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Economic Structure and the Theory of Economic Equilibrium

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4. Economic Structure and the Theory of Economic Equilibrium

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1. Introduction

This chapter discusses the structure of Walrasian general equilibrium theory and Marshallian partial equilibrium theory, which form a large part of the traditional or current mainstream economics called neo-classical economics. Beyond the general exposition of these equilibrium theories, we shall particularly pursue two issues.

Firstly, we shall try to clarify implicit dynamic concepts hidden in these theories which are generally regarded as uni-periodal economic theories. Actually, a start of the development of modern dynamic economics was, at least partially, made possible by Hicks[6], which integrated Walrasian and Marshallian implicit dynamic concepts, along with more explicit Swedish one, into a unified theory. The implications of some of these implicit dynamic concepts have, furthermore, not yet been fully developed explicitly by modern theories of the dynamic economics.

Secondly, we shall critically compare Walrasian and Marshallian theories with Edgeworth's theory of market, which succeeded Jevons's view of market. The communication structure is different between Walras-Marshall model of non-cooperative market games and Jevons-Edgeworth model of cooperetive market games. While two approaches result in the identical one in the case of a large economy with infinitely many agents, the latter suggests the possibility of a quite different result in the case of competition among a few, if we can safely ignore the costs of communication, negotiation and organization. In other words, the former

theories do not consider the implications of non-price competitions fully.

After this introductory section, following two sections will be devoted to discuss Walrasian general equilibrium theory. We shall describe how the core elements of economic system are successively combined to form the general equilibrium models of exchange, production, credit and capital formation, and finally, money and circulation (section 2). Then, using a simplified model of credit and capital formation, we shall consider the implicit time structure of Walrasian seemingly uni-periodal theory (section 3). One possible interpretation is the stationary equilibrium, while another possibility is to consdier the temporary equilibrium.

In the next two sections, time structure of Marshallian partial equilibrium theory will be discussed to show, firstly, that, unlike in the case of Walras, all the core elements of economic system are already introduced in the simplest model, the market-day model, but most of them are regarded as "being constant" until sufficient time has past to make them adjusted in the short-run or in the long-run model (section 4). Another implicit time structure to be shown in Marshall's theory is his concept of the stationary equilibrium of an industry in which individual firms are in disequilibrium, clearly a biological analogy with the case of constant forest and its changing trees (section 5).

Though Walrasian and Marshallian theories have different time structures, they share an identical view of markets, that economic agents are isolated and communicate with each other only in terms of prices and price-related concepts like demand and supply functions. In the last two sections, we shall explain Edgeworth's view of markets, in

which individual agents are free to form and block coalitions, and make contracts and recontracts not necessarily in terms of the price concept. Results are compared with those of Walras-Marshall view in the case of a large economy (section 6) as well as in the case of a duopoly (section 7).

The chapter will finish with a brief conclusion.

2. Logical Structure of Walrasian Theory

Walras[15] insisted that complicated phenomena can be studied only if the rule of proceeding from the simple to the complex is always observed. Walras first decomposes a complicated economy of the real world into several core elements like consumer-traders, entrepreneurs, consumers' goods, factors of production, newly produced capital goods, and money. He then composes a simple model of a pure exchange economy by picking up a very limited number of such elements, i.e., individual consumer-traders and consumers' goods, disregarding the existence of all other elements. Consumers' goods to be exchanged among individual consumer-traders are assumed simply to be endowed to them and not considered as produced at cost. There exist no production activities in this hypothetical world.

Travel from this simple model to the complex world proceeds from this simple model by adding one by one those core elements so far excluded i.e., entrepreneurs and factors of production first in the model of production, then newly produced capital goods in the model of credit and capital formation, and finally money in the model of money and circulation. In the model of production, capital goods are introduced as a kind of factors of production but the investment, i.e., the production of new capital goods simply does not exist. In all of the Walrasian models of exchange, of production and of credit and capital formation there exists no money at all, until it is finally introduced in the model of money and circulation.

In this journey from the simple to the complex, each intermediate model, enlarged from a simpler one and to be enlarged into a more complex one, is still a closed and self-compact logical system. Even

the simplest model, i.e., that of the exchange, is already a model of general equilibrium, in which results of interactions among core elements introduced are to be studied fully and exhaustively. However, each of Walrasian models is as unrealistic as the starting model of pure exchange with the exception of the last, into which all the core elements of a real world economy have been introduced.[1)]

These unrealistic models having only a limited number of core elements of the economy introduced can, of course, not be practically useful to apply to what Hicks[5] called particular problems of history or experience. They are designed to show the fundamental significance of such core elements of the real world economy as entrepreneurs and production, investment and the rate of interest, inventories and money, etc., by successively introducing them into simple models which are then developed into more complex ones. Walras's theoretical interest was not in the solution of particular problems but in what Hicks called the pursuit of the general principles which underlie the working of a market economy.

One can study the problem of the exchange in the most essential form in the model of exchange where it is abstracted from all the other complex problems. There we can see most clearly Walras's view of a well organized, highly institutionalized market in which the specialized auctioneer determines the uniform market price and changes it according to the excess demand or supply generated as functions of the price by price taking traders. The model of production can show the role of entrepreneurs and the mechanism of distribution among factors of production, including capital goods, without being bothered by such time-related problems as investment, saving and the rate of interest. The

latter problems can, then, be studied intensively in the model of credit and capital formation where the complex problem of money and circulation have not yet been introduced.

If the key of our approach in this volume is the relationship between production and time, therefore, time structure implicit in Walrasian seemingly uniperiodal theory should be found not in the model of production but in the model of credit and capital formation.

3. Time Structure of Walrasian Theory

Since the original Walrasian system of equations of credit and capital formation is too complicated to describe, let us consider a drastically simplified version of a two good (consumers' and capital goods) two factor (labor and capital) economy.[2] Two goods are produced from the input of labor service and the service of capital goods under constant returns to scale. Labor is the sole primary factor of production and there is no inventory investment, nor is money.

Let X_1 and X_2 be the level of output of the consumers' and new capital goods, respectively. The aggregate income of laborers and capitalists is

$$(1) \qquad Y = w(a_1X_1 + a_2X_2) + q(b_1X_1 + b_2X_2)$$

where w denotes the rate of wage q denotes the price of the service of capital goods, a_1 and a_2 are the labor input coefficients in the production of the consumers' and capital goods and b_1 and b_2 are the capital input coefficients in the production of consumers' and capital goods, respectively. Input coefficients are functions of factor prices, w and q.

At the general equilibrium of credit and capital formation, there is no profit left for entrepreneurs, so that

$$(2) \qquad p_1 = xa_1 + qb_1$$

$$(3) \qquad p_2 = wa_2 + qb_2$$

where p_1 and p_2 are respectively the price of the consumers' and new capital goods. Since markets for two goods have to be cleared,

$$(4) \qquad D(p_1, p_2, w, q, Y) = X_1$$

$$(5) \qquad M = X_2$$

where D denotes the demand for consumers' goods and H stand for the

demand for new capital goods. Factor markets have also to be cleared so that

(6) $a_1X_1 + a_2X_2 = L$

(7) $b_1X_1 + b_2X_2 = K$

where L and K are respectively the given existing labor force and the given existing stock of capital goods. Since there is no money, suppose capitalists own capital goods and lend them to entrepreneurs or sell the service of capital goods to them. If gross saving is defined as the excess of income over consumption, then, capitalists save in kinds or purchase new capital goods with saving, so that

(8) $p_2H = S(p_1, p_2, w, q, Y)$

where S denotes the aggregate gross saving.

Equations (1) - (8) may be interpreted as the description of a temporary equilibrium in the sense of Hicks[6], as was done by Morishima ([11], [12], pp. 70 - 81). It is assumed that expectations on the future prices are static, i.e., the elasticity of expectation is 1, in the determination of consumption and saving so that D and S are functions of current prices. There are 8 equations to determine 7 unknowns, Y, w, q, X_1, X_2, p_2, and H, since we can choose the consumers' goods as numeraire so that $p_1 = 1$. Eight equations are not independent, however, and one of equations can be derived from other equations and Walras's law,

(9) $Y = Pp_1D + S.$

In the determination of consumption and saving, capitalists assume that goods and service of factors have the same prices in the future as they have at the present moment, and the difference between resultant gross saving and the value of the depreciation of capital goods, i.e., the net saving can be either positive or negative. If it is positive,

we have the case of a progressive economy which Walras ([15] p. 269) himself wished to consider. The capital stock K is larger in the next period than in the current period so that temporary equilibrium prices in the former are in general different from those in the latter, even though capitalists in the current period expected unchanged prices through periods.

The assumption of the saving in kind is not necessary if we follow Walras to introduce a commodity E consisting of perpetual net income of a unit of numeraire, the price of which is the inverse of the rate of perpetual net income or the rate of interest i (Walras[15], p. 274). If this commodity is sold by entrepreneurs or firms wishing to buy new capital goods, and is purchased by capitalists wishing to save, the clearance of the market of this commodity through changes in i implies that aggregate gross saving = "aggregate excess of income over consumption = aggregate demand for (E) $\times$ price of (E) = aggregate demand for new capital goods $\times$ price of capital goods" (Walras[15], p. 21). Therefore,

(8)' $\quad p_2 H = S(p_1, w, i, Y)$

instead of (8) since capitalists are now concerned, not with p_2 and q, but with i in the determination of consumption and saving. Similarly, (4) may be replaced by

(4)' $\quad D(p_1, w, i, Y) = X_1$.

At equilibrium, the rate of net income for capital goods has to be equalized for the rate of net income for the commodity E,

(10) $\quad (q/p_2) - d = i$

where d denotes the technically given rate of depreciation of capital goods. This is nothing but Walrasian implicit or degenerate investment function, derived from assumptions that investers are price takers and

that expectations are static.[3] Since the introduction of a new unknown i is matched by the introduction of additional equation (10), we still have the equality between the number of unknowns and that of equations.

If the general equilibrium of credit and capital formation is interpreted as a temporary equilibrium, entrepreneurs and capitalists fail to expect correctly the prices in the future in a progressive economy, since changes in prices are induced by changes in K in a series of successive temporary equilibria. If we wish to have the perfect foresight prevailed and the expectation of unchanged prices made correct in the general equilibrium of credit and capital formation, it should be interpreted, as was done by Yasui[18] (pp. 173 - 278), as a stationary equilibrium, where K remains unchanged through periods. The reason is that only in a stationary state the price of the service of capital goods remain unchanged indefinitely into the future, which Walras assumed in equation (10). Of course, the service of the factors of production can have the same prices in the future as they have at the present, not only in a stationary state but also in a progressive economy of balanced growth. As Wicksell[16] (pp. 226 - 227) pointed out, however, the latter case is inconceivable, "as the sum of natural forces cannot be increased."

The condition for the stationary state is that the aggregate gross saving is equal to the value of depreciation of capital goods, or

(11) $H = dK$

in view of (8) or (8)'. Since the number of equations is increased by the addition of (11), then, we should have one more unknown introduced. The existing stock of capital goods K is, therefore, no longer an arbitrary given quantity, and has to be solved jointly with other unknowns from

equations of general equilibrium of credit and capital formation. Then, we have 9 unknowns, K, i, Y, w, q, X_1, X_2, p_2 and H to be solved from any 9 equations from 10 equations (1) - (3), (4)', (5) - (7), (8)', (10) and (11), since $p_1 = 1$ and one of equations is not independent in view of (9). Yasui[18] first pointed out the necessity of this modification of the original Walrasian theory of credit and capital formation.[4)]

Two alternative interpretations of Walras's theory of credit and capital formation, that is, temporary equilibrium and stationary state, corresponds respectively to two methods of economic dynamics in the modern economic theory, that is, the temporary equilibrium method and the growth equilibrium method, distinguished and evaluated by Hicks[7] (p. 28). Also it is well known that Walras's theory of capital gives the micro economic foundation to the so-called neo-classical macro growth theory developed by Solow, Swan, Meade and Uzawa.

4. Time Structure of Marshallian Theory

Marshall[9] also started, like Walras[15], with a very simple model to study complicated economic phenomena and then proceeded to more complex models. There is an important difference, however, between Walrasian general equilibrium analysis and Marshallian partial equilibrium analysis.

Unlike Walras who started with a general equilibrium model of an imaginary economy, which contains only a limited number of core elements of a real world economy, Marshall begins with the partial equilibrium analysis of a whole complex of a real world economy as such. In other words, every Marshallian model contains all the core elements of the economic system. Of course, Marshall also simplifies his study at first by confining his interest to a certain limited number of core elements of the economy. But he does it not by disregarding the existence of other elements but by assuming that other things remain unchanged. In this sense most of Marshall's models of an economy, though realistic, are open and not self-sufficient, since some endogeneous variables (i.e., the "other things") remain unexplained and have to be given exogeneously.

Marshall's simplest model which corresponds to Walras's model of exchange is that of the market day, in which goods to be sold are, unlike in the case of Walras, produced goods, although the amount available for sale is, for the time being, assumed to be constat. Since the length of a single market day is so short that the level of output cannot be changed, even though production does exist in this temporary model. Unlike in Walras's model of production, investment is actually undertaken in Marshall's short-run model which is also a model of production,

though the amount of currently available capital is given and unchanged, since the length of the period is still not long enough to allow the adjustments in capital equipments realized. The effects of such adjustments can be considered fully only in the study of Marshall's long-run model.

While money is introduced only in the final model in Walrasian theory, money does exist in all Marshallian models, though its purchasing power or its marginal utility is sometimes assumed to be constant. Walras has to consider the problem of exchange without using money under the unrealistic assumption of tâtonnement that no exchange transaction should be undertaken at disequilibrium prices. Since money is already introduced even in the model of the market day, however, Marshall can consider the problem of exchange in monetary economy, i.e., exchange of a commodity against money, without making tâtonnement assumption. The study of such non-tâtonnement exchange is made easy by the assumption of constant marginal utility of money, which makes the final equilibrium price independent of exchange transactions carried out at disequilibrium prices (Hicks[6], pp. 127 - 129).

Thus each Marshallian model corresponds to a different state of the same real world economy. The market day and short-run models are, therefore, as realistic as the long run model. They are practically useful to apply what Hicks[5] called particular problems of history or experiences. "Marshall forged an analytical instrument capable of easier application." A good example is the concept of consumers' surplus. Hicks concluded that Walras and Marshall differ in interest, the former in principles and the latter in practical applications.

Even if one is interested in principles only, however, Marshall's

contributions are important complements to Walrasian ones. For example, still particularly interesting is a dynamic element implicit in the equilibrium concept of Marshall who regards the economic biology as the Mecca of the economist ([9], p. xiv). Considering the relation between an industry and its firms as the relation between a forest and its trees, Marshall studied the long-run normal supply price of an equilibrium industry in the case where "some business will be rising and others falling" ([9], p. 378). Marshall used this concept of equilibrium industry with disequilibrium firms to argue for the compatibility of the increasing returns to scale and competiton, by considering that individual firms have their life-cycles and do not have enough time to exploit the increasing returns fully.

5. Equilibrium Industry with Disequilibrium Firms

Marshall considered the stationary state of an industry as the first "step towards studying the influence exerted by the element of time on the relation between cost of production and value" ([9], pp. 315 - 316). He did not require, however, that every firm in the industry remains always of the same size. It is supposed that firms rise and fall, but that the representative firm remains always of the same size. The representative firm is defined as the miniture of an industry, just as the representative tree of a virgin forest. There may not be an actual firm which may be picked out as representative in the industry. It is, however, a very convenient device to consider the normal supply price of an industry composed of firms behaving differently under different conditions.

The normal supply price of the industry is assumed to be the normal expenses of production (including normal profit) of the representative firm. It is the price the expectation of which is sufficient to maintain existing aggregate amount of industrial production. A price higher than it increases aggregate production, by increasing the growth of the rising firms and slackening the decay of the falling firms. A price lower than it diminishes industrial production, since it hasten the decay of the falling firms and slacken the growth of the rising firms.

Why do some firms gr rise by increasing their output while others fall by diminishihg theirs? Marshall argues that young firms, like young trees, grow while old firms, like old trees, decay, on the basis of his life-cycle theory of firms. It may be considered that a young (an old) firm increases (decreases) its output by expanding (reducing) its capacity since its normal expenses of production (including

normal profit) exceeds (falls short of) that of the representative firm, i e., the normal supply price of the industry.[5] In Marshall's stationary state of course, the condition of the long-run equilibrium is satisfied so that the demand price is equalized to the normal supply price of the industry while the supply price of each firm is considered to be its normal expenses of production including normal profit.

When the amount produced is such that the demand price[6] is higher than the supply price, then sellers receive more than what is sufficient to make it worth their while to bring that amount of the good to the market. There is an incentive at work to increase the amount brought forward for sale. On the other hand when the amount produced is such that demand price is lower than the supply price, seller receive less than what is sufficient to make it worth their while to bring that amount of the good to the market. There is, then, an incentive at work to diminish the amount brought forward for sale (Marshall[9], p. 345).

Let us denote by x the supply price of a firm and by p the supply price of the industry. A firm increases its output if p is higher than x, and decreases it if p is lower than x. It is assumed that the rate of change in output are is proportional to the difference between p and x. The different firms may have an identical value of x or different value of x. Let y(x) be the total output of firms with the same value of x. Furthermore, let D(x) denote changes (increases if positive, decreases if negative) in y. Then, from the assumption,

(12) $D(x)/y(x) = (p - x)$.

Since the aggregate output of the industry remains unchanged in the stationary state, i.e.,

(13) $\int y(x)dx = \text{constant}$,

we have from (12),

(14) $\int D(x)dx = \int(p - x)y(x)dx = 0.$

If we define the proportion of the total output $y(x)$ of firms with the supply price x to the aggregate industrial output as

(15) $f(x) = y(x)/\int y(x)dx,$

we have, in view of (15),

(16) $p = \int xf(x)dx,$

since from the right hand side of (14)

(17) $p\int y(x)dx = \int xy(x)dx.$

From the definition (15),

(18) $\int f(x)dx = 1.$

Therefore, (16) implies that the normal supply price of the industry or its representative firm is the average of supply prices of individual firms in the industry.[7)]

Marshall considered increasing returns in the sense of internal economy with respect to long-run average cost of individual firms, since he argued that short-run supply price increases with output but an increase in demand gradually increases the size and efficiency of the representative firm ([9], p. 460). If there exist internal economies and the supply price of an individual firms is a decreasing function of its output capacity, there is no limit for the expansion of a firm with the largest capacity, until the whole industrial output is concentrated in its hands. To prevent the concentration in the hands of a single firm of the whole industrial output, Marshall emphasized that the life span of private firms is limited and that expanding young firms with low supply price are changed eventually into shrinking old firms with high supply price long before such concentration is actually realized.

Marshall's life-cycle theory of firms insists that firms of the industry, like trees in the forest, has a cycle of the birth, growth, decay and death. It is based on the fact that the expansion of an individual firm is eventually arrested by the decay, if not of the owner's faculties, yet of his liking for energetic work, unabated energy and power of initiative ([9], pp. 285 - 286, [8], pp. 315 - 316). It may, therefore, give a realistic picture of the nineteenth-century industry, but the question remains is its relevancy after the development of joint-stock companies which Marshall himself admitted do not really die.

We may revive, however, Marshall's biological concept of equilibrium of an industry by considering the life-cycle of technology in equilibrium growth instead of the life-cycle of firms in stationary state.[8)]

6. Edgeworth's Equivalence Theorem

As was pointed out in section 2, Walras's view of market is that of a well organized market, in which individual traders do not mutually communicate each other while the communications are exclusively made between each trader and the (perhaps fictious) auctioneer who acts as the incarnation of the law of supply and demand. Although Marshall paid more attention to the case of imperfect market, where connections among traders are important ([8], p. 182), still his general view of market is not much different from that of Walras in the sense that the leading role is played by the uniform market price and the law of supply and demand.

An alternative view of market with a completely different communication structure is that of Edgeworth who succeeded Jevons's view of market, in which an important role is played by arbitrage behavior of traders so as to establish the law of indifference. Mutual communication among traders is essential, since they are expected to form and block coalitions and to make contracts and recontracts in Edgeworth's theory of exchange. Contracts are made not necessarily in terms of the uniform price and supply and demand are not expected to make changes in such price.

Edgeworth[2] (pp. 34 - 42) demonstrated, however, the equivalence of the outcomes of two different views of the market, i.e., Walras-Marshall view and Jevons-Edgeworth view, in the case of a large exchange economy with infinitely many traders on both sides of the market, by the use of the so-called Edgeworth box diagram. We shall sketch Edgeworth's demonstration, which forms a corner stone of modern mathematical economics, in this section, while a more interesting case of duopoly will be discussed

in the next section.

Consider an exchange economy in which two goods are exchanged between two trading body. Each trading body is consist of infinitely many traders who are respectively identical with respect to taste and initial holdings of goods. The outcome of exchange can be seen by considering the exchange between the representative trader of each homogeneous trading body by the use of Edgeworth box diagram.

In Figure 1, the quantity of the first good is measured horizontally, that of the second good, vertically, and the quantity of goods given to trader A are measured with the origin at A, those given to trader B, with the origin at B. Point C denotes the initial allocation of goods before trade, which implies also that the total amount of the first good to be exchanged between traders A and B is AC and that of the second good, BC.[9] Curves I, II, etc. are indifferent curves of trader A, curves 1, 2, etc. are those of trader B, and curve DEF is the contract curve which is a locus of points where indifference curves of two traders are tangent.

Point E is the equilibrium of the perfect competition, with the common tangent to indifference curves at E passing through point C. This is the outcome of the exchange if traders are price takers and demand and supply are equalized at the uniform price ratio denoted by the slope of the line EC. Edgeworth's equivalence theorem insists that point E is also the outcome of the exchange even if traders are not price takers but form and block coalitions and make contracts and re-contracts freely.

It is clear that all the point off the contract curve cannot be stable outcomes of the exchange, since both of traders can be better off

by making recontracts so as to settle down at some points on the contract curve. On the contract curve only points between D and F can be candidates of the stable outcome of exchange, since otherwise a trader can be better off by blocking the contract and returning to point C. If A and B are only traders as in the case of isolated exchange, actually, all the points on the contract curve located between D and F are stable outcomes of exchange. It should be noted that such points other than point E cannot be reached through the exchange with the uniform price ratio.

In our case of a large economy, however, it can be shown that all the points on the contract curve other than point E can be blocked by some coalitions of traders, which aim to make the participants better off. If so, only point E can be the stable outcome of the exchange and outcomes of two different views of market are shown to be equivalent.

For example, a contract of point H in Figure 1 can be blocked by a coalition formed by all the A type traders and more than half but less than all of the B type traders. In the coalition some A type traders still continue trade with B type traders in the coalition and are located at H, while the rest of A type traders having no trade pertners in the coalition are located at C. By increasing the number of B type traders joining the coalition sufficiently and therefore increasing the number of A type traders located at H, we can make the average allocation of two goods for A type traders (some at H, some at C) so close to H on the line CH that it is located like J above the indifference curve passing through H. By reallocating among themselves, therefore, all the A type traders are better off than they are at point H. With some payments to B type traders in the coalition, all the traders in the

coalition are better off than they are at point H, so that an exchange contract H is blocked by a coalition of traders.

Similarly, any point between D and F on the contract curve where the common tangent to two indifference curves does not pass through the point C can be blocked by a coalition of traders, if necessary, by changing the roles of A type traders and B type traders from those in the case of point H. Obviously only the point E belongs to the core, i.e., the set of exchange contracts which are not blocked by coalitions of traders.

As far as the case of a large economy with infinitely many traders on both sides of the market is concerned, therefore, different views on the information structure in the market does not matter at all. By Edgeworth's equivalence theorem one may defend the unrealisticness of the neo-classical assumption of no mutual communication among traders and the existence of auctioneer, since what does matter is not the realism of the assumption but that of the outcome.

7. Communication Structure of Duopoly

Following the suggestion of Farrell[3], let us now consider the case of duopoly with Edgeworth's communication structure, where there are only two traders of one type and infinitely many traders of another type, though the total quantities of two goods are finite in the exchange economy. Since equal quantities of goods should be allocated to identical traders of the same type, we can still use Edgeworth's box diagram (Figure 1), which now describes the half of the economy, one of the duopolists and its infinitely many customers.

Suppose first that there are two B type traders, B_1 and B_2 and infinitely many traders of type A. In Figure 1, BC is the quantity of the second good initially held by a B type trader and AC is the sum of quantities of the first good initially held by the half of A type traders. Curves I, II, etc. in Figure 1 are now aggregate indifference curves of A type traders, as well as individual ones, which can be constructed if the identical individual curves are homothetic so that the marginal rate of substitution between two goods depends only on the ratio of the quantities of goods and Engel curve is a line through the origin.

An exchange contract H in Figure 1 can now be blocked by a coalition of one B type trader (one of duopolists) and more than half but less than all of infinitely many A type traders. All the A type traders currently trading with the B_1 trader which we assume joins the coalition also join the coalition and keep the contract H with B_1. Some A type traders currently trading with B_2 which does not join the coalition join the coalition and cancels the contract with B_2 to return to the initial point C. By decreasing the number of the latter group of A type traders joining the coalition sufficiently and therefore increasing the number

of A type traders located at H, relative to those A type traders located at C, we can make the average allocation of two goods for individual A type traders in the coalition so close to that at the point H on the line CH that it is like an allocation J located above the indifference curve passing through H.[10] By reallocating among themselves, therefore, all the A type traders in the coalition are better off than they are at the contract H. With some payment to B_1 which is located at H, all the traders joining the coalition can be better off than they are at H, so that the contract H is blocked.

Suppose next that there are two A type traders, A_1 and A_2 and infinitely many traders of type B. In Figure 1, AC is now the quantity of the first good initially held by an A type trader and BC is the sum of quantities of the second good initially held by the half of B type traders. Curve 1, 2, etc. in Figure 1 are aggregate indifference curves of B type traders. In this case, an exchange contract H in Figure 1 can be blocked by a coalition of one A type trader (one of duopolists) and the less than half of infinitely many B type traders. Suppose A_1 joins the coalition. Those B type traders also joining the coalition can keep trade with A_1 unchanged so that they can keep the same level of utility as enjoyed at the exchange contract H. Duopolist A_1 cancels trade with those B type traders which are not permitted to join the coalition, so that A_1 moves on the line HC from H toward C. Unless it cancels too many contracts with B type traders, A_1 can be located like at J above the indifference curve passing through H. By reallocating among themselves, then all the traders joining the coalition can be made better off than they are at H, so that the contract H is blocked.

Similarly, any contract between D and F on the contract curve where

the common tangent to two indifference curves does not pass through the point C can be blocked by a coaltion of traders, if necessary, by changing the roles of A type traders and B type traders from those in the case of the contract H. Again, it is the point E only which belongs to the core. In other words, even a duopoly market ends up with an equilibrium identical to that of the perfect competition, if duopolists and infinitely many customers are free to communicate to organize coalitions.

If, on the other hand, there is no such direct communication between duopolists and customers and the latter behave simply as price takers in the face of the uniform price offered by the former, it is well known that the equilibrium is in general different from that of the perfect competition, as was shown by Cournot[1]. The structure of communication is, therefore, very important in the case of the theory of duopoly, and more generally, in the case of oligopoly. In view of the prevalence of non-price competition among oligopolists, which implies the existence of direct communication between oligopolists and customers, we have to admit the unrealisticness of the assumption of the traditional theory of oligopoly, which assumes away the possibility of such communication.

Our consideration suggests, then, that the efficiency of an industry may depend not so much on the degree of concentration (the number of firms) as on the possibility of such direct communication, and the cost of information, communication, and organization.

8. Conclusion

Implicit dynamic concepts are hidden in the time structure of Walrasian and Marshallian theories which are generally regarded as uni-periodal economic theories. Some of them correspond clearly to the more developed concepts of modern dynamic theories. The implications of Marshall's equilibrium of industry with disequilibrium firms has, however, not yet been fully developed explicitly by modern theories of the dynamic economics. While Edgeworth's theory of exchange has generally been evaluated as an important contribution to the theory of perfect competition, the implications of its communication structure of the market is considered in the case of duopoly and it is suggested that the efficiency of an industry depends not so much on the degree of concentration as on the communication structure.

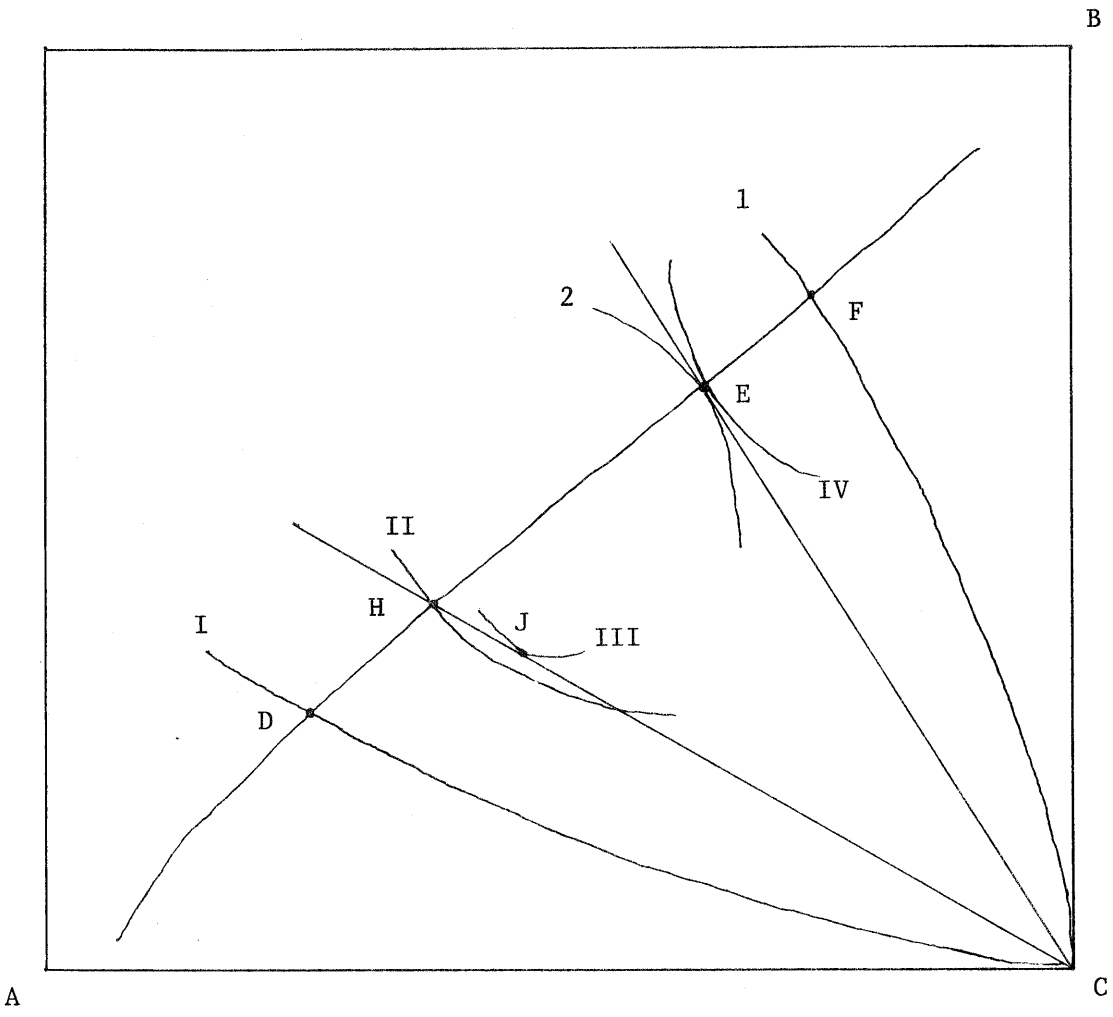

Figure 1

Footnotes

1) For a difficulty in the last model, that of money and circulation, see Negishi[14], Chapter 7, section 5.2.

2) This is a simplified version of the model given by Morishima[12] (pp. 108 - 112). We cannot, however, agree with Morishima's interpretation of the model ([12], pp. 112 - 122). See footnote 3) below.

3) It is, therefore, superfluous to introduce Keynesian investment function. See, however, Morishima[12], pp. 112 - 122.

4) As early as in 1936, Yasui pointed it out. See Yasui[18], p. 248, and also Garegnani[4], part 2, Chapter 2. In spite of Garegnani, however, the fact that the stock of the existing capital goods cannot be arbitrary given is not the defect of Walrasian theory of credit and capital formation. It is also the case with the classical theory of the stationary economy.

5) In other words, short-run average cost including normal profit is higher (lower) than the normal supply price of the industry for the contracting (expanding) firms, while short-run marginal cost is equal to the normal supply price of the industry for all firms.

6) The demand price for a certain amount of a good is the price which clears the market, i.e., makes the demand equalized to the given amount.

7) It is interesting to see that Marx's market value ([10], p. 178) corresponds in this respect to Marshall's normal supply price of the industry. See Negishi[13], Chapter 6, section 6.

8) For an example of such an attempt, see Negishi[13], Chapter 5

9) Of course, this is a simplifying assumption and in general C can be anywhere in the box.

10) Though H and J are allocation to a half of A type traders in the economy, they can be considered as allocations to an A type trader, since indifference curves are homothetic. Alternatively, we can argue more generally by the use of Scitovsky indifference curves.

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