Consumption Structure and the Pattern of Economic Growth

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This paper studies the relationship between consumption structure and economic growth by constructing a two-sector variety expanding model. We classify the goods into two groups based on difference in the elasticity of substitution, and consider how the change of consumption structure affects economic growth. We consider the change as shifts in demand from the goods having higher elasticity (more competitive) to the other (less competitive) goods. As a result, we find that the growth rate is U-shaped.

Keywords: Consumption structure, Sector-specific R&D, Two-sector economic growth

JEL Classification: O41, E21, O31

I. Introduction

The purpose of this paper is to investigate the relationship between consumption structure and economic growth using an endogenous growth model. In the real world, as income increases in the process of economic growth, consumers' preferences for goods and services evolve, and hence consumption structure must change. If the preference of consumers shifts to goods with higher technological improvements, economic growth will occur, and vise

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versa. Therefore, we can also consider consumption structure as one of the engines of economic growth. Recent research studies of endogenous growth theory have focused on increasing productivity. However, there is little discussion on the relationship between consumption structure and economic growth.

Otaki (1997) considers economic growth considering explicitly the externality of consumption. Matsuyama (1992) explains, on the other hand, economic development as the difference of income elasticity between agricultural goods and manufacturing goods.

In contrast to the existing literature, this paper investigates the relationship between economic growth and demand structure of goods having different elasticities. The difference in price elasticity is related to the difference in the mark-up ratio in the goods market. In other words, the difference in price elasticity leads to difference in the degree of competitiveness. That is, the higher the price elasticity of demand, the more competitive is the goods market. Similarly, the lower the price elasticity of demand, the less competitive is the goods market. The purpose of this paper is to explain how a change in consumption structure of goods with different degree of competitiveness affects economic growth.

CES utility function of the Dixit-Stiglitz type, which incorporates incomplete substitutability between different goods, can explain increases in the variety of goods. Grossman-Helpman (1991) uses a utility function of this type, and analyzes the relationship between diversity of consumption goods and economic growth. However, this utility function assumes that the elasticity of substitution among different goods is the same. Since its elasticity is equal to the price elasticity of demand for all goods, this means that the mark-up ratio for all goods is the same. As a result, the demand for all goods is symmetric in equilibrium, and demand structure does not change in the process of economic growth. Accordingly, using this utility function, we cannot analyze the relation between economic growth and changes in demand structure of goods with different degree of competitiveness.

In this paper, we construct a model that takes into account the consumption structure based on Grossman-Helpman model, and analyze the relationship between economic growth and changes in demand structure of goods having different degree of competitiveness. For this purpose, instead of assuming that the elasticity of substitution among all goods is the same, we classify the goods into two groups based on difference in elasticity of substitution. In other words, we assume that one group has higher elasticity of substitution than the other. The difference in the elasticity of substitution between the two groups of goods leads to difference in the price elasticity of demand between them. This implies that the two groups of goods differ in their mark-up ratios. Although the variety in each group may increase over time due to technological progress, here we assume that the elasticity of substitution among the varieties in the same group is the same.

Dividing final goods into two groups, we analyze how a shift in demand from the more competitive to the less competitive goods affects economic growth. Is the growth rate raised or lowered by such a shift in demand? This is the problem to be examined in this paper. The paper is organized as follows. Section II presents the model. Section III discusses the determination of the growth rate. Section IV shows the relationship between consumption structure and the pattern of economic growth. In Section V, we consider welfare. Section VI discusses the main results. Section VII concludes with summary of results.

II. Basic Setup

We consider a closed economy with a constant population and full employment. We divide goods into two groups according to the difference in the elasticity of substitution. Consumers are assumed to purchase both groups of goods. Let us denote one group of the goods with small elasticity of substitution (non-competitive or less competitive goods) as N, and the other group with the large elasticity of substitution (more competitive goods) as M. Varieties in each group increase through R&D activities.

A. Consumer's Behavior

A representative household maximizes his or her utility over an infinite horizon, as given by

$$U=\int_0^{\infty} u(c)e^{-\rho t}dt, \tag{1}$$

where ρ is the subjective discount rate. We assume that the instantaneous utility ($u(c) = \ln c$) is given by:

$$\ln c = \alpha \ln c_N + (1-\alpha)\ln c_M - \alpha \ln \alpha - (1-\alpha)\ln(1-\alpha), \qquad (2)$$

where c_M and c_N stand for the household's consumption of each group of goods, and α is a parameter ($0 < \alpha < 1$).[1] This utility function implies $c = c_N^{\alpha} c_M^{1-\alpha} / \alpha^{\alpha}(1-\alpha)^{1-\alpha}$.

Aggregate consumption in each group is expressed as follows:

$$C_N = \{\int_0^n x_{Ni}^{\frac{\beta-1}{\beta}} di\}^{\frac{\beta}{\beta-1}}, \qquad (3)$$

$$C_M = \{\int_0^m x_{Mj}^{\frac{\gamma-1}{\gamma}} dj\}^{\frac{\gamma}{\gamma-1}}, \qquad (4)$$

where m and n stand for the number of available varieties at time t. It is assumed that varieties increase due to R&D activities. x_{Mi} and x_{Nj} denote the quantity of consumption of brand i in group M and brand j in group N, respectively. β and γ are the parameters showing the elasticity of substitution between any two products in the same group, and are assumed to satisfy $1 < \beta < \gamma$. Each of them is equal to the price elasticity of demand for each group of goods. Therefore, the ith good in group M and the ith good in group N are different in their price elasticities of demand.

Define the aggregate expenditure of the household as follows:

$$\frac{E}{L} = P_M c_M + P_N c_N, \qquad (5)$$

where E is aggregate expenditure, P_κ ($\kappa = M, N$) is the price index of the group κ, and L is constant labor supply in this economy.[2]

The household determines the demand for each group of goods to maximize his or her utility subject to this budget constraint. The first order condition is

[1] This means that the household cannot switch expenditure away from high priced group.

[2] Denote that the price index on the group of $M(P_{Mi})$ is $\{\int_0^m p_{(Mi)}^{1-\beta} di\}^{\frac{1}{1-\beta}}$ and similarly on the group of $N(P_{Nj})$ is $\{\int_0^n p_{(Nj)}^{1-\gamma} dj\}^{\frac{1}{1-\gamma}}$.

$$c_N = \frac{\alpha E}{P_N L}, \qquad c_M = \frac{(1-\alpha)E}{P_M L}. \tag{6}$$

We now turn to intertemporal optimization. Substitutinng (6) into (1), we obtain the indirect utility function

$$\hat{U} = \int_0^\infty [\alpha(\ln E - \ln P_N) + (1-\alpha)(\ln E - \ln P_M)$$
$$- \alpha \ln \alpha - (1-\alpha)\ln(1-\alpha)] e^{-\rho t} dt. \tag{7}$$

A household maximizes (7) subject to the intertemporal budget constraint given by

$$\dot{V} = rV + \bar{w}L - E, \tag{8}$$

where V is asset (total value of firms), r is the interest rate, and $\bar{w}$ is the wage rate. We find that the evolution of aggregate expenditure, E, should satisfy

$$\frac{\dot{E}}{E} = r - \rho. \tag{9}$$

B. Firms

In this subsection, we consider producers' behavior. In our model, the R&D sector creates blueprints and firms in the goods sector produce differentiated goods based on the blueprints.

We assume that once the producer of consumption goods buys the design to manufacture consumption goods i, it can become the monopolistic supplier of this type. This economy is endowed with a single primary factor of production, which is labor.[3] Labor is allocated between the manufacturing sector and the R&D sector.

a) Manufacturing Firm

It is assumed that the manufacturing firm is monopolistically competitive. The monopolistic supplier of brand k maximize profit

[3]To assume the homogenous labor, the wage paid by each other can be expressed by $\bar{w}$.

$$\max \pi_k = p_k x_k - \bar{w} x_k, \quad k = M_i, N_j. \tag{10}$$

We assume that one unit of labor is required to produce one unit of goods. The first order condition for profit-maximization yields the simple mark-up formula

$$P_k = \left(\frac{\theta}{\theta - 1}\right)\bar{w}, \qquad \theta = \beta, \gamma. \tag{11}$$

As this equation shows, in equilibrium, prices of goods in the same group are the same, so that demand for them is also the same, that is, $x_{N_i} = \bar{x}$ and $x_{M_j} = \tilde{x}$. This leads to the equality of profits in the same group.[4]

These profits will be paid to shareholders as dividends. This gives the no-arbitrage condition

$$r = \frac{\dot{v}_\kappa}{v_\kappa} + \frac{\pi_\kappa}{v_\kappa}, \qquad \kappa = M, N, \tag{12}$$

where v_κ is the value of the firm, which is equal to the present discount value of profit. Moreover, the firm has to pay the price of a patent to the R&D firm. Competition in the patent market make the value of firm equal to the patent price. In equilibrium, therefore, the manufacturing firm earns no net profits, as the result of competition.

b) R&D Firm

We now consider an R&D firm which is creating a new design. It is reasonable to assume that the production of a new design depends on the existing stock of knowledge.

In addition, we assume that the R&D firm in each group can only use the existing stock of knowledge in its own group. In this sense, R&D is sector-specific. New knowledge is produced by using the existing stock of knowledge and labor.

We assume the production function of the R&D firm which creates the new design is,

[4]See Appendix.

$$\dot{\chi} = \delta_\chi L_{R\chi}\,\chi, \qquad \chi = m,n \tag{13}$$

where δ_χ is the parameter representing the productivity of R&D activities and $L_{R\chi}$ is the amount of labor employed by the R&D firm.

Everyone can enter into R&D activities freely. Therefore, in equilibrium, excess profits become zero as a result of free entry. Thus we obtain from the first order condition of profit-maximization

$$\bar{w} = \delta_\chi v_\chi\,\chi. \tag{14}$$

Let us consider the labor market. Denoting $\dot{m}/m = g_m$ and $\dot{n}/n = g_n$, and taking into account (13), we can express the amount of labor as $L_{Rm} = g_m/\delta_m$ and $L_{Rn} = g_n/\delta_n$. Therefore, the full employment condition becomes

$$L = L_M + L_N + \frac{g_m}{\delta_m} + \frac{g_n}{\delta_n}. \tag{15}$$

III. Balanced Growth Path

We say that the economy is at a steady state when the rate of variety expansion for each group of goods (g_m, g_n) is constant.

Let us select labor as numeraire and set the wage rate to unity. This economy has no transition and is always at the steady state.[5] Thus, from (14), we find the relation $\dot{v}_M/v_M = -g_m$, $\dot{v}_N/v_N = -g_n$. Accordingly, the capital market clearing condition is

$$r = -g_n + \frac{\delta_n}{\beta - 1} L_N = -g_m + \frac{\delta_m}{\gamma - 1} L_M. \tag{16}$$

Since one unit of production of consumption goods requires one unit of labor, (3) and (4) can be rewritten as $L_N = \int_0^n x_N di = C_N n^{\frac{1}{1-\beta}}$ and $L_M = \int_0^m x_M di = C_M m^{\frac{1}{1-\gamma}}$, respectively. Using these relations and transformating (6), the total amount of labor employed in the firms of

[5]In following discussion, subscript i and j are dropped.

each group producing consumption goods is

$$L_N=\frac{\beta-1}{\beta}\alpha E, \tag{17a}$$

$$L_M=\frac{\gamma-1}{\gamma}(1-\alpha)E, \tag{17b}$$

These equations mean that the amount of labor employed in each sector can be expressed as a function of the elasticity of substitution and the expenditure in the each group. Also, from the definition of assets, using (14), we have $V=\Delta(=(\delta_m+\delta_n)/\delta_m\delta_n)$. From (8), since the expenditure can be rewritten as $E=\rho\Delta+L$, the expenditure in the wage unit is always constant. Then, from (9) the interest rate is always equal to the subjective discount rate ($r=\rho$). Therefore, the rate of technological progress in each group can be written as

$$g_n=\frac{\delta_n}{\beta}\alpha(\rho\Delta+L)-\rho, \tag{18a}$$

$$g_m=\frac{\delta_m}{\gamma}(1-\alpha)(\rho\Delta+L)-\rho, \tag{18b}$$

The lower the elasticity of substitution (β, γ), the lower the subjective discount rate (ρ) and the more efficient R&D's (δ_m, δ_n), the higher is technological progress.

Next, let us consider economic growth. Here, we define the general price level P as $P=P_N^{\alpha}P_M^{1-\alpha}$.

Then, from substituting (6) into c, aggregate consumption is given by

$$c=\frac{E}{L}\,\frac{1}{P}. \tag{19}$$

This equation implies that the growth rate of real income per capita[6] is equal to the growth rate of consumption. Therefore, the rate of economic growth is given by

$$\frac{\dot{c}}{c}(=g_c) = \frac{\alpha}{\beta-1}g_n + \frac{1-\alpha}{\gamma-1}g_m$$
$$= \left(\frac{\delta_n}{\beta(\beta-1)}\alpha^2 + \frac{\delta_m}{\gamma(\gamma-1)}(1-\alpha)^2\right)(\rho\Delta+L)-\rho. \tag{20}$$

That is, we can express economic growth in terms of the rate of technological progress and the share of expenditure on each goods.

IV. Consumption Structure and the Pattern of Economic Growth

Let us consider the relationship between the growth rate derived above and the consumption structure. Equation (11) means that the smaller the elasticity of substitution is, the higher is the mark-up ratio, and vice versa. In this paper, we define the change in the consumption structure as a shift from the group of more competitive goods to that of the less competitive goods. That is, we investigate how economic growth is affected by a change of the share of expenditure on each group of goods (α). We think of the change of share as a change in consumer's preference.

***Proposition* 1**

The pattern of economic growth is U-shaped in the change in the consumption structure. The growth rate is minimized when the expenditure share α is equal to $\Gamma/(\Phi+\Gamma)$, where $\Phi = \delta_n/\beta(\beta-1)$ and $\Gamma = \delta_m/\gamma(\gamma-1)$.

Proof. Rearranging (20) by α, the growth rate is

$$g_c = \left[(\Phi+\Gamma)(\alpha - \frac{\Gamma}{\Phi+\Gamma})^2 - \frac{\Gamma^2}{\Phi+\Gamma} + \Gamma\right](\rho\Delta+L)-\rho, \tag{21}$$

[6]In equilibrium, aggregate expenditure is equal to the income.

where

$$\Phi = \frac{\delta n}{\beta(\beta-1)} \qquad \Gamma = \frac{\delta m}{\gamma(\gamma-1)}.$$

The effect of *a* change in α on g_c is,

$$\frac{\partial g_c}{\partial \alpha} = (2(\Phi+\Gamma)\,\alpha - 2\Gamma)(\rho\Delta + L). \tag{22}$$

Therefore, within the range $\alpha < \Gamma/(\Phi+\Gamma)$, as α becomes large, the growth rate slows down and vice versa.

Q.E.D.

The higher expenditure share on the less competitive goods promotes technological progress in this group, since the demand for this group increases. Similarly, it slows down technological progress in the group of more competitive goods. At first, such negative effect decreases economic growth. However, the growth rate will increase as the rate of technological progress for less competitive goods dominates. Accordingly, we will show that the pattern of economic growth is *U*-shaped as the share of expenditure on the less competitive goods increases.

***Proposition* 2**

If the difference in the elasticity of substitution between two groups is large (small), then higher expenditure on the less competitive group will increase (decrease) economic growth (Figure 1, 2).

Proof. From (21), since the growth rate is quadratic equation in α, the axis is expressed as

$$\alpha = \frac{\Gamma}{\Phi+\Gamma} = \frac{1}{\dfrac{\Phi}{\Gamma}+1}. \tag{23}$$

Therefore, the location of α is determined by R&D efficiencies and elasticities of substitution. If $\alpha > (<) 1/2$, the denominator should satisfy the following condition,

$$\alpha < \frac{1}{2} \Leftrightarrow \frac{\gamma(\gamma-1)}{\beta(\beta-1)} < \frac{\delta_m}{\delta_n} \tag{24a}$$

$$\alpha > \frac{1}{2} \Leftrightarrow \frac{\gamma(\gamma-1)}{\beta(\beta-1)} > \frac{\delta_m}{\delta_n} \tag{24b}$$

That is, the location of α is determined by rates of elasticies and R&D efficiency between two groups. Because we assume $\gamma > \beta$, the larger the difference between γ and β is, the further the vertex shifts to the left. Therefore, at small values of α, the growth rate will turn from a decreasing phase to an increasing phase (Figure 1).

Similarly, if the difference between γ and β is small or δ_n is larger than δ_m, the vertex moves more to the right. Then, the axis will be at a value larger than 1/2. Accordingly, even if α is large, the growth rate is still low (Figure 2).

Q.E.D.

The intuition behind this proposition is easy to understand. The change of α gives the growth rate a positive effect and a negative effect. The former is from an increase in demand for less competitive goods. The latter is from an decrease in demand for more competitive goods.

If the difference in the elasticity of substitution between the two groups is large, then technological progress in the more competitive goods sector (g_m) is considerably low compare to that in the other sector. Therefore, g_n does not affect the economic growth rate (g_c), even if demand for this group decreases. In this case, since the positive effect dominates the negative effect, g_c gets higher as α increases (Figure 1).

On the other hand, in the case where the difference in the mark-up ratio between the two groups is small, the higher expenditure on the less competitive group may not raise the rate of economic growth (Figure 2), since the negative effect dominates the positive effect until α becomes considerably large. As a result, the growth in less competitive goods can not promote economic growth.

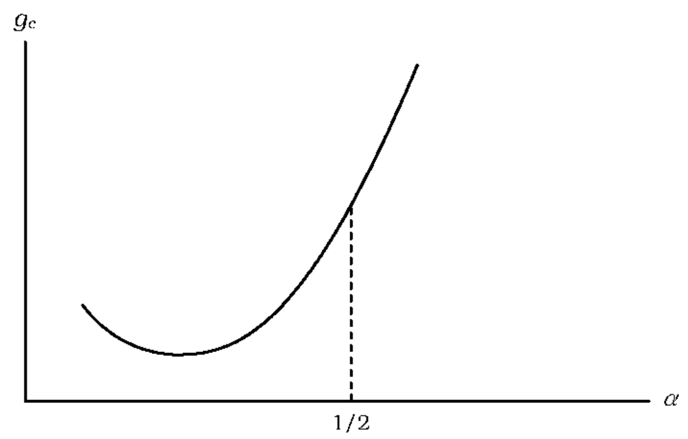

FIGURE 1
THE PATTERN OF ECONOMIC GROWTH: IN THE CASE WHEN THE DIFFERENCE IN THE ELASTICITIES OF SUBSTITUTION BETWEEN TWO GROUPS IS LARGE

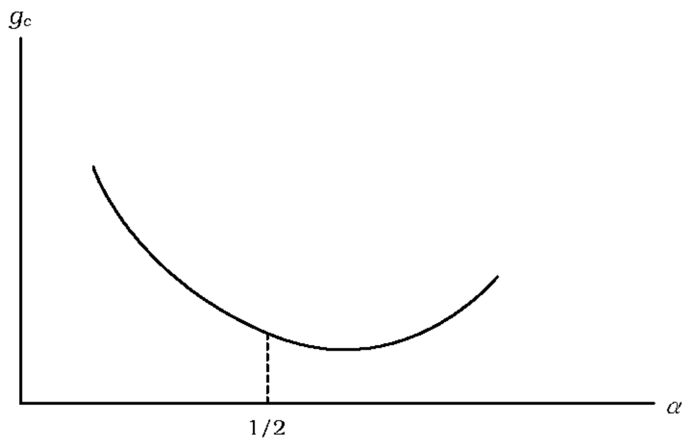

FIGURE 2
THE PATTERN OF ECONOMIC GROWTH: IN THE CASE WHEN THE DIFFERENCE IN THE ELASTICITIES BETWEEN TWO GROUPS IS SMALL AND δ_m IS LARGER THAN δ_n.

Corollary 3

From (20), the smaller β and γ are, the larger is the rate of technological progress. However, the effect of changes in β and γ on the growth rate depends on the value of α.

The result that less competitiveness between goods leads to a higher rate of economic growth is similar to that derived from Grossman-Helpman (1991). In their model, getting monopolistic profits is an incentive for R&D activities. Accordingly, less competition will lead to a higher growth rate. In this paper, we get the same result because we used the same engine of growth. In addition to these results, since we divide the goods into two groups, we can consider the effect on the growth rate due to changes in β and γ. As is discussion above, its effect depends on the value of α.

V. Welfare

In this section, we will examine the welfare effect due to changes in the share of expenditure between the two groups of goods. From (6), the evolution of the price of each good is given by

$$\frac{\dot{P}_N}{P_N}=-\frac{1}{\beta-1}g_n,\quad \frac{\dot{P}_M}{P_M}=-\frac{1}{\gamma-1}g_m. \tag{25}$$

We can see from (25) that the prices of both goods decrease due to technological progress. If we set the initial number of available varieties for each group as m_0 and n_0 respectively, prices can be written as

$$P_N=n_0e^{-\frac{1}{\beta-1}\{\frac{\delta_n}{\beta}\alpha(\rho\Delta+L)-\rho\}},\quad P_M=m_0e^{-\frac{1}{\gamma-1}\{\frac{\delta_m}{\gamma}(1-\alpha)(\rho\Delta+L)-\rho\}}. \tag{26}$$

Substituting these into (7), we obtain the present value of utility at the steady state as

$$\hat{U}=\frac{1}{\rho}[-\alpha\ln n_0-(1-\alpha)\ln m_0$$

$$+\frac{\alpha}{\beta-1}\left(\frac{\delta_n}{\beta}\alpha(\rho\Delta+L)-\rho\right)+\frac{(1-\alpha)}{\gamma-1}\left(\frac{\delta_m}{\gamma}(1-\alpha)(\rho\Delta+L)-\rho\right)$$

$$+\ln L+\ln(\rho\Delta+L)]. \qquad (27)$$

The change in utility due to a change in α can be expressed as:

$$\frac{\partial\hat{U}}{\partial\alpha}=\frac{1}{\rho}\Big[-\ln n_0+\ln m_0$$

$$+2\left(\frac{\delta_n}{\beta(\beta-1)}-\frac{\delta_m}{\gamma(\gamma-1)}\right)(\rho\Delta+L)\,\alpha-\left(\frac{1}{\beta-1}-\frac{1}{\gamma-1}\right)\rho\Big]. \qquad (28)$$

From this, it is clear that the patterns of economic growth and utility are the same. However, the value for the latter will now also depend on the subjective discount rate (ρ), the difference in the initial number of available varieties (m_0,n_0) and the difference in the reciprocal of the degree of monopoly (β, γ) minus 1 between the two groups. Therefore, when the growth rate is minimized, welfare is also at its minimum.

VI. Discussion

In this paper, we have focused on the elasticity of substitution in goods and analyzed the relationship between economic growth and consumption structure. It turns out that the difference between β and γ plays an important role. We have seen that the elasticity of substitution is reflected in the degree of competition in the goods market. What goods are classified into the group of less competitive goods or more competitive goods? Hall (1988) and Nishimura *et al.* (1999) estimate the mark-up ratios of different industries. The former uses the 1953-84 data of 26 industries in the United States, and the latter Japanese firms in 21 industries of 1971-94.[7] From their results, we can find that Rubber products, textile and automobiles have a low mark up, on the other hand, electrical machinery has a relatively high ratio in both countries. Nishimura *et al.* (1999) point out that industries, which charge low mark-up, internationally compete with rivals. Theoretically, when the market is perfectly competitive, firms charge zero mark up ratio. Therefore, it is fair to say that the more rivals a firm has, the less the mark up ratio is. However, from a different point of view, we may think of more competitive goods as ones in new industries, and less competitive goods in already existing industries. In the former, there are few similar goods in the market, so the consumer will have limited substitutes for this good, and therefore, low elasticity of substitution. Firms producing those goods will have few rivals, so they can have a high degree of monopoly in the market and thus can impose a high mark-up rate. Such firms will have a high monopolistic profit, and, consequently, a high rate of technological progress. From the latter point, let us reinvestigate Hall(1988) and Nishimura *et al.* (1999) again. In their papers, we find that the mark-up of textile industry (2.578 in the U.S. and 1.133 in Japan) is smaller than the electric machinery industry (3.086 and 1.305) in both countries, and communication in the United States (36) is too high. This provides an example that goods in new (old) industry are less (more) competitive ones.

Based on this classification of goods, at first, let us see the economy in the United States. Following estimation by Hall (1988), we find that the mark-up ratios of American industries considerably differ among industries. The ratios are set in a wide range from around 1 to 36.[8] This case is illustrated by Figure 1. The 1990's boom in the United States can be explained by strong consumer preference, and, therefore, higher expenditure, towards goods in the newer industries such as IT goods. When more people prefer goods in new industries, more labor will be allocated to R&D activities in these industries. As a result, higher economic growth will be achieved. We also note that the gap in elasticities of substitution between IT goods and goods in other existing industries is large.[9]

[7]We cannot simply compare with their results, since their analysis differ not only in data but also in methods.

[8]Except for petroleum and coal products, and wholesale trade.

[9]Hall shows that the communication industry charges high mark-up ratio, which is around 36. Since Hall (1988) uses data for the years 1953-84,

The large difference between β and γ means that a group of new industry has the bigger difference relative to the old. That is, the smaller β is, the newer industry is, which raises economic growth. As a result, if the economy devotes more expenditure to goods in the new industries, it will achieve a higher growth rate.

Next, we consider Japanese industries. Nishimura *et al.* (1999) estimate the mark-up ratios of Japanese firms in 21 industries, and show that among 21 industries, the average mark-up is around 1.1 in 13 industries, and in 9 industries the industry-average mark-up exceeds 1.2. Expressing the mark-up ratio by substitution of elasticity, the value of markup, 1.1 is around 8, similarly 1.2 is around 5. This means there is little difference between β and γ in Japan. This is the case of small gap between β and γ as shown in Figure 2. Even if the demand for new goods is large, the impact of a decrease in demand for old goods is strong, and therefore, the rate of economic growth is reduced. This is the case when growth of new industries may not raise economic growth. It seems that change in consumption structure in Japan through IT revolution cannot so much affect the growth rate of Japan as the United States. We may say about this that Japan is different from the U.S. on the gap between the degrees of competitiveness of two groups, and hence the economy in the U.S. is close to Figure 1, but, in Japan is Figure 2. On the other hand, let us look back high-speed era in 1960's-70's Japan. At that time, there remained many restrictions to trade goods, tariff system or exchange system, and so on. Therefore, we can divide goods into two types, which one has already opened and the other closed yet to the world. That is, the large difference between competitiveness that existed in Japanese market. This case is illustrated by Figure 1. Although Japanese economy sometimes experienced that growth rate decreased during that era, the growth recovered as consumption structure shifts. Because for consumers expending more on less competitive goods means to guarantee demand for new industries' goods, then the firm invests more positively in R&D. Thus, Japanese economy was able to keep growth rate high.

Finally, let us focus on expenditure share. Observing consump-

there may not contain data of the Internet services which started at 1980'. However, high mark-up ratio of communication industry means few rivals for this industry, and hence there is rooms which other firm can enter.

tion structure in Japan, Muto (1999) shows that in 1965 consumers expend 36.2% of their expenditure on food, but in 1995 the ratio decreases to 22.6%. On the other hand, communication takes a share from only 3.5% in 1965 to 11% in 1995. Emergence of the new industry of cellular phone and the internet leads to increasing in communication cost. Sasaki (1996) analyses consumer demand in Japan, using Japanese time series data to investigate the consumer demand for 16 commodity categories.[10] He explains that the growth of demand for each commodity is determined by the effects of changes in relative price, real income and time. As income increases, consumers can get enough goods in the already existing industry and buy many more kinds of goods. Then, when a new good that consumers need is invented by new industry, they demand it. Hence expenditure share changes.

Considering all these things we can say the following: As incomes increase and new goods prices fall with technological progress, consumers can afford the new industries' (less competitive) goods. Since change in expenditure share guarantees the demand of monopolistic industries, technological progress in this group are increased. This makes economic growth and consumption structure change more. This paper can explain such growth aspects by focusing on consumption structure.

Moreover, we have shown that the change of consumption structure, which means expenditure share shifts from more competitive to less competitive goods, gives the growth rate not only a positive effect but also a negative effect. Therefore, the growth rate is U-shaped due to such the change. Two kinds of U-shaped are related to the difference in the degree of competition between two groups. That is, in the case where the difference is large (small), we obtain Figure 1 (2) because the positive (negative) effect dominates the negative (positive) effect. In addition to this, when expenditure share on the less competitive goods increases, the amount of the change of the growth rate also depends on the difference in competition.

[10]He also shows average budget share of each item.

VII. Conclusion

In this paper, we considered the relationship between consumption structure and economic growth by constructing a model that includes the two groups of goods and assumes sectorspecific technology. The degree of the newness of a consumer goods group is reflected by β and γ.

In addition to the usual results that smaller elasticity of substitution leads to faster the economic growth, we have shown that economic growth depends on the expenditure share, the difference of elasticity between two groups of goods and the efficiency of R&D activities. When the difference is large, the rate of economic growth gets higher as the consumption structure changes, since the positive effect dominates the negative effect. However, when it is small, such change leads only to slow down economic growth.

Based on these results, we conclude that consumption structure determines the allocation of labor and is an important factor of economic growth. Thus, we can explain the various patterns of economic growth by considering the demand side.

Appendix

We show that the economy stays at the steady state. From (17a) and (17b),

$$L_N=\frac{\alpha\gamma(\beta-1)}{(\gamma-1)(1-\alpha)\beta}L_M. \tag{A.1}$$

Substituting (18a), (18b) and (A.1) into (15), and rearranging,

$$r=\frac{1}{V}\left(\frac{\gamma}{(\gamma-1)(1-\alpha)}L_M-L\right), \tag{A.2}$$

where $(\delta_n+\delta_m)/\delta_n\delta_m=\Delta=V$. Moreover, using (17b)

$$r=\frac{1}{V}(E-L). \tag{A.3}$$

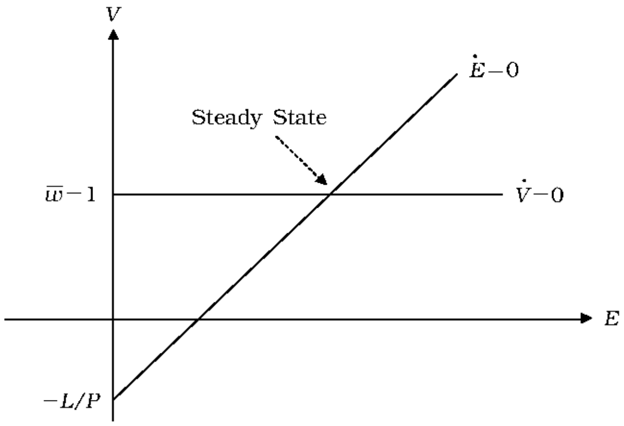

FIGURE 3
THE INSTABILITY OF THE STEADY STATE

Therefore, we rewrite (9) as follows,

$$\frac{\dot{E}}{E}-\frac{1}{V}(E-L)-\rho. \tag{A.4}$$

Similarly,

$$\dot{V}=L(\bar{w}-1). \tag{A.5}$$

Therefore, we obtain Figure 3. From these, we find that the steady state is unstable, since the coefficient of E is positive. Therefore, the economy stays at the steady state, that is, it does not have any transitional paths.

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