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ECONOMIC GROWTH, INCOME DISTRIBUTION, AND MACROCCONOMIC POLICIES

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In one-sector growth model economic growth through technical progress can distort the income distribution in the short and medium run, but may converge to the stability of functional shares in income distribution without technical progress before reaching stationary state in the long run. In the presence of capital accumulation induced from technical progress this paper provides theoretical reasons to explain Kravis'(1959) empirical finding that the notion of long-run constancy in relative shares is false. Public policies are required to correct the relationship between maximizing economic growth following technical progress and the resulting distortion of functional income distribution. To achieve the two objectives in a trade-off altogether, this paper comes up with a package of policy: investment incentive for growth, the decrease of saving level, and the increase of labor's ownership on induced capital accumulation.

I. INTRODUCTION

The relationship between income distribution and growth in the history of economics has been studied. What matters is that the theoretical determinants of income distribution are very poorly understood in developed as well as underdeveloped countries. One of the most exciting results of the macroeconomic theories of the Cambridge school has been regarded as a very simple relation connecting the rate of profit and the distribution of income to the rate of economic growth, through the interaction of the different propensities to save. A post-Keynesian theory on profit and distribution which is common to a number of macro-dynamic models elaborated in Cambridge has emerged as a development of the Harrod-Domar model of economic growth. The common features of all these models are theories of long-run equilibrium. The models assume full employment systems where the possibilities of economic growth are externally given by

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population increase and technical progress. Therefore, the amount of investment necessary in order to keep full employment through time is also externally given.

Main problems in post-Keynesian models assume the exogeneity of technical progress and investment. Most models cannot take account of the induced effect of technical progress on capital accumulation. Such type of technical progress cannot exert an influence on the income distribution. Hence the emphasis on the long-run equilibrium sheds little on the possibility that the income distribution favorable to the capitalst can occur in the adjustment period. Especially, the developing counties faces this phenomenon.

A remarkable change in public and private perception about the ultimate nature of economic development has occured in the 1970s. The dethronement of maximizing GNP as the major objective of economic activity in the second development decade puts in its place concern for the alleviation or eradication of absolute poverty and the reduction of income inequality. There is a consensus among economists that two objectives can probably best be achived in a growing economy. The problem lies in how to coordinate growth and distribution which is taught to be in conflict.

The theories of income distribution in the economics have usually been distinguished between two principal measures for analytical and quantitative purposes : "personal" or "size" distribution of income and "functional" or "distributive" factor share income distribution. This paper belongs to the latter in new perspective to reflect the new values(Goulet, 1978), such as life-sustenance, esteem and freedom in the second decade of development. As far as I know, there is no model to analyze the relationship between distribution and growth through technical progress in which the endogeneity of such induced capital accumulation is assumed. In my paper it is shown that continuous technical progress may accelerate the speed of increase of capitalist's income share. The model assumes the neoclassical production function with the characteristics of twice differentiable. Representative post-keynesians such as Kaldor(1969), Robinson(1969), and Pasinetti(1975), have tried to build more sophisticated growth models although they reject the notion of a production function. Hence modeling in the paper the relationship between income distribution and growth is different form the previous literature in treating the production function.

These issues, together with several others, are examined in this paper. Section II reviews post-keynesian theoretical framework briefly. This is the starting point of this paper to extend the previous elaboration. Section III investigates factors to determine the rate of growth of marginal product in labor and capital. Growth through technical progress is defined which measures the total change in output as the economy fully adjusts in the long-run equilibrium to each new level of technology. In this paper technical progress is regarded as being disembodied, because in the vintage mdels of economic growth there is no new capital accumulation and it is impossible to reveal technical progress determined endogenously.

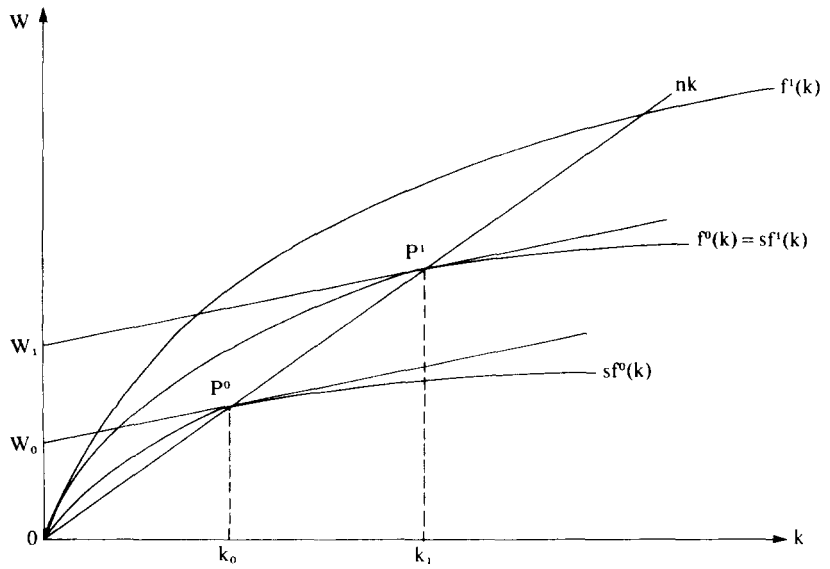
Note that although the rate of growth of marginal product of each factor is closely related to theories of business cycle, the topic is not discussed in this paper. Section IV analyzes the change in the functional shares of income distribution occurring in the adjustment period toward a long-run equilibrium. A one-sector model of optimal growth is used to investigate the long-run stability of functional shares in income distribution in response to changing technology. Hence this section yields new aspects on the short-run fluctuation of income distribution allocated to worker and capitalist. Section V comes up with several macroeconomic policies based on this paper to coordinate the presumed constancy over long periods of time in western economies and economic growth. Finally, several conclusions are summarized and further research is disussed.

II. THE LIMIT OF TYPICAL ONE-SECTOR MODEL FOR INCOME DISTRIBUTION AND GROWTH

Following Johnson(1973), the simple illustration of factor shares and growth in one-sector model is introduced. It makes clear what is furthermore to be analyzed in light of reality.

The diagram in figure 1 depicts the relation between factor shares and growth through techncal progress. Assume the Harrod-neutral technical change.

Here W denotes the wage, n the growth rate of population, s the saving rate, k the capital-labor ratio, and $f^1(K)$ the production function. Capital accumulation moves from k_0 to k_1 until its marginal product is reduced to its original level,



[Figure 1]

and, as can be easily shown by similar triangles, relative factor shares are unchanged (labor's share is $\frac{0W_0}{k_0P^0}$ before and $\frac{0W_0}{k_1P^1}$ after the change). According to this, technical change under Harrod-neutral cannot distort the income distribution at the stationary state.

It is assumed that the locus of economic growth can be difined as the continuity of stationary point. In Keynesian point of view, the long-run equilibrium can be a guide to the economy, not its substance. In fact, economic growth in most developing countries has deepened the distortion of the income distribution. Economic theory about income distribution may offer a guidance of how and why incomes tend to be concentrated in certain populations. Although sizable body of theoretical literature in income distribution has been built up around the concept of functional income distribution, it would not help us to understand the determinants of the size distribution of income which are of importance in reality. Hence it is worthwhile to build up the model to explain the fact in the context of functional income distribution.

III. THE MODEL WITH ENDOGENOUS CAPITAL ACCUMULATION

The model is based on Diamond(1965), Liviatan(1970), and Hulten(1975), besides involving Solow's style of capital accumulation. The model assumes two aspects of technical change that are essential for a description of the behavior over time. These are the rate of technical progress and the bias of the change. The production function, F(L, K, T), is twice differentiable and homogeneous of the first degree, where K is capital, L labor, and T time. What is remarkable in this paper is to assume that T is endogenously determined by research and development(R & D) expenditures as well. Their relation is

$$T = g\ (RD)$$

where RD is R & D. For the sake of simplicity, it is assumed that T equals R & D. T corresponds to technical progress accruing from R & D investment. This simple assumption leads the model to reflect that technical progress is determind endogenously, i.e., in the economic system. Hence T has dual characteristics representing time and technical progress.

$$(1) \quad P = \frac{F_T}{F} = \frac{KF_{KT} + LF_{LT}}{KF_K + KF_L}$$

$$(2) \quad B = \frac{\partial \left(\frac{F_K}{F_L}\right)}{\partial T} \qquad \left(\frac{F_K}{F_L}\right)$$

where F_i denotes $\frac{\partial F}{\partial i}$ $(i = L, K, T)$. That is, P indicates the rate of technical progress and B the bias of the change. In the bias of induced invention, if relative prices of the factors of production change in favor of using a factor, say capital, entreprenurs are stimulated to adopt inventions of the labor-saving type, that is, such methods of production that increase the marginal product of capital more than they increase the marginal product of labor[1]. That is, if $B>0$, technical change is capital-intensive, i.e., labor-saving. If $B<0$, it is labor-intensive, i.e., capital-saving. Note that our model does not take into account the change in relative prices of the factors of production.

1. Neo-classical Economic Growth with Endogenous Technical Progress

The population growth rate is $\frac{L_{T-1}-L_T}{L_T} = \frac{dL}{dt} = n$ and exogenous. Following the text book procedure, the capital accumulation is performed as follows:

$$(3)\quad \left(\frac{K}{L}\right) = s\,F\left(\frac{K}{L}, 1, \frac{T}{L}\right) - n\,\frac{K}{L}$$

The resulting new function for capital accumulation becomes:

$$(4)\quad \dot{k} = sf(k, t) - nk$$

where k denotes $\frac{K}{L}$, s the saving rate, and $\dot{k} = \frac{d}{dT}$. Equation (4) corresponds to what Harrod termed the functional equation. Since $\frac{\dot{k}}{k}$ in the induced innovation literature is an endogenous variable, it must be included in the model to investigate redistribution with growth through technical progress.

2. Income Distribution

In order to describe the time profile of various economic variables, two standard characteristics of a production function will also be used. These are the elasticity of substitution, σ, and the share of capital, π. They are defined as follows:

$$(5)\quad \sigma = \frac{d\ \mathrm{In}\ (L/K)}{d\ \mathrm{In}\ (F_K/F_L)} = \frac{F_K\,F_L}{F\,F_{KL}}$$

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[1]J. Hicks'(1932), *The Theory of Wage*, has done the well-known dual classification of technical invention into "labor-saving", "neutral", and "capital-saving" and into "autonomous" and "induced" inventions. His "induced" invention generates the hypothesis that a change in relative factor prices stimulates the invention of new methods of production biased in the direction of using the new cheaper factor to save the expensive one. Morishima and Sato(1969) shows the possibility and its magnitude of "induced" invention in the analysis of the United States data, 1902-1955.

$$(6)\quad \pi = \frac{K\,F_K}{F.}$$

The definition of P and B can be solved for F_{KT} and F_{LT} giving[2]

$$(7)\quad \frac{F_{KT}}{F_K} = P + (1-\pi)\,B$$

$$(8)\quad \frac{F_{LT}}{F_L} = P - \pi B$$

From the definition of σ we have:

$$(9)\quad \frac{\frac{\partial F_K}{\partial k}}{F_N} = -\frac{(1-\pi)}{\sigma K}$$

$$(10)\quad \frac{\frac{\partial F_1}{\partial k}}{F_1} = \frac{\pi k}{\sigma.}$$

When equations (7) and (9), and equations (8) and (10) are combined respectively, the rate of growth of the marginal products can be represented by the two indices, i. e., the bias of technical change and the rate of increase of the capital-labor ratio.

$$(11)\quad \frac{F_K}{K_K} = P + (1-\pi)\,B - \frac{(1-\pi)}{\sigma} \cdot \frac{k}{k}$$

$$(12)\quad \frac{\dot{F}_L}{F_L} = P - \pi\,B + \frac{\pi}{\sigma} \cdot \frac{\dot{k}}{k}$$

The factor price which is the basis of functional income distribution according to market mechanism is determined by the marginal product. In such context, how is the benefit of growth through technical progress dispersed to capitalist and worker? It can be obviously explained by the difference between equations (11) and (12). That is,

[2]As far as I know, the original version is Diamond's(1965) article. In fact, Ferguson's(1968) book regarded as a original contributor by other scholars is published later.

$$(13)\quad \frac{\dot{F}_K}{F_K} - \frac{\dot{F}_L}{F_L} = B - \frac{1}{\sigma} \cdot \frac{k}{k}$$

As discussed above, the point stressed in this paper is that technical progress does not occur by accident, but through the efficient allocation of resouces in pursuit of profit or other motives. In this perspective, this paper emphasizes the endogeneity of $\frac{k}{k}$. Such argument can be supported in the following sense. The previous work has regarded the trerm $\frac{k}{k}$ to be exogenous. According to Stoneman (1983), it would seem to be reasonable to argue that this can be considered a vailid assumption only if : first, resources are fully employed at each moment in time ; second, the respective supply of labor and capital is independent of factor prices and technology. Hence, such conditions do not hold in this paper to focus on the presence of frictional unemployment in the adjustment to golden-rule point and of technical progress determined endogenously in the economic system.

Equations (13) and (4) are combined to understand the contribution of growth to the income distribution :

$$(14)\quad \frac{\dot{F}_K}{F_K} - \frac{\dot{F}_L}{F_L} = B - \frac{1}{\sigma k}\,[sf\,(k,t) - nk]$$

Equation (14) more closely associates the interpretation on the rate of growth of worker's and capital's marginal product with economic growth.

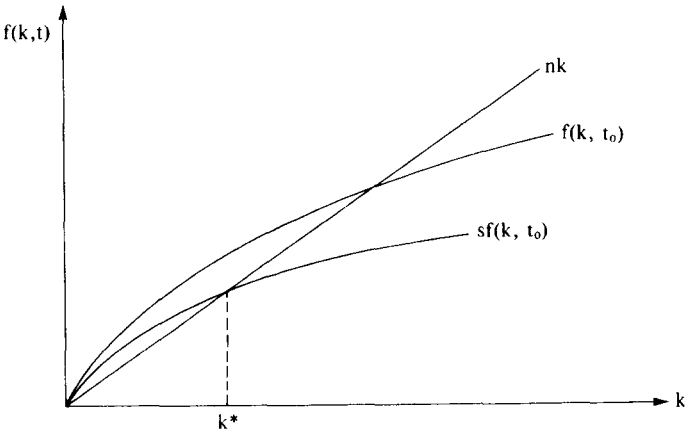
In the presence of both technical bias and capital accumulation, the changing magnitude of functional shares in a growing economy is not clearly determined. Various interpretation and empirical findings in Atkinson(1976) and Johnson(1973) about relative stability in functional shares may be due to failing not only to identify the exact direction in the change of parameters and variables in models but also to distinguish the relation between inequality and growth in the short and the long run, respectively. Hence this paper stresses the role of missing facts in the analysis of growth and income distribution.

A. The Absence of Technical Bias

Following Robnson's theorem on neutral inventions(or Hicksian neutral) (Uzawa, 1969), B becomes zero. The sign of the left-hand side in equation (14) is determined by [s f(k, t)-n k]. Equation (14) becomes:

$$(15)\quad \frac{\dot{F}_K}{F_K} - \frac{\dot{F}_L}{F_L} = -\frac{1}{\sigma k}\,[sf(k,t) - nk]$$

The familiar illustration of neoclassical growth theory help identify the implications of equation (15).



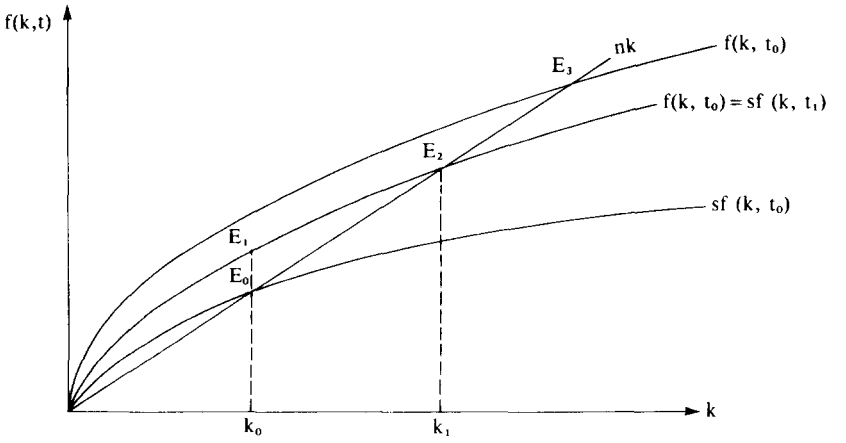
[Figure 2]

In Figure 2, the left-region of k* yields the negative sign and the right region of k* the positive sign, in equation (15). The region, k<k*, implies that the rate of growth of marginal product of labor is much higher than that of capital. The accelerated captal accumulation until the point satisfying the golden rule increases labor's marginal product and, hence, would improve their welfare in the measure of mrginal product. In other words, the earlier stage of capital accumulation brings about more benefit to labor class than capitalist. This is due to the fact that the faster growth of capital accumulation than labor raises the ratio of capital-labor ratio and, in turn, labor's marginal product. The opposite occurs in the later stage, k>k*. But it is reminded that the above argument does not imply the increase of labor'd share, but that of labor's marginal product. The next section, in turn, examines the function income distribution based on labor's share.

B. Technical Progress and Income Distribution

Let us see the impact of technical progress on growth and, then, on income distribution. Technical progress proceeds to new point to support golden rule. The new welfare maximum point induced requires the new investment and changes the functional shares of income in the lag economy. Such changes in the new situation can be illustrated in Figure 3.

The firm prefers the lump-sum investment to the gradual, to arrive at the output capacity to utilize the new technology fully and to support the golden rule. The new opportunity for investment whcih derives from new technology can stimulate the firm's investment. Suppose the stationay state in growth is achieved at point E_0 at the initial technology level, $f(k, t_0)$. Assume for the sake of simplicity new technology made through R & D is available and the new production possibilty moves to $f(k, t_1)$. It is assumed that the saving under new technology is equal to $f(k, t_0)$, i.e., $f(k, t_1) = f(k, t_0)$. The new stationary point is at E_2). If the



[Figure 3]

firm stays at E_0 or E_1, the rate of increase of the marginal product of labor is faster than that of capital. This result is in contrast to the constancy of functional shares obtained from the model which assumes Harrod-neutral or Hicksian neutral like Section II.

From equations (11) and (12), the rate of growth of the share of capital and labor can be derived.

$$(16)\quad \frac{\dot{\pi}}{\pi} = (1-\pi)\left[B + \left(1-\frac{1}{\sigma}\right)\cdot\frac{\dot{k}}{k}\right]$$

$$(17)\quad \frac{\dot{S}}{S} = (1-S)\left[B + \left(1-\frac{1}{\sigma}\right)\cdot\frac{\dot{k}}{k}\right]$$

where S denotes $\frac{LF_L}{F}$. Suppose capital-intensive technical bias exists. Morishima and Sato (1968) supports this assumption in the analysis of the United States 1902-1955. Following Kuznets' appoach to examine problems in developing countries, this may shed light on the analysis of income distribution. Then the rate of growth of the share of capital is determined by the magnitude of σ, and the rate of growth of k as well as the size of capital-intensive technical bias. As shown in Figure 2, equation (16) is positive in the left region of k^* if $\sigma>1$. If $\sigma<1$, equation (16) has the negative sign in the same region. Since each factor's functional share depends on technical bias and induced capital accumulation as well as the magnitude of parameter, the direction in the change of distributive factor share is complicated. Hence section IV in this paper will utilize the results obtained from empirical studies.

C. Income Distribution at the long-run equilibrium

Assume the Harrod neutral does not hold. That is, there is the bias of invention. To compare our model with the others, suppose the economy lies in the stationary state of capital accumulation regardless of its endogeneity. Then equations (16) and (17) become

$$(18) \quad \frac{\dot{\pi}}{\pi} = (1-\pi)\, B$$

$$(18') \quad \frac{S}{S} = (1-S)\, B$$

According to equation (18), the economy at the stationary state of capital stock can increase the share of capital through capital-intensive technical bias, B. The positive sign of B yields the continuous increment of capitalist's share. The bias to capital of the technology of new invention can make the income distribution in the economic growth allocated to labor class worse, while the capitalist's share can get richer. Hence assuming the growth is based on capital-intensive technology, the government must enact public policies for income distribution to crrect the distorted income distribution which results from the technology favorable to capitalist. In contrast, the opposite argument to the above holds in equation(18').

If the endogeneity of capital accumulation holds as well, the constancy of functional shares in income distribution in the long run is suspected. In this context, we may enumerate two reasons. First, the economy has been changed by efforts to arrive at a sequence of new golden-rule point in time. Although Schumpeter's contribution in the evolution of capitalist system is not quoted, to support the survival of capitalist system induced from R & D activity technical progress, as would be shown in Figure 3, continues to push up the economy's production level at point E_1 above the old stationary state E_0. Another non-neutral technical progress through new invention before reaching the new golden-rule point causes the distortion of income distribution. As a reuslt, capitalist's share is increased and, hence, the hypothesis on the constancy of functional share does not hold.

Second, the economy in the transition has been faced with uncertainty. Supply shock has been considered to accrue from either investment or productivity. Recent businss cycle theory has attempted the model to include it. Such uncertain impact provides a new perspective on the production function. It results in the irregular surface of production function in contrast to the traditionally smooth shape. This possibility is investigated in Brock and Mirman(1972). The irregular surface of production function provides the possibility of the suspicion on the long-run constancy of functional shares and on their instability.

Therefore, such two types of impacts of non-neutral technical progress sup-

port Kravis' (1959) final conclusion that the notion of long-run constancy in relative shares is false. In this paper the first case between two reasons is mainly analyzed.

IV. INCOME DISTRIBUTION IN THE SHORT AND MEDIUM RUN

This section combines the ways discussed in Sections II and III, to examine the change of income distribution in the short run and the medium run. The change of functional shares of income distribution in the short run focuses on the adjustment process to the new stationary point induced by growth through technical progress.

Equation required for the comparison of distributive functional shares is derived from combining equations (4), (16), and (17). The equation becomes:

$$(19)\quad \frac{\dot{\pi}}{\pi} - \frac{\dot{S}}{S} = [2-\pi-S]\,[B+(1-\frac{1}{\sigma})\cdot\frac{\dot{k}}{k}]$$

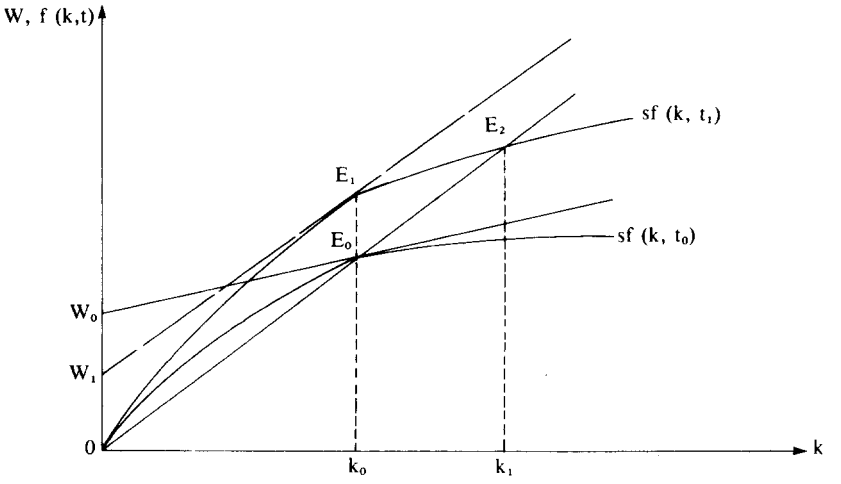
$$[2-\pi-S]\,[B+1-\frac{1}{\sigma})\cdot\frac{1}{\dot{k}}\cdot(sf(k,t)-nk)]$$

Suppose the bias of technical change is zero, i.e., $B=0$. Then equation (19) becomes:

$$(20)\quad \frac{\dot{\pi}}{\pi} - \frac{\dot{S}}{S} = [2-\pi-S]\,(1-\frac{1}{\sigma})\cdot\frac{\dot{k}}{k}$$

We begins with the special case that technical progress may decrease labor's functional share compared with that before technical progress. It is illustrated in Figure 4. In contrast, Fried(1980) as well as Buiter(1981) to hail him does not consider this as a kind of special case. Fried's contribution in overlapping-generation model to investigate the distribution of gains in trade turns out to support protectionism in the international trade. We cannot find the justifiable rationale to regard it as general case. In this paper it is classified as a special case. As discussed below, it is kept in mind that this special case naturally supports the distortion of income distribution in a growing economy which results in the increase of capitalist's share.

Given K_0, technical progress moving from $f(k, t_0)$ to $f(k, t_1)$ does not change the capital-labor ratio. Assuming technical progress is not neutral, this can cause the case that labor's share is decreased, i.e., $W_0>W_1$. The production is increased to $f(k, t_1)$ following technical progress, but the favor to the labor may not occur. The special case indicates that the extent of technical progress can determine the bias of functional shares in income distribution. What causes the bias after technical innovation is the different endowment of agents at a point in time. Capitalist has the property right on new capital stock. What the inequality of in-



[Figure 4]

come might hold in the long run is just a consequence of the economy. There is no rationale naturally to accept that technical progress of the labor-saving kind that would cause labor class to be made worse off are common. If any policies to prevent it are not taken, consequently a labor-saving innovation increases the welfare of capitalist and reduces the welfare of laborer raising only its marginal product at the point in time.

According to Figure 4, equation (19) indicates that, under the condition, $0< \sigma < 1$, capital-intensive technical bias dominates $(1-\frac{1}{\sigma})\frac{\dot{k}}{k}$. Since technical bias is absent, equation (20) exhibits a different situation from equation (19). It is closley related to the boom or depresson in the economy. If $\frac{\dot{\pi}}{\pi} - \frac{\dot{S}}{S}>0$, the condition, $s\, f(k, t) - nk>0$, is satisfied. This condition, in turn, stands for the boom of the economy.

Let us return to another case in Figure 3. Assume a sequence of technical progress, $t_0<t_1$, is caused by research and development expenditures. This sequence does not account for how the corresponding capital stock to k_1 is accumulated. The literature up to date seems to have regarded it as an automatic process. It is not free-rider on technical progress through R & D investment, but a kind of induced capital accumulation. The amount of new investment to support golden rule in economic growth, $k_0\, k_1$, is determined in light of the firm's willingness to perform induced capital accumulation.

In this paper the new added capital stock, $k_0\, k_1$, is endogenous, not exogenous. The rate of growth of the capital-labor ratio is affected by technical progress[3].

[3]The growth of the capital-labor ratio which accrues from technical progress is discussed in Hulten(1975). Since the article introduces good references on this topic, the reader is refered to this paper for further research.

The problem in Diamond(1965) and Ferguson(1968) is to assume that the rate of growth of the capital-labr ratio is determined independently of factor prices and technology. But this paper relaxes one of two assumptions. That is, the capital-labor ratio is no longer independent of technical progress. The model in this paper includes the time variable, T, repeseniting technical progress accruing from research and development activity to influence the capital-labor ratio. The future task as well as the limit to this paper is to mitigate the assumption that factor prices are independent of the adjustment speed of the capital-labor ratio. Especially, the variation of short-run functional shares can occur during the adjustment period.

We start with the equation(19). The term, $\frac{k}{k}$, is endogenous, not exogenous, in this paper. According to empirical studies in many manufacturing industries, the elasticity of substitution appears in the range, $0< \sigma<1$. First, suppose $\frac{k}{k}>0$. If $\frac{\dot{\pi}}{\pi} - \frac{\dot{S}}{S} > 0$, the change in capital-intensive technical bias dominates $(1- \frac{\pi}{\sigma}) \frac{k}{k}$. The increase of the capital-labor ratio makes labor scarcer, which results in the high speed of growth of labor's marginal product. The final share of output is beneficial to captalist, since the effect of capital stock based on capital-intensive bias dominates the difference of marginal product between two factors. As stressed above, the autonomous process to arrive at the point to satisfy the golden rule may be non-existent, or, if any, trivial. Moreover, the economy below k_1 in Figure 3 is in the recovery phase of depression, in which the dynamic movement to stationary state is on the stable arm. Although the stable path exists, it does not permit the economy to arrive at the stationary point autonomously. Hence policies to stimulate the capital accumulation induced from technical progress are desirable. Assuming capital-intensive technical progress before reaching an old stationary state occurs, capitalist's share is more favorable than worker's. Possible policies to coordinate growth and the stability of functional shares in income distribution will be discussed in the next section.

The second case assumes $\frac{k}{k}<0$ and capital-intensive technical bias. This represents the economy above k_1 in Figure 3, which is in the phase of boom. The capital-intensive technical bias accelerates the rate of growth of capitalist's functional shares. In the absence of technical progress before converging to an old stationary state, the stable movement to golden-rule point decelerates the rate of growth of capitalist's functional share and, in turn, maintains the long-run constancy of distributive factor shares.

The final case is based on $\frac{k}{k}<0$ and labor-intensive technical bias. Morishima and Sato(1968) provides an empirical finding that, in the period of depression, labor-intensive technical bias stands out. Labor-intensive technical bias which dominates $(1-\frac{1}{\sigma}) \frac{k}{k}$, results $\frac{\pi}{\pi} - \frac{S}{S}>0$. That is, the rate of growth of labor 's share is faster than that of capitalist's.

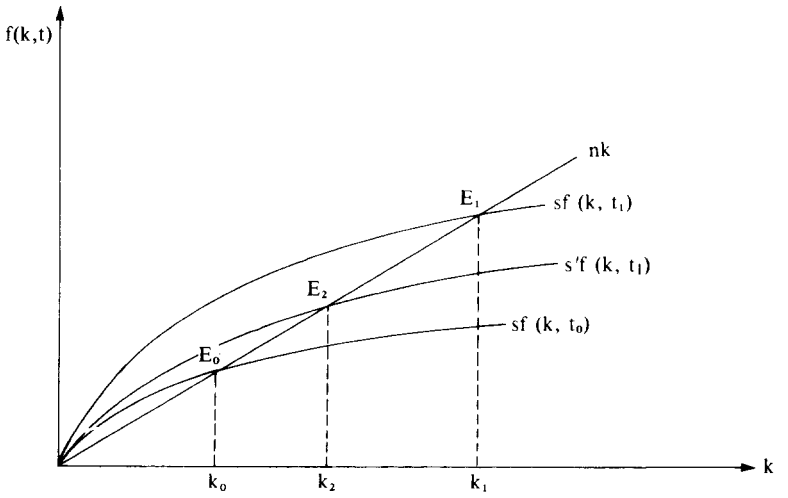
We turn to examining equation (20). In the absence of technical bias, growth is plausibly more favorable to labor class. If we follow prevailling result of empirical studies, i.e., $0<\sigma<1$, the the magnitude of of functional share is based on

the sign of $\frac{\dot{k}}{k}$. If $\frac{\dot{k}}{k}<0$, the rate of growth of capitalist's share is faster than that of labor's. This is the same as the special case in Figure 3. If $\frac{\dot{k}}{k}>0$, the opposite to the above holds.

V. MACROECONOMIC POLICIES TO COORDINATE GROWTH AND EQUITY

The previous literature has shown various views on the constancy of functional shares in the long run. The presence of capital-intensive technical bias (B) plays a critical role to determine the relative size between two classes. If $\frac{\dot{k}}{k}>0$ which is more realistic range between two ranges as more plausible case and capital-intensive technical bias (B) dominates $(1-\frac{1}{\sigma})\frac{\dot{k}}{k}$, the rate of growth of capitalist's share is faster than that of labor's. Hence we need some policies to improve the state of distorted income distribution.

Most of the literature is empirical works. In this paper the importance of making a distinction between the secular relationship between the bias of inequality and levels of development on the one hand and the short-term relationship between inequality and growth on the other is clearly recognized. Since economic development in the 1960s set forth the problem that rapid growth yields absolute poverty and income inequality, this paper puts stress on the two problems as well as the dethronement of maximizing GNP. Consequently, this analysis focuses on policies to prevent various cases in section IV which entails the acceleration of the rate of growth of capitalist's distributive share, because it has become the reality in the first decade of development. Hence macroeconomic policies to coordinate growth and equity are come up with in this section. Although this finding is close-



[Figure 5]

ly related to theories of business cycle[4], this paper leaves the task open for further reseach.

As the special case is stressed above, labor's share may be smaller than the capitalist's share, especially in the adjustment period. For the convenience of explanation, Figure 5 is utilized.

In the perspective to prevent the bias of functional shares in income distribution, there are three ways : first, the economy achieving the technical progress rapidly moves to another stationary point, E_1 ; second, the interval between two stationary points is shortened ; third, labor's property in induced captal stock is increased as well. We begins with the policies to induce the capital accumulation rapidly to reach the new stationary point, E_1. This means that the capital accumulation induced by technical progress must be performed as soon as possible. In the illustration, the investment required for it denotes k_0 k_1. The importance of investment stressed in this paper to maintain the long-run stability of functional shares is consistent with Ahluwalia and Chenery's (1974) conclusion in the analysis on personal income distribution. Their conclusion is based on the simulation of various polices utilizing the model of redistribution with growth. Their concern with income distribution is not simply a concern with income shares but rather with the level and growth of income in lower-income groups. The major conclusion in their paper, which is derived from the simulation as to three strategies to improve personal income distribution, such as consumption transfers, investment redistribution, and wage restraint, is that there is considerable potential for raising income in low-income groups through a policy of "investment transfers".

To realize the rapid capid accumulation, we can come up with several policies to coordinate growth and redistribution, such as fiscal policy, monetary policy, and exchange rate policy. First, fiscal policy can be used. The investment stimulation through fiscal policy may be to give the favorable tax incentive to the firm performing the induced capital accumulation. Like other policies, the fiscal policy to grant tax incentive faces a further and more serious conflict. The problem may arise once effects of taxation on investment incentives are considered. The policy may not be in conflict with a higher rate of growth which may call for a higher rate of capital accumulation, but it is in conflict with redistribution according to most economists' view. More surprisingly, in the perspective of our model, the tax incentives to induce capital accumulation following technical progress stimulates firm's investment motives, which, in turn, raise labor's share and, hence, main-

[4]In this paper the attempt is not made to associate theories of business cycle with cyclical behavior of relative shares. The topic will be studied as a sequence of this paper. Some representative papers alone are introduced here: Lucas, R.E., "Capacity, Overtime, Empirical Production Functions," American Economic Review, 1970, pp.23-27. Sargent, T.J. and N. Wallace, "The Elasticity of Substitution and Cyclical Behavior of Productivity, Wages, and Labor's Share," *American Economic Review*, May 1974, pp. 257-263. Sargent, T.J., *Macroeconomic Theory*, Academic Pess, New York, 1979, Chapter XVI. Especially, Johnson(1973) in the reference of this paper is reconmmended.

tain it at least constant. This story may be a paradox in light of the previous models to treat redistribution and equity.

The monetary policy can be used as the second method. Its effect can be separated into direct and indirect categories. The direct method is to supply the credit for firms requiring the induced capital accumulation. The indirect method is to improve the environment for investment stimulation, such as reducing the interest rate. The impact of monetary policy as direct control may have a much better effect on the rapid capital accumulation induced by technical progress.

Finally, the exchange rate policy can be of importance in completing the rapid capital accumulation. Suppose the capital accumulation depends on the import from oversea. If the local currency is overvalued, imports will be undervalued relative to that of domestic goods. One of the implications is that imported capital goods are cheap relative to domestic inputs, especially where labor is overvalued. In consequence, an excessively capital-intensive method of production is encouraged and, hence, capital import will substantially be increased.

The overvaluation of exchange rate may frequently be of importance in the rapid capital accumulation of the less developed countries. In contrast, it must be recalled that if other policies to correct the income distribution are not taken with the exchange rate policy, the policy alone can be in conflict with the income distibution. Johnson(1974) indicates this trade-off possibility accruing from the overvaluation of exchange rate:

> The initiation of planned economic development is itself likely to make the pre-existing exchange rate overvalued. Planned development implies both an increase in the level of domestic activity and hence in the aggregate demand for imports and a shift of demand towards capital goods, which have to be imported.... Given the inflexibility of resource allocation generally assumed to prevail in underdeveloped countries, the required relative price adjustment might be substantial, involving substantial income distribution from consumers to producers of internationally traded goods.

Note we neglect other effects of exchange rate overvaluation except its impact on capital accumulation.

We turn to the second issue, i.e., shortening the interval between stationary points. The short interval can eliminate the long duration of unequal share between labor class and capitalists. This stresses the coordination of growth and distribution rather than the growth at the expense of income distribution. In Ahluwalia(1976) there is a definite suspicion that there are short-run mechanisms which are quite distinct from any structural or long-term factors. This raises the question of whether the degree of inequality may be affected not only by the level of development but also by the speed at which this level is achieved. The shrinkage of the interval k_0k_1, can be done by two methods ; one is the increment of population growth rate, while the other is the reduction of saving rate. But the former

is undesirable. Hence we mainly concern the latter. According to Figure 5, the decrease of saving rate from s to s′ is made to shorten the interval between points to satisfy golden rule.

This paper raises the question of how much level of saving is optimal to perform both the desired growth and the improvement of income distribution(Ramsey, 1928). The optimal saving rate is not determined to pursue economic efficiency for growth at the cost of income distribution. The level of optimal saving in the economy where there is a trade-off between redistribution and economic efficiency best reflects society's attitude toward competing goals. In the developing country, the sucess of second-best policies to achieve the conflicting objective may depend on whether a consensus among the people in the chosen policies can be obtained.

If the growth objective is introduced, this would seem to require a regressive tax system, because the marginal propensity to save is higher among high-income recipients than among low-income groups. In contrast, in our model to assume technical progress determined endogenously, to arrive at the new stationary point can not call for a disputable and crucial regressive tax system regarded as the necessity for gowth. The policy implications identified in our model shed doubt on the theories of post-Keynesian income destribution [Kaldor (1956), Pasinetti (1975), etc.] which has emphasized the role of labor's and capitalist's different propensity to save in pursuing economic growth.

We return to our third main theme. The third policy places stress on raising the proportion of worker's stock ownership on the induced capital accumulation. Labor's share is low compared to that of capitalist, despite the faster growth of labor's marginal product rather thatn capitalist's. Assuming the ownership of property could be equally distributed over all the citizens in the community, the third policy can be neglected. Also endowment-based criteria among approaches to distributive justice may not regard this third poplicy as important. In contrast, egalitarian critera including John Rawls'principle of "maxmin" turn our attention to the questions: why in the sort of free-enterprise or mixed economy with which we are familiar we end up with such startling inequalities in the ownership of property, what changes in our institutional or tax arrangements could be neccessary substantially to equalize ownership, and what disadvantages from the point of view of efficiency these reforms could themselves have. Such outlook to coordinate the size of pie and the distributive justice of income distribution again confirms Ahluwalia and Chenery's(1974) conclusion to raise income in low-income groups through a policy of "investment transfers". As a complementary method to balance efficiency and equity, progressive income tax discussed above must embrace the function to equalize the distribution of the ownership of property. Hence a tax on incomes from property as contrased with a tax on incomes from work must be a more direct imposition on the owners of large properties.

VI. CONCULUSIONS AND EXTENSIONS

As a weakness of the previous literature, it was stated at the outset that, since the functional shares in the income distribution with growth can be constant in the long run, gradual output increase would raise labor's share but decrease captalist's, in the transition process to arrive at new stationary state. Growth on the long run equilibrium always entails the constantcy of functional shares. It is stressed in this paper that such conclusion results from the analysis of long-run economy.

Economic theory to stress the long run phenomena offers little guide in the Keynesian prospect. This paper focuses on the short and the medium run adjustment period and the endogenous technical progress. Our analysis leads us better to understand the relationship between economic growth and functional distribution of income. A sizable body of theoretical literature in income distribution has been built up around the concept of functional income distribution, but it would not help us to understand the determinants of the size distribution of income, i.e., how and why incomes tend to be concentrated in certain groups. Although this paper is in the context of the literature of functional income distribution, we conclude that policies to coordinate growth and redistribution with alleviations of absolute poverty are similar to those in the personal income distribution. Both approaches have the same conclusions that desirable redistribution with growth can probably best achieved in a grwing economy. But it is kept in mind that this paper emphasizes the possibility in the decrease of income share of labor class which growth results in.

To realize redistribution with growth and the alleviation of prevailing absolute poverty, this paper recommends the policy package which comprises three resulting comprehensive agenda. First, to maintain the constancy of functional income distribution, technical progress speeds up the transition to new stationary point. This increases the absolute size of labor income. This process puts stress on the rapid capital accumulation induced from technical progress. This paper sets forth how fiscal, monetary, and exchange rate policies should be carried out. Second, optimal saving level is suggested to achieve both the mitigation of absolute poverty and the reduction of income inequality. The decrease of saving rate is shown to be a kind of effective policy. This implication is in contrast to post-Keynesian view to stress capitalist's high propensity to save. Third, the role of political economy in income distribution is examined in the context of personal income distribution. This emphasizes raising the proportion of worker's stock ownership on the amount of induced capital accumulation.

What is repeatedly emphasized is that possible policy approches to the problem of growth and inequaliy must be taken into account as a package of complementary and supportive policies. Moreover, rapid economic growth and more equitable distributions of income are not necessarily compatiable as the eradication of ab-

solute poverty. In the context of the functional income distribution it can be stated in this paper that the presumed trade-off between maxmizing GNP and a more equitable distribution of income is in reality better expressed as a trade-off between income growth rates between two classes.

We turn to further research. This paper assumes factor prices to be given. The assumption must be mitigated to narrow the gap between the results obtained from two principal measures of income distribution. It would be worth while to examine the short-run variation of income distribution by using theories of business cycle.

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