Introduction

As David Ricardo mentioned in his famous book, to determine the laws which regulate income distribution is the principal problem in Political Economy. In this paper, we discuss the distribution of national income in closed economy. National income is a sum of incomes which all agents in the country receive. A model which represents a country is necessary to explain completely how national income is distributed to each agent in the country. We use a general equilibrium model in this paper. As usual, there are two kinds of agents in the model, which are households and firms. But we omit the income of firm for simplicity. So we assume that no firm has retained earnings and every firm distributes its profit to households completely.

In exploring how national income is distributed among households, we pay our attention to each firm’s value added generated by the present period’s production. Value added is revenue (gained by selling products) minus cost of intermediate goods. Let \( v^f \) be firm \( f \)'s value added, \( F \) be the numbers of firms. Then national output equals to \( \sum_{f=1}^{F} v^f \). Since \( v^f \) is distributed to each household as some kinds of income, \( \sum_{f=1}^{F} v^f \) also equals to national income. Therefore, when we finish explaining how each firm distributes its value added, an explanation of distribution of national income is made.

We assume that there are two kinds of incomes, wage (income of laborer) and income of firm’s owner. Although income of firm’s owner is sometimes called profit, we avoid the use of the term in this paper, because profit is often used to mean revenue minus cost. We want to eliminate some confusion of terminology. Profit means revenue minus cost in this paper.

Suppose that firm \( i \) produces one kind of consumption goods by using one kind of intermediate goods, one kind of labors and one kind of capital goods. Firm \( i \)'s value added is represented by \( p_c x^c_i - p_a x^a_i \), where \( p_c \) is price of consumption good, \( x^c_i \) is firm \( i \)'s output, \( p_a \) is price...
of intermediate goods, and \( x^*_a \) is firm \( i \)'s input of intermediate goods.

Firm \( i \)'s profit is represented in two ways by the point of view of analysis, short-run and long-run. In microeconomics, short-run is usually described as a period in which at least one kind of inputs cannot be adjusted fully, and long-run is usually described as a period in which all kinds of inputs can be adjusted fully. In short-run, inputs are classified into variable inputs or fixed inputs. When we treat intermediate goods and labors as variable inputs, and capital goods as fixed inputs, firm \( i \)'s profit is represented by \( p_a x^i_e - p_a x^i_a - wL^i \), where \( w \) is wage rate (price of labor) and \( L^i \) is firm \( i \)'s input of labors. In long-run, firm \( i \)'s profit is represented by \( p_a x^i_e - p_a x^i_a - wL^i - rK^i \), where \( r \) is price of capital good's service and \( K^i \) is firm \( i \)'s input of capital good's services.\(^4\)

Now, how should we explain the distribution of firm \( i \)'s value added between wages and incomes of firm's owners? At first we examine the marginal productivity theory, which is widely accepted neoclassical theory of income distribution.

## 2 The Marginal Productivity Theory

The marginal productivity theory insists two propositions as follows.

1. Reward per input paid to suppliers of inputs is equal to marginal-value product of the input.
2. Value added is distributed to suppliers of inputs completely for every firm.

The first proposition of the marginal productivity theory is derived from first-order conditions of firm’s profit maximization problem. In the marginal productivity theory, the firm \( i \)'s actions in the present period are formalized as follows from a point of view of long-run.

Given \( p_a, p_e, w, r \),

\[
\text{Maximize} \quad p_c f^i_c(x_a, L, K) - p_a x_a - wL - rK, \quad (1)
\]

where \( f^i_c : (x_a, L,K) \mapsto x_e \) is a long-run production function of firm \( i \).

First-order conditions of firm \( i \)'s profit maximization problem are

\[
p_a = p_c \frac{\partial f^i_c (x^*_a, L^*, K^*)}{\partial x_a}, \quad (2)
\]

\[
w = p_c \frac{\partial f^i_c (x^*_a, L^*, K^*)}{\partial L}, \quad (3)
\]

\[
r = p_c \frac{\partial f^i_c (x^*_a, L^*, K^*)}{\partial K}, \quad (4)
\]

where \( (x^*_a, L^*, K^*) \) is a solution of profit maximization problem. The right hand side of Equation (2), (3), (4) is a marginal-value product of each input respectively.

Since we can think of each input’s price as a reward per input paid to suppliers of inputs, the first proposition of the marginal productivity theory is undoubtedly true. But we have to be careful about the fact that each price is assumed to be given. This proposition does not tell how the size of reward paid to suppliers of inputs is determined. Marginal-value product of each input varies with combination of inputs, so it is not intrinsic value of the input. The implication of equations (2), (3), (4) is that firm \( i \) determines the combination of inputs so that marginal-value product of input becomes equal to the given input’s price.

It is a typical thought of neo-classical theory that

\(^4\) It is important to distinguish the trade of capital goods from the trade of capital good’s services. When one sell a capital good to another, the ownership of the capital good transfers from seller to buyer. But when one sell a capital good’s service to another, transfer of the ownership of the capital good does not take place. We can interpret selling capital good’s services as selling the right to use the capital good for a certain period. Agent who can sell capital good’s services is owner of the capital good.
the price of goods or services is determined by the interaction of demand and supply in the market. To explore how the size of reward paid to suppliers of inputs is determined, we have to use the general equilibrium analysis. The general equilibrium model needs to contain consumption good market, intermediate good market, labor market, and capital good’s service market, to argue how firm i’s value added is distributed.

Let us consider the country which produces three kinds of products, consumption goods, intermediate goods, and capital goods in the present period. As we explained previously, consumption goods are assumed to be produced by intermediate goods, labors, and capital goods. Both intermediate goods and capital goods are assumed to be produced by labors and capital goods. For simplicity, we assume that intermediate goods are used only in production of consumption goods. And, for the moment, we assume that same kind of capital goods are used in the production of all kinds of products, namely, we assume that there are only one kind of capital good’s services in the present period.

If one firm produces more than two kinds of products, first-order conditions of profit maximization problem are not represented as equations (2), (3), (4). Thus we assume that there are no joint products in the present period. And we assume that the number of firms which produce consumption goods is $I$, the number of firms which produce intermediate goods is $J$, and the number of firms which produce capital goods is $N$. So $I + J + N = F$, where $F$ is the total number of firms in our country.

Each firm which produces consumption goods is indicated by an index $i = 1, \ldots, I$ and we denote firm $i$’s production function by $f_i^c : (x_a, L, K) \mapsto x_c$. Each firm which produces intermediate goods is indicated by an index $j = 1, \ldots, J$ and we denote firm $j$’s production function by $f_j^i : (L, K) \mapsto x_a$, where $x_a$ is quantity of intermediate goods. Each firm which produces capital goods is indicated by an index $n = 1, \ldots, N$ and we denote firm $n$’s production function by $f_n^k : (L, K) \mapsto x_k$, where $x_k$ is quantity of capital goods which are produced in the present period. We suppose that all production functions are differentiable and each production function’s partial differential coefficients are positive for every input.

We must be careful not to formalize firm $i$’s profit maximization problem as follows.

Given $p_c, p_a, w, p_k$,

$$\begin{align*}
\text{Maximize} & \quad p_c f_i^c(x_a, L, x_k) - p_a x_a \\
& \quad - wL - p_k x_k,
\end{align*}$$

(5)

where $p_k$ is price of capital good. The distribution of income from value added is one thing, and the investment (i.e. the purchase of capital goods) another. This fact seems to be apparent, so some readers might think we need not point it out now. But it is important matter for the treatment of capital goods in a general equilibrium model. In addition, the distinction between the payment to the firm which produces intermediate goods and the payment to the firm which produces capital goods is also important. We will explain these points using a numerical example in the next section.

## 3 Distribution of Income from Value Added and Investment

As mentioned in the previous section, we are considering a country which produces three kinds of products, consumption goods, intermediate goods, and capital goods. Table 1 shows the notation in this paper.

Since the firm $i$’s value added is represented as $p_c x_i^c - p_a x_a^i$, the total value added in the consumption good industry is $\sum_{i=1}^{I} (p_c x_i^c - p_a x_a^i)$. As intermediate goods are assumed to be used only in the production of consumption goods, the firm $j$’s value added and the firm $n$’s value added are
represented as $p_a x^j_a$ and $p_k x^n_k$ respectively, where $x^j_a$ is firm $j$’s output and $x^n_k$ is firm $n$’s output. So the total value added in the intermediate good industry is $\sum_{j=1}^J p_a x^j_a$, and the total value added in the capital good industry is $\sum_{n=1}^N p_k x^n_k$.

Let $Y$ be national output. As national output is sum of every firm’s value added, we get the following expression.

$$Y = \sum_{i=1}^I (p_c x^i_c - p_a x^i_a) + \sum_{j=1}^J p_a x^j_a + \sum_{n=1}^N p_k x^n_k.$$  (6)

When the intermediate good market is in equilibrium, the demand for intermediate goods is equal to the supply of intermediate goods in the market.

$$\sum_{i=1}^I p_a x^i_a = \sum_{j=1}^J p_a x^j_a.$$  (7)

By using equation (7), we can simplify equation (6) as follows.

$$Y = \sum_{i=1}^I p_c x^i_c + \sum_{n=1}^N p_k x^n_k.$$  (8)

The right hand side of this equation is the total value of final goods which are produced in the present period.

Let $W_c$, $W_a$, $W_k$ be the total wage distributed in consumption good industry, intermediate good industry, and capital good industry respectively. And let $O_c$, $O_a$, $O_k$ be the total income of firm’s owners distributed in consumption good industry, intermediate good industry, and capital good industry respectively. If we denote national income by $NI$, $NI$ is represented as follows.

$$NI = W_c + O_c + W_a + O_a + W_k + O_k.$$  (9)

Since $W_c + O_c = \sum_{i=1}^I (p_c x^i_c - p_a x^i_a)$, $W_a + O_a = \sum_{j=1}^J p_a x^j_a$, and $W_k + O_k = \sum_{n=1}^N p_k x^n_k$, national income is equal to national output.

$$NI = W_c + O_c + W_a + O_a + W_k + O_k = \sum_{i=1}^I (p_c x^i_c - p_a x^i_a) + \sum_{j=1}^J p_a x^j_a + \sum_{n=1}^N p_k x^n_k = Y.$$  (10)

Table 2 shows a numerical example of national output. Sum of every firm’s value added is 500 ($= 150 + 150 + 200$), which is national output. Total wage in the country is 350 ($= 100 + 100 + 150$) and total income of firm’s owners in the country is 150 ($= 50 + 50 + 50$). Then national income is 500 ($= 350 + 150$), which is equal to national output.

Total investment in the present period is 200, which is equal to total revenue of capital good industry. Savings are income minus consumption expenditure. National income is 500, total consumption expenditure is 300, which is equal to total revenue of consumption good industry, then total savings, which are sum of every household’s income, is 200.
savings, are 200 ($= 500 - 300$). As money which households save is used to buy capital goods, total savings equal to total investment.

Note that Table 2 does not show any demand for capital goods which are produced in the present period. Total demand for the capital goods must be 200, because total supply of capital goods is 200. As total income of firm’s owners is 150, part of total wage is used for purchase of capital goods.

The formalization of firm’s actions in the present period like expression (5) confuses the distribution of income from value added with the payment to the firm which produces capital goods. $p_k x_k$ in expression (5) is investment of firm $i$ and it is paid to firms which produce capital goods. We must not deduct $p_k x_k$ from firm $i$’s value added, which is equal to $p_a f^i_c(x_a, L, x_k) - p_a x_n$ and firm $i$’s value added should be distributed to households as wage or income of firm’s owner completely. Because if part of firm $i$’s value added is paid to firms which produce capital goods, $W_c + O_c = \sum \left(p_c x^i_c - p_c x^d_c\right)$ doesn’t hold and national income becomes unequal to national output. Once firms’ values added have been distributed to households completely, households save part of their incomes and firms raise funds to buy capital goods. We must formalize these actions in a general equilibrium model. And $p_k x_k$ must be deducted from the funds which firm $i$ raise not from the firm $i$’s revenue or value added.

While intermediate goods and labors vanish after they are used in the present period’s production, capital goods are ordinarily used for several periods. So we need to derive demand function of capital goods from a maximization problem of present discounted value of several future periods’ profits, not from a maximization problem of the present period’s profit like expression (5). How much fund to raise is concerned with how much capital goods to buy inevitably. Demand function of fund is also derived from the same maximization problem.

When we construct a general equilibrium model, we should not suppose that there are markets where future products or future inputs are traded in the present period as Debreu did in his famous book. And we must not formalize firm $i$’s actions in several periods as follows.

Given $p_c^t, p_a^t, w^t, r^t (t = 0, 1, \ldots, T)$

\[
\text{Maximize} \quad \sum_{t=0}^{T} \left( p_c^t f^t_c(x_a^t, L^t, K^t) - p_a^t x^a_t - w^t L^t - r^t K^t \right),
\]

where superscript $t$ represents period and $t = 0$ means the present period. In this framework, firm needs not to raise fund to buy capital goods, because it can sell future products now and use the revenue to buy capital goods. Complete general equilibrium model which supposes the existence of futures market for all kinds of goods is not appropriate for exploring savings and investment. Since payments and receipts are made at once, household need not store value for future consumption and firm need not raise fund to carry out investment in the model.

We have to use a temporary general equilibrium model which is built on the assumption that trades in markets occur periodically. In the model, $t$-th period’s goods are traded in the market when $t$-th period has come and all agents decide what to buy and what to sell in $t$-th period at the

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5 Lending and borrowing of fund are made through trade of financial assets like bonds or stocks. Household carries out its savings by purchase of financial assets not consumption goods, and firm raises fund by selling financial assets.

6 This is a crucial difference between Keynes’ investment theory and the marginal productivity theory.

7 cf. Chapter 2 of Debreu, G. [2]

8 Financial assets are means of store of value for households. As household need not store value, there is no room for incorporating financial assets properly in complete general equilibrium model.
beginning of the period. Needless to say, each agent’s expectation of future events and plan of future actions is crucial determinant of the present period’s savings or investment.

4 Problems of the Marginal Productivity Theory and Owner of Capital Good

We may now return to the argument how we should explain the distribution of firm $i$’s value added between wages and incomes of firm’s owners. As we cannot treat capital good just like intermediate good, and capital good is usually used for production during several periods, we have to distinguish capital goods which are produced in the present period from those which were produced before the present period. And we need to suppose that capital goods which are used in the present period’s production are the ones which have already existed at the beginning of the present period, that is the ones which were produced before the present period. Capital goods which are produced in the present period are supposed to be used in production from next period.

When we construct a general equilibrium model, we have to take the quantities of capital goods which have already existed at the beginning of the present period as given and allot them to each agent as initial endowment. Then to which agents should we allot them, households or firms? Which agents are owners of capital goods, households or firms?

When a general equilibrium is constructed, initial endowments are usually allotted to households only. And we can think the marginal productivity theory also does so, because it explains that income of firm’s owner is distributed as rent $rK$. In the marginal productivity theory, households possess capital goods and sell their services to firms and get rent as income. Therefore capital good’s service market where households rent capital goods to firms must exists in a general equilibrium model. But there are some problems in the assumption that capital good’s service market exists.

First of all, in the real world, almost all capital goods like factories or machines are owned by firms and they are listed on the debit side of each firm’s balance sheet. Households which are some firm’s owners do not have capital goods directly but have stocks instead, when the firm is a incorporated company. Every stockholder has a right to receive part of the firm’s profit, and gets dividend as income. There are few households which rent capital goods to firms in the real world.9

Second, if owners of capital goods are households, agents which buy capital goods must be households, namely investments must be carried out by households. This fact makes the explanation of investment and savings odd. The problem of how much to buy capital goods inevitably relates to a plan of future production and firm’s expectation. Demand function of capital goods must be derived from a maximization problem of present discounted value of several future periods’ profits, not from a maximization problem of a household’s utility.

Third, we cannot avoid giving unrealistic property to capital goods in a general equilibrium model. In order to sell and buy capital good’s services (i.e. rent capital goods) in a market, capital goods must be able to move freely among agents. So it should be possible that capital goods which were used by a certain firm yesterday are used by another firm today. In the real world, only limited kinds of capital goods are rented and most kinds of capital goods are owned by firms, in other words, there are only a limited number of markets where capital goods are rented, because movement of capital goods from one firm to another is not easy in most cases. Capital goods like machines

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9 There are many firms which rent capital goods like personal computers or construction machinery to other firms in the real world. But payments to these firms are the same as payments to firms which produce intermediate goods and differ from the distribution of value added.
or factories are always designed for special use, hence capital goods which are used by one firm are often useless for another one. Besides in the case of capital goods like buildings or factories, it is essential where they were built. Because it is difficult for a firm, which does its production in a certain region, to use capital goods which exist far from the firm. Most capital goods are fixed once they are produced. And the opportunity cost of using them in production is very low in the real world, because it is difficult to rent them to other firms.

5 Appropriate Formalization of Production
Let us suppose that all capital goods which have already existed at the beginning of the present period are owned by firms, and that the capital good’s service market does not exist. Then the amount paid in the past to purchase capital goods is a sunk cost and the opportunity cost of using capital goods in production is zero.\(^1\) Let \(x_k^i\) be the quantity of capital goods which firm \(i\) owns at the beginning of the present period.

In the present period’s production, firm \(i\) can adjust input of capital good’s service within the upper limit, which is prescribed by \(x_k^i\). But how much capital good’s services are used in production is indifferent to the cost of production, since the opportunity cost of using capital goods in production is zero.\(^1\) So we need not represent the input of capital good’s service explicitly, and we express firm \(i\)’s production function as \(f_i(x_a, L, x_k^i)\). This is a short-run production function.\(^1\) We need not represent the quantity of capital goods explicitly either, but we represent it for the sake of discussion.

The firm \(i\)’s production in the present period is formalized as follows from a point of view of short-run.

Given \(p_c, p_a, w, x_k^i\),

\[
\text{Maximize } p_c f_i(x_a, L, x_k^i) - p_a x_a - w L. \quad (13)
\]

This is the appropriate formalization of production.\(^1\) Explanations of production from the point of view of short-run are always seen in microeconomic textbooks, but they are scarcely used in general equilibrium analysis. This is probably because many people implicitly think that if there are \(l\) kinds of commodities, then there exist \(l\) markets, and any agent which pays the price can get a commodity at once provided that the market is in equilibrium. On the contrary, we cannot treat capital goods like intermediate goods in a general equilibrium model, and the formalization of production from the point of view of long-run like expression \((14)\) or \((15)\) is inappropriate.

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10 If some firm decides to give up its business and leave the market, it can sell its used capital goods. But we do not think about such a case here.

11 If we represent the input of capital good’s service explicitly, firm \(i\)’s profit maximization problem is stated as follows.

\[
\text{Maximize } p_c f_i(x_a, L, K) - p_a x_a - w L - 0 \cdot K. \quad (12)
\]

12 It is widely known that Joan Robinson was critical about long-run production function. But she is affirmative about short-run production function. She stated as follows in the introduction of Robinson, J. [10].

The capital in existence at any moment may be treated simply as “part of the environment in which labor works.” We then have a production function in terms of labor alone.

13 Firm’s actions in the present period are classified into three categories, production, investment and finance (i.e. raising fund). We intend to discuss the formalization of investment and finance in a paper which will be written after this.
Given $p_c$, $p_a$, $w$, $p_k$, 

Maximize \[ p_c f_c(x_a, L, x_k) - p_a x_a - wL - p_k x_k. \] \hspace{1cm} (14)

Given $p_c$, $p_a$, $w$, $r$, 

Maximize \[ p_c f_c(x_a, L, K) - p_a x_a - wL - rK. \] \hspace{1cm} (15)

Capital goods are ordinarily used for several periods. And most used capital goods are seldom sold at high price, since they are fixed once they have been produced. So firms must be careful when they purchase capital goods. Investment is always accompanied with risk. The amount of capital goods that a firm owns at the beginning of the present period is a result of the past actions of the firm.

Although firms perform their productions and investments simultaneously, they cannot increase their productivity during the present period by their investment of the present period. For it takes time to produce capital goods after making a plan of future production. This is also the reason we use short-run production function in the formalization of production. When firms decide how to produce in the present period, the amounts of capital goods which they can use in the present period are always given.

To construct a general equilibrium model, we have to give the quantities of capital goods which firms own at the beginning of the present period. So we can discuss what is the best amount of capital goods for the firm and use long-run production function for the discussion. But we cannot use the formalization of production from the point of view of long-run in the discussion, because it is not consistent with any general equilibrium model which treats capital goods properly.

6 Conclusion

How should we explain the distribution of firm $i$’s value added between wages and incomes of firm’s owners? The marginal productivity theory insists that the reward per input paid to suppliers of inputs is equal to marginal-value product of the input and that value added is distributed to suppliers of inputs completely. So we can express the marginal productivity theory’s explanation as follows.

\[ v^{ci} = wL^{ci} + rK^{ci}. \] \hspace{1cm} (17)

To explain how the prices of labor and capital good’s service are determined, we need to use a general equilibrium model which represents a country. But, when we construct the model, we cannot suppose that there exists a capital good’s service market where households rent capital goods to firms. For the assumption entails some crucial problems concerning the treatment of capital goods in a general equilibrium model. To treat capital goods properly in a general equilibrium model, we must use a temporary equilibrium model which is
built on the assumption that trades in markets occur periodically. In the model capital goods must be owned by firms and households which are owners of some firm must have stocks, which are rights to receive parts of the firm’s profit.

The formalization of production from the point of view of long-run like expression (14) or (15) is inappropriate, because it is inconsistent with general equilibrium model which treats capital goods properly. Since the marginal productivity theory’s explanation is based on the inappropriate formalization, it is also inappropriate. The appropriate formalization of production is expression (13), which is a formalization from the point of view of short-run.

Following the appropriate formalization, we get a explanation of income distribution as follows.

\[ v^{ci} = wL^{ci} + \pi^{ci}, \]

where \( \pi^{ci} \) is firm \( i \)'s profit. Namely

\[ \pi^{ci} = p_c f^i(x^{ci}, L^{ci}, \pi^{ki}) - p_a x^{ci} - wL^{ci}. \]  

(19)

In this explanation, the distribution of value added to laborer is also made through the trade in labor market. So households which supply labors receive wages in the labor market. But the distribution of value added to firm’s owner is an allocation of residual (i.e. revenue minus cost).

Let \( \theta_{ci}^h \) \( (i = 1, \ldots, I, h = 1, \ldots, H) \) be household \( h \)'s share in firm \( i \)'s profit. \( H \) is the total number of households in our country. Household \( h \)'s share in firm \( i \)'s profit is expressed as follows.

\[ \theta_{ci}^h = \frac{\text{number of stocks which household } h \text{ owns}}{\text{total number of firm } i \text{’s stocks}}. \]  

(20)

From our assumption that every firm distributes its profit to households completely, we get the following equation.

\[ \sum_{h=1}^{H} \theta_{ci}^h = 1 \quad \text{for all } i \in \{1,2,\ldots,I\}. \]  

(21)

The household \( h \) receives dividend \( \theta_{ci}^h \pi^{ci} \) from the firm \( i \). This is the income of firm’s owner. The size of profit, which is prescribed by the prices of output and inputs and by the production function, varies from firm to firm. But the rates of returns of two firm’s stocks become even by the trades in stock markets, provided that the degrees of risks of both firm’s stocks are the same. That is to say, if the degrees of risks of firm \( f \)'s stock and firm \( f' \)'s stock are the same, we have the following equation.

\[ \frac{\pi^f}{S^f} = \frac{\pi^{f'}}{S^{f'}}, \]  

(22)

where \( \pi^f \) is average profit of firm \( f \) and \( S^f \) is total number of firm \( f \)'s stocks and \( p^f \) is price of firm \( f \)'s stock. \( \frac{\pi^f}{S^f} \) is average profit per stock of firm \( f \) and the left hand side of equation (22) is the rate of return of firm \( f \)'s stock.\(^{13}\) The right hand side of equation (22) is the rate of return of firm \( f' \)'s stock.

In the above argument, we assume that there are only one kind of consumption goods, intermediate goods, capital goods (which are produced in the present period), labors and capital good’s services (the capital goods were produced in the past) respectively. But even if we increase the kinds of each goods or services, the essentials of the argument does not change and the existence of several kinds of capital goods will increase the plausibility of the argument.\(^{15}\)

Some readers might think it is strange that there

\[ \text{For the sake of simplicity, we do not consider the possibility of appreciation or depreciation of firm’s stock here.} \]

\[ \text{For example, if firm } i \text{ uses two kinds of capital goods, its production function is represented as } f^i_c(x_a, L, x^{ci}_v, x^{ci}_w) \text{ where } x^{ci}_v (v=1,2) \text{ is the quantity of capital good } v \text{ which firm } i \text{ owns at the beginning of the present period. Since we explain income of firm’s owner as residual, we need not aggregate quantities of different kinds of capital goods.} \]
are profits. For it is often insisted that there are no profits in the long-run equilibrium. If there is a profit, other firms will enter the market and the price of the product must fall. (cf. Figure 1) And the entries of new firms will continue until the price of the product reaches the existing firm’s minimum average cost. (cf. Figure 2)

The above argument that there are no profits is incomplete, because it is based on the partial equilibrium analysis. The reason a new firm enters some market is that it can make more profit than other product markets. So the situation considered as the long-run equilibrium is that even if a new firm enters any product market, it can make profit of the same size. To explore this situation, the partial equilibrium analysis is insufficient, because it considers only one market and many things concerning other markets are given. We must consider all product markets at once to explore the situation. It is often said that normal profit is contained in the firm’s cost, and that profit is zero means excess profit is zero. But it is not clear how the normal profit is represented and contained in the firm’s cost. Moreover how the size of normal profit is determined is not clear.

Note that we cannot construct a general equilibrium model in which every firm’s profit is zero. As we mentioned previously, each firm’s profit depends on the prices of outputs and inputs and the firm’s production function. But the combination of prices which clears all markets is not necessarily the one which makes every firm’s profit zero. So the second proposition of the marginal productivity theory, which insists that value added is distributed to suppliers of inputs completely for every firm, is also inconsistent with general equilibrium models. As we cannot explain that normal profit is expressed as $rK$ (price of capital good’s service times input of capital good’s service) and every firm’s profit becomes zero by using a general equilibrium model, it is not strange that there are profits.

References


Distribution of National Income in a General Equilibrium Model:
Appropriate Formalization of Firm's Actions (畠中)


