of the volume consumed by entrepreneurs, π_{t-1}/P_{t-1}, and the volume consumed by capitalists, C_{t-1}/P_{t-1} ((5)). The price level of consumption goods, P_t, is determined by aggregate demand, D_t, and aggregate supply, S_t ((6)).[14] The volume of output remains constant ((7)).

From equations (5) and (6) the following equation is obtained:

$$D_t = P_t\ [Y_{t-1} - (\pi_{t-1} + C_{t-1})/P_{t-1}] \qquad (8)$$

The left-hand side is the demand of the factors of production for consumption goods, while the expression in square brackets on the right-hand side represents the supply of consumption goods to the factors of production. The price level is determined by these two. This should be the 'fundamental equation'.

From equations (3), (4) and (7), the following is obtained:

$$P_t = D_t/[Y - D_{t-1} \cdot n/P_{t-1}] \qquad (9)$$

Thus, in the case where, in the previous period, the rate of the demand for money required by entrepreneurs is either larger than (Wicksell probably had this case in mind), or equal to, the rate of increase (decrease) in the price level, the price level necessarily goes on rising (falling) so long as the demand for money required goes on increasing over time.

IV. KEYNES AND HIS CONTEMPORARIES

1. The *Treatise*[15]

A. Keynes's View

We shall examine Keynes's views on bank rate theories, investment/saving and the quantity theory of money.

Keynes identifies four bank rate theories so far developed, variously regarding the bank rate as;

(i) the means of regulating the quantity of bank money. Keynes thinks something essential is missing there.
(ii) the means of protecting a country's gold reserves. Keynes evaluates and uses it in his open system.
(iii) a psychological influence on price levels. Keynes criticizes this for a failure to explain the original effect of the change in the bank rate on the price level.
(iv) influencing investment and savings: Keynes regards this as the essence of the bank rate. He sees Wicksell(1898) as representing this idea and coming close to his "fundamental equation"[16]:

Although the bank rate plays a pivotal role in Keynes's theory, money supply also has a part to play. This may have something to do with Wicksell's construction of his theory in an "organized credit economy", and Keynes's criticism that Wicksell does not succeed in "linking up his theory of bank rate to the quantity equation" (*TM*.1, 167).

Keynes explains his "general theory of bank rate" as an extension of (iv) as follows:

(i) Suppose that the market rate of interest, say, rises above the natural rate, which causes the demand price of investment goods to fall (Profit Deflation), resulting in a decrease of the volume of investment. A rise in the market rate of interest also causes savings to increase, though not by an equal amount. Thus investment decreases more than savings increase.
(ii) A fall in the price level of investment goods causes production to decrease (which means a decrease in the value of investment). In addition, since an increase in savings means a decrease in consumption, the price level of consumption goods decreases. Thus, the price level as a whole falls.
(iii) When producers incur losses, they cut the level of employment at the existing rate of earnings. If this continues, unemployment increases until the rate of earnings is reduced (Cost Deflation. *TM*.1, 171).

Keynes argues (i) with the second fundamental equation in mind. The first point in (ii) is based on the TM supply function (to be explained later) in the investment goods sector, the second on the first fundamental equation.

Here the second fundamental equation occupies a central position, and the first fundamental equation a relatively minor one. The two equations and the TM supply function are used here somewhat loosely.[17]

Keynes stresses that investment is not usually equal to savings, offering two reasons: those who determine the division of the total output are not the same as those who determine that of the total income; earnings and savings do not include entrepreneurs' profits (or losses), while the value of investment does.

Keynes criticizes the quantity theory[18] as follows:

(i) It deal with the various kinds of ambiguous price levels;
(ii)It fail to distinguish between income, business, and savings deposits, so that disturbances arising from changes in the relative proportions of deposits cannot be explained.
(iii) It cannot analyze a dynamic process in which the price level changes from a divergence between saving and investment.

Underlying his criticism is an important conviction: unless the influence of the bank rate upon investment and saving and the distinction between earnings and profits are introduced into analysis, the dynamic process of price formation cannot be captured. He arrives at this conviction, claiming an advantage of the "fundamental equations" over the quantity theories (see *TM*.1, 198-199); any analysis which fails to distinguish between various kinds of transactions will cause confusion.

Keynes offers two reasons for giving priority to the bank rate over the quantity of money.[19]

(i) A change in the bank rate influences various factors such as the volume of output and the rate of profits, which means that we cannot estimate the quantity of money related to any one of them.
(ii) The direction of causation is as follows: changes in the bank rate cause the market rate of interest to shift relative to the natural rate, which in turn causes the quantity of money, and consequently the price level, to move.

B. Keynes's Theory[20]

a. Two Theories

The most significant feature of the *Treatise* theory should be the coexistence of a Wicksellian theory and 'Keynes's own theory'.

The *Treatise* belongs to this current of thought in explaining the fluctuations of the economy in terms of the natural and money rates of interest, and accepting Wicksell's three conditions of monetary equilibrium.

At the same time, Keynes develops his own theory, consisting of two parts, one of which addresses the determination of variables relating to consumption goods and investment goods in 'each period'.

(Mechanism 1) The cost of production and the volume of output are determined at the beginning of the current period. Once the expenditure for consumption goods is determined on the basis of earnings, it is automatically realized as the sale proceeds of consumption goods, and the price level and the profit amount are simultaneously determined.

(Mechanism 2) The cost of production and the volume of output are determined at the beginning of the current period. The price level of

investment goods is determined[21] either in the stock market or as the demand price of capital goods. As a result, profit is determined.

The other part deals with the determination of variables between one period and the next.

（Mechanism 3）The behavior of entrepreneurs is such that, if they make a profit（loss）in the current period, they expand（contract）output in the next.

We will refer to this behavioral function as the TM supply function.

Now, 'Keynes's own theory' can be expressed as the dynamic process consisting of Mechanisms 1 and 2 working through Mechanism 3 --- a dynamic process inclusive of price levels and volumes of output.

b. The Credit Cycle

The *Treatise* depicts the credit cycle as follows. Suppose that something (a new invention, say, or a return of business confidence) happens to increase the attractiveness of investment. The price level of investment goods rises, and their output increases in the next period through the TM supply function. As a result, the level of employment and consumption increase. Consequently the price level of consumption goods rises, and their output increases in the next period through the TM supply function. Thus the behavior of firms in increasing output under high profit causes a rise in money wages ("income inflation"). In this process, the volume of working capital also increases, so that business continues to pick up at an accelerated rate.

The turning point occurs as a result of several causes: evaporation of the attractions of new investment; faltering in financial expectations (due to the predominance of bearishness, and an increase in the financial circulation); a fall in the price level of consumption goods (due to the slower increase in the expenditure on consumption than in the output of consumption goods, as well as the growing inability of the banking system to keep pace with the increasing requirements of the industrial and the financial circulations, which incidentally causes a rise in the rate of interest.

Then the economy tends to decline for a number of reasons: a fall in the price level of consumption goods drives away entrepreneurs whose production costs are high; financial sentiment becomes bearish; and an increase in the requirements of the industrial circulation causes a rise in the rate of interest and retards investment. Keynes considers the fall in the price level of consumption goods in this phase to be appreciably large. Shortly thereafter, together with a decrease in working capital, production decreases through the TM supply function, so that business deteriorates

rapidly.

The economy is now at the lowest level. It moves toward the upper phase again due to the following causes: the price level of consumption goods stops falling, and begins to rise because consumption decreases less than output, and liquid capital increases. Together with the restored attractiveness of new investment, these cause the economy to pick up again.

B. The *General Theory*

Interestingly enough, the *General Theory* rejects Wicksell's cumulative process theory. Keynes stresses the need to allow for interaction in the way the economy works, and equality of saving and investment (see *GT*, pp.84, 85).

Keynes criticizes two related ideas, namely the notion that credit creation by the banking system makes investment possible without any corresponding saving, and the theory of forced saving. In the case of the latter, he argues that it has no meaning unless some "standard rate of saving" is defined, and this is defined on the assumption of full-employment.

Keynes, is, furthermore, critical of Wicksell's natural rate of interest (see *GT*, p. 243) as well as of a cumulative method, favoring an interactive method.

2. Myrdal

A. Myrdal's View

Myrdal took his criticism of neoclassical orthodoxy further than Wicksell. He noted the then growing dissatisfaction over the lack of internal integration between price theory and monetary theory in Walrasian theory[22], where the problem of production and exchange is dealt with as a theory of relative prices, while the quantity theory is used as an appendix for the determination of absolute prices.

How did orthodox economics come to incorporate a sharp division between the two theories? Myrdal describes neoclassical marginal utility theory as overthrowing the classical production cost theory with the result that money came to be regarded as merely representing the power to purchase goods and services.

He deems closer integration of the quantity theory with general price theory to be logically impossible, for they are based on different principles.[23]

Even if the integration were indeed impossible, would some co-ordination be possible? Myrdal argues that attempts made in this direction are fraught with difficulty.[24] Unlike price theory, which can remain at an abstract level, the

quantity theory cannot help contacting with the real world.

The quantity theory thus developed, he argues, has serious defects[25]:

(i) During a dynamic process the velocity of money varies, which rules out any simple relation between the quantity of money and the price level.
(ii) The relation between the quantity of money and the price level cannot be one-way, for both simultaneously depend on factors outside the mechanism of payment proper.
(iii) The price level in the theory cannot be defined in the form of providing the multiplicative factor required by the theory of relative prices.
(iv) Although the quantity theory stresses movements of the price level, no homogeneous price level exists. It ignores the change within the price level.
(v) The price level merging in the theory is a curious concept including the prices of pecuniary rights.
(vi) The quantity theory challenges practical possibility by adopting total sales as weighting principle of a price index.

Points (i) and (ii) are made by Wicksell. However, points (iii) and (iv) are not, for the autonomy of relative prices is taken for granted there.

Myrdal goes on to criticize the central price theory:[26]

(i) Failing to provide the "multiplicative factors", the price theory remains abstract and unreal.
(ii) The theory has prices relating to a single point in time, so that the price theory cannot treat time contracts. Thus the problem of credit is relegated to the quantity theory, which in turn proves unfit for the task, dealing only with the price level. Credit is crucial not only to the price level but also to price relations.
(iii) Because the price theory embodies Say's Law, it cannot analyze business cycles.

In the credit problem Myrdal pinpoints a serious defect brought into economics by the separation of monetary theory from the price theory.

B. Myrdal's Theory

a. Basic Theory

Mrydal endeavored to construct his own monetary theory through careful

examination of Wicksell's "monetary equilibrium", for which the three conditions are: (i) equality between the market rate of interest and the natural rate; (ii) equality between investment and saving; and (iii) price level stability.[27]

Wicksell considered them to be equivalent only as assumptions. Myrdal's conclusion is:

(1) What matters to monetary equilibrium is condition (ii).
(2) Condition (i) does not hold good. But the argument based on condition (i) implicitly contains an investment function which is important in the theory of cumulative process.
(3) Condition (iii) does not hold good.

Myrdal formulates monetary equilibrium in which condition (ii) holds good as follows:

$$R_2 = W = S + D \qquad (1)$$

where R_2 is the production cost of gross investment, W free capital disposal, S savings proper, and D total anticipated value-change of the real capital. All are expressed in ex-ante terms. The money rate of interest which satisfies (1) is "normal".[28]

R_2 is the discounted value anticipated at the initial point of time, which the entrepreneurs calculate by discounting various kinds of cost needed for a certain amount of investment. It is a money demand for new investment.

The amount of money which the public are free to dispose of is expressed in ex-ante terms. Savings proper (hereafter savings) are defined as the part of income not used for consumption goods.[29]

$$Y - C = S \qquad (2)$$

where Y is income, C consumption, and S saving.

Income, which is synonymous with "net return", is an ex-ante concept defined as:

$$Y = B - (M + D) \qquad (3)$$

where B is the discounted sum of all anticipations of gross returns in the next period, M the discounted sum of all anticipations of gross cost in the form of operating cost of the co-operating means of production in the same period.

Gross investment and free capital disposal are both ex-ante concepts

determined by different economic agents, and thus not equal. They are, however, ex-post equal, for the banking system makes up for the difference.

Myrdal's monetary equilibrium has two characteristics: a position departure from which produces a cumulative movement, and the fact that it fixes certain specific price relations. Myrdal considers that in monetary equilibrium relative prices, the price level, and production might change.

Now suppose that the economy starts off in monetary equilibrium.

The investment function works as the driving force. This is given by:

$$R_2 = F(Q) \qquad (4)$$

where F(.) is the investment function, and Q the profit margin.

This shows that the entrepreneurs as a whole determine the amount of investment based on the profit margin.

Q is given by:

$$Q = \Sigma_w (c_1' - r_1') \qquad (5)^{30}$$

where c_1' and r_1' are, respectively, the value and the reproduction cost of the existing real capital, and $_w$ the investment-reaction coefficient of each firm's investment function.

Equation (5) says that the profit margin as a whole is the sum of the profit margin of individual firms, which is the difference between the value and the reproduction cost of the existing real capital possessed by each firm, weighted by $_w$. Myrdal assumes that the value of capital fluctuates violently while the reproduction cost is inflexible because it includes various kinds of inflexible prices.

Let us now turn to consumption goods. Here we find two kinds of argument.

The first is concerned with determination of the price level of consumption goods. The part of income not saved is always equal to the volume of consumption goods sold, O, multiplied by its price level, P_1:

$$Y - S = P_1.O \qquad (6)$$

The left-hand side is the demand for consumption goods, C, which is an ex-ante concept. The volume of production is determined ex-post by the roundabout production structure. The price level of consumption goods is

determined here.

Equations (2) - (6) complete the system. This holds good in each period. Income and the profit margin are subjectively expected concepts. The entrepreneurs determine the amount of investment based on the profit margin. The amount of investment is realized in accordance with Wicksell's assumption of "freie Valuta". The amount of investment thus realized is injected into the stage of production of intermediate goods. The demand for consumption goods ascertained through equation (2) determines the price level together with the volume of production ascertained through the roundabout production mechanism.

The second argument centers on the idea that a rise (fall) in the price level of consumption goods induces, through its effect on expectations, a rise (fall) in the value of capital, C_1, in the next period. This is expressed as:

$$\Delta C_1 = \Phi (\Delta P_1) \qquad (8)$$

This influences the profit margin through equation (5). Myrdal's model is thus completed as a dynamic system.

We need to note here how Myrdal deals with the natural rate of interest and the money rate. He argues that in a system inclusive of money and credit the natural rate of interest should be redefined as a rate of return of planned investment, and that the difference between the two can be understood as the difference between the existing capital and the reproduction cost. Thus the difference between the two rates is incorporated in Myrdal's model in the redefined form. Believing as he did that even in monetary equilibrium there exists a profit margin which stimulates investment, he rejected Wicksell's first condition --- that is, zero profit margin cannot be a criterion of monetary equilibrium in dynamic conditions.[31] Thus Myrdal was able to evade a semi-dichotomy into which Wicksell fell.

b. The Cumulative Process

Based on the above system, Myrdal explains the cumulative process in three cases in which a primary change occurs: (i) a change in anticipations; (ii) a change in the money rate of interest; (iii) a change in savings. What is explained is the situation in which divergence between investment and free capital disposal is cumulatively expanding, due to the primary change.

Suppose that some primary change takes place in an economy in which monetary

equilibrium has been attained. The initial impulse then induces a change in the value of real capital, while it does not induce any change in the cost of production, so that the profit margin changes, in turn bringing about a change in the demand for investment. At the same time, the initial impulse induces a change in income through a change in "total anticipated value-change of the real capital", which in turn leads to a change in saving or consumption ((i) and (ii). In (iii) saving directly changes without a change in income). As a result of all this, change also occurs in free capital disposal.

Due to the above process, monetary equilibrium is not maintained and the economy begins to move in either direction. Free capital disposal is money capital provided voluntarily by the public. The difference between the demand for investment and saving is provided by the banking system (the assumption of "freie Valuta"). This is a sort of forced saving.

A change in the demand for investment goods and for consumption goods induces a change in the roundabout production structure, which, in turn, gives rise to a change in the volume of production of both goods.

Change is then brought about in the price level of consumption goods and in anticipations. The former change is related to equation (6), the latter to equation (8) - an important factor in making economic fluctuations cumulative.

3. Hayek

A. Hayek's View

Hayek classifies the development of monetary theory in four stages, arguing the need to attain the fourth stage. Hayek (1931, 4-5) criticizes the quantity theory as the first stage from the point of view of methodological individualism, arguing that aggregate concepts such as the quantity of money, the general price level, and the amount of production can have no influence on the decision-making of individuals.

Even when quantity theorists refer to relative prices, Hayek (1931, 6-7) argues, changes in them are attributed to "disturbing factors".

Hayek criticizes the quantity theory on the grounds that even when it discusses the influences of prices upon production, it does so only in terms of the general price level and total production.[32]

Hayek is also dissatisfied with the neoclassical system per se, arguing that monetary theory is by virtue of the quantity theory detached from general economic theory[33], which means a theory of relative prices.

Hayek objects to the classical dichotomy. He rejects the theoretical validity of the quantity theory from the standpoint of methodological individualism and criticizes the general economic theory on the grounds that it ignores the effects of money.[34]

B. Hayek's Theory

Hayek advocates a monetary theory that analyzes the process by which a change in the quantity of money influences the structure of roundabout production through a change in relative prices.[35]

Hayek considers his theory to be built on Wicksell's theory, eliminating its defects[36] along the correct line developed by Mises (1912).[37]

Hayek's theory of roundabout production runs as follows:

People spend their money income on consumer goods or producer goods; The relative prices of these goods change depending on whether relative demand for each kind of good increases or decreases. As there are various kinds of producer goods, changes in relative prices cover consumer goods and various kinds of producer goods. Thus there occurs a change in the price margin between successive stages of production; producer goods, consisting of both non-specific and specific goods, shift so as to be used in higher (lower) stages of production; the structure of production becomes longer (shorter); and the volume of output of consumer goods increases (decreases).[38]

Hayek applies this analysis to two states of the economy, taking the cases of "voluntary saving"[39] and "forced saving". The demarcation is whether the quantity and velocity of money remain constant and do not influence the real economy.

The former characterizes the normal state of the economy which the monetary authority should aim at, while the latter represents its disruption, prolonging disequilibrium.

Let us see what happens in the case of forced saving.

When additional money is injected into an economy which is initially in a state of equilibrium, how are natural or normal prices disturbed and how is the structure of production affected? Two cases can be distinguished: (i) the new money (credit) is provided to producers, who desire to obtain producer goods; or (ii) the new money (credit) is provided to consumers, who want to buy consumer goods.

In case (i), investment (the demand for producer goods) is equal to the sum of voluntary saving and new credit. In case (ii), investment is equal to voluntary

saving. In either case, the amount of money increases due to the provision of credit, resulting in the money rate of interest falling below the natural rate. Crucially, case (ii) follows as a result of case (i) having occurred. Let us begin with case (i).

Would-be entrepreneurs provided with credit can now purchase producer goods, but only if they offer to pay prices higher than do the existing entrepreneurs. Due to the fall in the money rate of interest, a rise in the price of the original means of production, and a rise in the prices of non-specific producer goods, the existing entrepreneurs will find it rational to reduce expenditure on the original means of production and increase expenditure on new intermediate products (capital).

Thus the new entrepreneurs can generate a new, more roundabout stage of production in the economy through obtaining the necessary original means of production and non-specific producer goods. In this way the production process comes to be drawn out.

The volume of output in the stage of production, from which the original means of production and non-specific producer goods were withdrawn and directed toward a higher stage of production, decreases. Because of this, the volume of output of consumer goods will also decrease over time. This is "forced saving" in Hayek's sense. Due to the decrease in the production of consumer goods and the invariable consumption expenditure, the prices of consumer goods rise. Hayek believes consumers would like to restore their real consumption to its former level, if possible, by spending more money. The money income of laborers working in the producer goods sector increases, because more money is handed over to the entrepreneurs in this sector. The laborers are able to spend their extra money income on more consumption. Thus the laborers increase their expenditure on consumption while the volume of output of consumer goods does not increase so quickly. As a result, the prices of consumer goods rise further and further.

This argument is crucial to Hayek's theory. The lengthening of the roundabout production structure must eventually increase the output of consumer goods. However, it is theorized that in the case of forced saving no actual increase occurs. The increased expenditure on consumption due to the increased income of the laborers also plays an important role in Hayek's theory. The output of consumer goods will temporarily decrease due to the lengthening of the roundabout production structure, while expenditure on consumption will continue to increase. As a result, the prices of consumer goods go on rising cumulatively. This is the cumulative process in Hayek's sense.

As a result of the public's increasing its expenditure on consumption out of increased income, with the hope of making real consumption return to its former

level, there eventually occurs a reverse in the movement of the ratio of demand for consumer goods to demand for producer goods, so that the prices of consumer goods rise relative to those of producer goods.

In this step we see the origins of case (ii). The reverse movement of the ratio of demand for consumer goods to demand for producer goods is the same as case (ii), in which the economy moves in the opposite direction from that in case (i). However, Hayek points out the following differences which explain why in case (ii) a serious depression takes place: (a) the emergence of an excessively short roundabout production structure; (b) specific producer goods are relatively abundant, and their prices fall.

It should be noted that in Hayek's theory the prices of consumer goods and non-specific producer goods go on rising in the depression phase. It is only the prices of specific producer goods that fall. It should also be noted that unemployment occurs because the adjustment required in the shortening of the roundabout production structure does not occur smoothly. Accordingly, depression in Hayek's sense is frictional in nature.

Hayek goes on to advocate that the production structure should be adjusted in accordance with the ratio of voluntary saving to voluntary spending as quickly as possible, and that arbitrary injections of money should be avoided as they disturb this normal ratio and push the economy into crisis (see 1931, 95).

V. SIMILARITIES AND DIFFERENCES

Having completed our examination of the stances and theories of Wicksell, Keynes, Hayek and Myrdal, the first point we wish to stress is that each has its own peculiar features, and indeed the latter three are independent of Wicksell.

Wicksell's theory centers around the two rates of interest. In Keynes it is his "own theory" that matters. Myrdal's theory is based on investment and free capital disposal (saving), with the emphasis on ex-ante and ex-post concepts. Hayek's theory centers around the theory of roundabout production with the emphasis on voluntary and forced savings.

Having established these points, we also wish to stress that Keynes, Hayek and Myrdal are greatly influenced by Wicksell. All of them evaluate Wicksell's theory highly in the evolution of monetary economics, and regard their theories as pertaining to Wicksell's line of

thought.

In the following paragraphs we shall see how Wicksell, Keynes, Hayek and Myrdal relates to one another in terms of degrees of similarities and differences — adding Lindahl and Mises.

Wicksell, Keynes, Hayek, Myrdal and Mises adopt period analysis which aims at analyzing transitional periods, while Lindahl analyzes disequilibrium given that equilibrium is attained at each period.

Wicksell, Myrdal, Lindahl and Mises[40] assume an organized credit economy. Keynes does not adopt this line, although the emphasis in his analysis falls on the bank rate rather than the quantity of money. What matters to Hayek is whether the quantity of money is kept constant.

Wicksell, Keynes, Hayek and Mises adopt a 'divergence between the natural and money rates of interest' as an analytical tool, but in different ways. In Wicksell this tool occupies a central place. In Keynes the focus is set rather on the relation between the rate of interest and investment/saving. In Mises and Hayek the money rate of interest is uniquely defined as the price of consumers' goods over that of producers' goods.[41] Myrdal and Lindahl are critical of this tool. Myrdal argues that monetary equilibrium cannot be defined as equilibrium of the two rates of interest. Lindahl argues that at each period the value of investment is determined in such a way that the two rates of interest are equal.

Myrdal and Keynes adopt a divergence between investment and saving as an analytical tool, arguing that it can be traced back to Wicksell. Hayek assumes that investment is always equal to saving. What matters to him is the distinction between voluntary saving and forced saving. Lindahl assumes that at each period investment becomes equal to saving.

Wicksell, Myrdal, Lindahl, Mises and Hayek adopt a theory of roundabout production. Mises and Hayek regard it as crucial in monetary economics, while Wicksell, Myrdal and Lindal do not. Only Keynes does not adopt it.

Wicksell, Myrdal, Keynes and Mises approve the concept of the price level. Mises accepts it in the form of "internal objective value of exchange" of money, although he is somewhat reluctant to calculate the index number. Only Hayek rejects it from a methodological point of view.

What matters to Wicksell are the fluctuations in money prices while the others consider the fluctuations in relative prices. Mises and Hayek

link the fluctuations in relative prices with a theory of roundabout production. Myrdal and Lindahl develop a similar argument, albeit not as a central place.

Wicksell assumes full employment or constancy of the volume of output[42] while the others consider fluctuations in the volume of output. Myrdal argues that the theory of relative prices, which takes Say's law for granted, cannot be applied to analyze the problem of the business cycle.

Wicksell, Lindahl, Myrdal and Keynes regard the expenditure from income as crucial in determining the price level of consumers' goods.

Wicksell adopts wage fund doctrine while the others do not.

Wicksell, Keynes and Lindahl stress the importance of the stability of the price level through bank rate operations while Myrdal and Hayek are critical of this view.

Hayek explicitly develops a doctrine of forced saving, stating that it is developed in Wicksell and Mises. Keynes is critical of it, arguing that it has nothing to do with the main argument of a theory of money.

VI. CONCLUSION

Wicksell put forward a theory of cumulative process as an alternative to the quantity theory of money. It is a theory of how the fluctuations in the price level are caused by the divergence between the natural rate and money rate of interest in the organized credit economy. Wicksell took for granted the classical dichotomy between the theory of exchange value and the theory of money prices.

Wicksell's theory of cumulative process greatly influenced younger economists, who succeeded to Wicksell's theory of cumulative process through their immanent criticism. They did not, however, accept the dichotomy, arguing that monetary theory should not be confined to the determination of absolute prices only.

As far as the above is concerned, it was shared by them. They concurred both in rejecting the above dichotomy and in their reasons for doing so. However, they differed in how and on what points they should or should not accept Wicksell' cumulative process theory. Their aim was to construct their own monetary theories, criticizing neo-classical orthodoxy.

In the case of Myrdal, a divergence between investment and saving (free capital disposal) induces a change in the roundabout production structure, which brings about a change in the prices of consumption goods and expectations; this ,

in turn, widens divergence between investment and saving. It should be noted that Myrdal reached his investment theory through his critical examination of the natural rate and market rate of interest.

In the case of Hayek, what matters is the case of forced saving which takes place through injection of money. Although the effects differ according as to whether money is injected into the investment goods or consumption goods sector, analysis of the roundabout production proves the sovereign approach.

In the case of Keynes, in light of the fact that the three conditions for monetary equilibrium are accepted and the second fundamental equation is used mainly in the applied part of the *Treatise,* Wicksell's cumulative process theory seems to be accepted most faithfully. However, what matters in the *Treatise* should be not so much this point as 'Keynes's own theory'.

In the present paper we have endeavored to clarify Wicksell's influence through reconstruction of their theories, examining their similarities and differences.

Keynes partially accepted Wicksell's cumulative process theory in the *Treatise*. Theoretically speaking, however, this is not a crucial point. When we trace his theoretical development from the *Treatise* onward, it is essential to keep the main focus on how he dealt with his own theory. It was through his self-critical reflection on this that he eventually arrived at the *General Theory*. His harsh criticism of the Wicksellian way of thinking to be seen in the *General Theory* epitomizes the nature of the painstaking journey that he labored on for five years.

NOTES

1) Wicksell (1889, p.514 in Boianovsky=Trautwein (2001)) ascribes his theory of cumulative process to Ricardo (1810). For comparison with Wicksell (1898), see Boianovsky=Trautwein (2001). Wicksell (1898) does not refer to Thornton. The similarity was pointed out in 1916 by Davidson to Wicksell. See Laidler (1991, 150).

2) The original refers to Ricardo.

3) See, for example, Moore (1988), Rogers (1989) and Woodford (2003).

4) For a criticism of the "Z" theory from a point of stock equilibrium and "own rates of interest", see Cottrell and Lawlor (1991).

5) Realfonzo (1998) characterizes Wicksell's influences as "monetary theory of production" critical of "neoclassical theory". We make much the same point in this paper.

6) On which see Chiodi (1991, 48-50). The difference between Wicksell and Mises is examined in Bellofiore (2000, 549-554) in great detail.

7) For the difference between Wicksellian and Walrasian general equilibrium theory, see, for example, Rogers (1989, Chapter 2).

8) See *IP*, 135. For the debates about Wicksell's cumulative process theory --- among Wicksell, Davidson and Åkerman --- which took place in Sweden in early 20th century, and which influenced Lindahl's and Myrdal's monetary economics in the 1920s and 1930s, see Siven (1998). Wicksell (1913) is a rejoinder to Davidson.

9) On which, see *IP*, 165-167. Keynes labeled it as the "Gibson Paradox".

10) Wicksell (1915) does not consider that the fluctuations in prices occur due to a divergence between investment and saving. It is not the money rate of interest, but the natural rate of interest which is determined by an equilibrium of investment and saving. He maintains that the fluctuation in prices occurs due to a divergence between the natural rate of interest and the money rate of interest.

11) Ahiakpor (1999) regards Wicksell's theory of cumulative process as retrogession. His commentators, Gootzeit, Ebeling, Humphrey, and Aschheim=Tavlas oppose Ahiakpor's view. My understanding is close to Humphrey's. I do not, however, concur with the view shared by the four that Wicksell's theory is an extended and elaborate version of the quantity theory of money. This is partly due to their wider definition of the quantity theory of money.

12) Stressing the "supply of deposits" rather than "real shocks and rate differentials", Humphrey (1997) regards Wicksell as "a *bona fide* quantity theorist". I would say the reverse is true, for the "supply of deposits" is passively determined in Wicksell's theory.

13) See Wicksell (1898, 44). This is accepted by Lindahl (1939, 142), Myrdal (1939, 22), and the *Treatise* (1, 122).

14) This is in accord with Siven's (1998, p.131) view in relation to "excess demand or interest gap as an engine of inflation".

15) We regard Hawtrey (1913) and Robertson (1926) as pertaining to the Wicksellian stream of thought, although they do not undergo Wicksell's direct influence.

16) See *TM*.1, 176-177. Kahn (1984, 74) denies Wickell's influence on the *Treatise*.

17) This is true of the argument at *TM*.1, 183-187.

18) See *TM*.1, 205. We identify three types of interpretation: The *Treatise* accepts it; The *Treatise* criticizes it; and The *Treatise* stands in between.

19) See *TM*.1, 196-197. This shows why the *Treatise* regards money supply as endogenous. For exogeneity/endogeneity in Keynes's economics, see Moore (1988) and Graziani (2003).

20) For details, see Hirai (1997-9, pp.88-104).

21) Hicks (1935) discovers three theories of money: savings and investment theory; a Wicksellian natural rate theory; the bearishness function in the *Treatise*. He finds the third one most interesting.

22) See Myrdal (1939, 10-11).

23) See Myrdal (1939, 11-12).

24) See Myrdal (1939, 13).

25) See Myrdal (1939, 14-15).

26) See Myrdal (1939, 16-17).

27) Wicksell (1908) stresses the importance of the stabilization of the price level. This caused controversy with Davidson who thinks of the relation between an increase in productivity and the fall in the price level. Robertson's (1928, 56-57) argument concerning the relation between economic growth and the fall in the price level runs along Davidson.

28) See Myrdal (1939, 96).

29) See Myrdal (1939, 90). Y is not used in the original.

30) See Myrdal (1939, 79). In the original, c_1' and r_1' are written as c_1 and r_1 respectively.

31) See Myrdal (1939, 83-84).

32) See Hayek (1931, 6-7).

33) See Hayek (1931, 3-4).

34) Mises (1912) argues that the quantity theory fails to explain variations in the value of money in terms of subjective valuation (See 91-92). This criticism goes in tandem with that of the classical dichotomy.

35) See Hayek (1931, 28).

36) See Hayek (1931, 26).

37) See Hayek (1931, 25-26)*PP*, 25-26. For the relation among Wicksell, Hayek and Mises, see Bellofiore (1998).

38) Expenditure on consumer goods is assumed to increase more rapidly than their production.

39) See Hayek (1931, 50-54, 55-57, and 75-79).

40) This aspect of Mises is emphasized as an "ultra-Wicksellian idea" by Bellofiore (1998). For Mises' criticism of Wicksell, see Mises (1912, 355-357), and Wicksell's reply (1914).

41) This definition is criticized by the *General Theory* (192) as well as by Hawtrey (1935).

42) "The Great Depression" in the fourth quarter of the 19th century

saw a gradual fall in prices together with full employment. Wickesell's theory reflects this. It was not until the early 1920s that he became concerned with a change in output and employment. See Boianovsky (1998).

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