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MODELING THE CAUSES OF STAGNATION OF A MATURED CAPITALIST ECONOMY WITH OPEN ECONOMY

SAIKAT BHATTACHARYA
RESEARCH SCHOLAR
JADAVPUR UNIVERSITY
KOLKATA

ABSTRACT

In the present study a model is presented, which shows that capitalist economy stagnates as it produces more and more goods and services. Moreover, we have also tried to find out how open economy can make matured capitalist economy worse off and better off. We have applied here Marxian concept of continuous profit accumulation by increasing automation and Schumpeterian concept of product innovation and process innovation by capitalist entrepreneurs to raise profit. As new product is introduced, profit is made by recruiting more labor which raises real wage in the capitalist economy. But in process innovation, profit is made by increasing automation which reduces demand for labor and hence real wage. In early stage of capitalism, existing product base is small so effect of automation is low but as existing product base rises impact of automation dominates that of product innovation. Matured capitalist country outsources its industries to developing economies. The former is better off by having demographic dividend of the developing economies while the matured capitalist economies can be worse off if outsourced industries are too much labor intensive.

KEYWORDS

MARXIAN model, stagnation, matured capitalist economy.

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1. INTRODUCTION

This paper is an extended version of the paper "Modeling the causes of stagnation of a matured capitalist economy" under open economy where matured capitalist economy outsources its production of various commodities to developing economies. The earlier version with closed economy was published in *International Journal of Research in Commerce, Economics and Management* Volume No. 6 (2016), Issue No. 1 (January). Result of Brexit Referendum and victory of Donald Trump clearly indicates that economic stagnation of matured capitalist countries is finally attacking the core of open economy values. Indian IT industry is already facing huge loss from protectionist policies of new government of USA. The crisis of 2008 clearly shows the weak economic condition of the developed countries. This weakness is not limited to any particular economy rather all developed economies are showing low growth rates. Moreover, a closer look will make it clear that most developed capitalist economies are facing the problem of low growth rate since 1990s. Developed countries like Japan, Germany, France, United Kingdom are recording almost less than 2% average annual growth rates for the last two decades. Even USA is struggling to return to its pre-2008 crisis growth rate at the moment. In this paper we have explained the low growth in matured capitalist economy as inherent contradiction in capitalist economy. So we here present a model which shows that capitalist economy stagnated as it matures i.e. more and more goods and services are produced by capitalism. Moreover, we have also tried to find out how open economy can make matured capitalist economy worse off and better off. We have applied here Marxian concept of continuous profit accumulation by increasing automation and Schumpeterian concept of product innovation and process innovation by capitalist entrepreneurs to raise profit. On one hand as new product is introduced, profit is made by recruiting more labor which raises real wage in the capitalist economy. But in process innovation, profit is made by increasing automation which reduces demand for labor and hence real wage. In early stage of capitalism, existing product base is small so effect of automation is low but as existing product base rises impact of automation dominates that of product innovation. It can also be added that when matured capitalist country outsources to developing economies, on the one hand the former is better off by having demographic dividend of the later while the matured capitalist economies can be worse off if outsourced industries are too much labor intensive. We have divided the paper into eight sections where section 1 presents introduction, section 2 gives literature review, section 3 explains the theory working behind the model, section 4 explains the relation between technological progress and employment where there is no introduction of new products, section 5 explains the model with closed economy and fixed population, section 6 explains the model with closed economy and changing population, section 7 deals with possibilities of finding growth prospects by matured capitalist economies in open economy framework and section 8 gives the concluding observations.

2. LITERATURE REVIEW

The theory of monopoly financial capitalism is first forwarded by Marxist economist ¹Paul M. Sweezy and Harry Magdoff in the two books namely "Irreversible Crisis" and "Stagnation and the Financial Explosion". Now theory of Monopoly Financial Capitalism says that capitalism in the monopoly financial capitalist stage can survive by creating bubbles in the financial market by continuously inflating financial asset prices. Thus speculative profits can be made by buying and selling of financial assets (including real estate). This asset price inflation feeds on the assumption of the investor that asset prices only go up and it is done by channeling huge credit to finance speculative activities. This can be traced from rising debt to GDP ratio in all matured capitalist economies. But as asset price inflates above the real valuation of the asset the time will come sooner or later when bubble will burst. Thus the capitalist economy starts facing recession. Now capitalist investors find no more financial assets in which they can profitably invest. So investment as a whole in the economy falls. Hence recession is in full force. Now as financial asset price starts falling, asset holders have to face losses and creditors who financed those asset holders start facing losses too since their debtors are defaulting. At this moment Government of a matured capitalist economy emerges to save financial firms from defaulting. The Government bails out the financial firms using expansionary monetary policies. This can be seen historically in US economy in the year 1987, 2001 and 2008. Thus it's becoming clear that matured capitalist economies are getting adopted to this kind of policies in this age.

²John Bellamy Foster and Fred Magdoff has extended this theory and applied it to understand the Great Financial Crisis that originated in 2008 from sub-prime mortgage crisis of USA in their book, "The Great Financial Crisis- Causes and Consequences". They said that in USA in this age of Monopoly Financial Capitalism the financial firms are using financial assets of common people of households as collaterals and spreading debt among US households. Thus debt of household rises too. This household debt was actually stimulating the consumption of US economy which actually helped to counter the over-accumulation crisis in US economy.

¹Sweezy, Paul M. and Magdoff, H. "Stagnation and the Financial Explosion", *Monthly Review Press* (2008).

Sweezy, Paul M. and Magdoff, H. "Irreversible Crisis", *Monthly Review Press* (1998).

²Foster, J. B. and Magdoff F. "The Great Financial Explosion: Causes and Consequences", *Monthly Review Press* (2009).

³Shaikh, A. "The Falling Rate of Profit and the Economic Crisis in the US", *unpublished* (October, 1987).

⁴Easterly William, "Economic Stagnation, Fixed Factors and Policy Thresholds", *Working Paper of Economics Department of World Bank* (October, 1991).

⁵Parenti Stephen and Prescott Edward "What a Country Must Do to Catch up Industrial Economies", *Working Paper of Economics Department of World Bank* (October, 2001).

⁶Vernon R. "International Investment and International Trade in the Product Cycle", *Quarterly Journal of Economics* (1966).

Financial firm them-selves have become debtors in this age of Monopoly Financial Capitalism. Thus the financial firms who financed asset holders' investment in financial assets are debtors too. These financial firms start facing default too.

³A. Shaikh in his "Falling Rate of Profit and Economic Crisis in USA", shows us the continuous fall of profit rate in USA between 1970 and 1987 and with cointegration analysis pointed out that falling profit is leading to fall in investment in the US economy and not the other way round.

⁴Easterly William in his "Economic Stagnation, Fixed Factors and Policy Thresholds" points out how lack of production inputs including land, skilled labor as well as stagnant population can lead to stagnation in an economy.

⁵Edward Prescott and Stephen Parenti in his "An Exogenous Growth Model Based on Total Factor Productivity" shows that the growth rate of a country depends on technology stock of the world and the later a country starts the more the technological stock available for it and higher is its growth rate of output and faster is its development.

⁶Raymond Vernon in his "International Investment and International Trade in the Product Cycle" discusses how a sophisticated product innovated in developed economies and older unsophisticated products outsourced in developing economies. Finally, they find place in least developed economies where developing economies move upward and start producing newer sophisticated products. Finally, when developing economies start innovating new products then it becomes developed.

3. THEORY BEHIND THE MODEL

This model is based on Marxian concept of capital accumulation, Schumpeterian idea of innovation and input output model framework.

By Marxian concept of capital accumulation, we mean that: Two class i.e. capitalist class and labor class. Capitalist class has several properties :- (1) the desire of continuous capital accumulation; (2) ownership of means of production; (3) capitalist class employs labor class to produce goods and services by using the means of production; (4) capitalist class earns profit by selling goods and services at a price above what was to labor class as wage; (5) this profit is the basis of capital accumulation.

By Schumpeterian concept of innovation, we mean that: (1) Applying new technology to create new goods and services. (2) Applying new technology in existing production i.e. automation.

In our Input-Output model we hold the following assumptions: (1) There is one capital accumulating sector. Labor is supplied from outside the model. (2) Labor is completely mobile between different products. (3) There is full employment of labor i.e. for a specific real wage rate offered the total amount of labor demanded by the accumulating sector is equal to total amount of labor supplied from outside. If more labor is demanded by the capital accumulating sector, it has to offer higher real wage to draw in more labor from outside.

The capitalist class will want to increase profit by introducing new technologies. Whenever a new technology is invented, it can be used by the capitalist class in two ways. First is to raise profit rate in the existing production and second is to raise profits from introducing new production. Now profit rate from existing production can be raised by increasing capital labor ratio in the production process. So this automation of production reduces demand for labor. On the other hand, new production increases demand for labor. So new product introduction brings about rise and fall in demand for labor simultaneously.

This model shows that during initial years of capitalism, when the size of existing production is negligible and all production is new production from capitalist point of view, the demand for labor is high. But as the capitalism matures and existing production size is large enough, the impact of new production increasing demand for labor becomes marginal. Hence the falling labor demand from automation of existing production has more impact. So demand for labor is low.

Now the model also assumes that the goods and services produced are entirely consumed by the labor class while capitalist class used all its income in investing for capital accumulation. So fall in demand for labor implies fall in demand for wage rate which implies fall in demand for consumption of goods and services. So fall in labor demand growth rate entails fall in output growth rate as capitalist economy matures.

Hence, the model predicts that as capitalism matures and the number of production rises, the demand for labor falls. Now growth rate of output also depends on the growth rate of demand for labor which further effects growth rate of real wage. And rise or fall in wage and employment growth rate entails rise or fall in demand for consumption goods. So fall in growth rate of labor demand entails fall in growth rate of output. So as capitalism matures, growth rate of output becomes lower steadily and can end up in stagnation.

4. RELATION BETWEEN PROFIT RATE AND DIRECTION OF TECHNOLOGICAL PROGRESS IN A MODEL OF OLD PRODUCT WITH NO INTRODUCTION OF NEW PRODUCTS

In this model production consists of two types of goods: (1) consumer products and (2) the capital goods required to produce those consumer products.

Both consumer products and capital goods use labor and capital goods as factors.

The capitalist class hires labor and gives wage in return. Labor is hired from outside the model. The more the amount of labor the capitalist class needs to employ the higher is the real wage rate that capitalist class must offer in order to draw in more labor from outside the model.

Similarly, real profit rate rise too as the demand for capital goods rises. This is because capital goods require inputs like labor and different raw materials which are supplied from outside the model. As demand for capital goods rises, demand for these inputs rises as well and so their price. Thus, real profit rate rises.

Moreover, the demand for consumer products comes from the labor class only. Capitalist class spends its entire income in capital accumulation.

NOTATIONS

p = general price level in the economy

Y = aggregate output level in the economy

w = wage rate

r = profit rate

L = amount of labor employed in the economy

K = amount of capital in forms of machineries called capital goods produced and employed in the economy

C = consumer product produced in the economy

p_c = price of consumer good

EQUATIONS

$$Y = C + K \quad (1)$$

[There are two types of production: a consumer good and capital goods.]

$$C = AK \quad (2)$$

[Where, A is a constant implying the ratio of consumer product produced to the capital goods employed in the economy.]

$$pY = wL + rK \quad (3)$$

[Both consumer good and capital goods use labor and capital good as factors.]

$$L = aK \quad (4)$$

[Where, a = labor-capital ratio or technological coefficient.]

$$w/p = bL = baK \quad (5)$$

[Here b is a positive constant implying real wage rate is directly related to the total amount of labor employed in the economy. As total number of employed labor increase, real wage increase too at a fixed ratio.]

$$r/p = hK \quad (6)$$

[Here, h is a positive constant implying that as the employment of capital goods in the economy rise, the real profit rate rise too at a fixed ratio.]

$$p_c C = wL \quad (7)$$

[Here we assume the entire consumer goods is consumed by the labor class.]

Here in this system, we have seven equations and seven endogenous variables i.e. Y, C, K, L, a, w and r . The parameters in the system are: A, p, p_c, h and b .

At equilibrium,

$$pY = p(C+K)$$

$$\Rightarrow wL + rK = pC + pK$$

$$\Rightarrow waK + rK = pAK + pK$$

$$\Rightarrow wa + r = pA + p$$

$$\Rightarrow (w/p)a + (r/p) = 1 + A$$

If capitalist class wants to increase (r/p) , $(w/p)a$ needs to fall since $(1+A)$ is constant. Hence, to raise real profit rate, capitalist class either has to reduce wage or reduce labor capital ratio which will entail fall of wage or has to do both simultaneously. So new technology will be used by the capitalist to reduce labor-capital ratio to raise real profit rate.

MATHEMATICAL DEDUCTION

Since we assume that the entire consumer goods is consumed by the labor class then,

$$p_c C = wL$$

Taking natural logarithm on both sides we get,

$$\ln p_c + \ln C = \ln w + \ln L$$

Differentiating both sides with respect to time t we get,

$$(1/p_c) (dp_c/dt) + (1/C) (dC/dt) = (1/w) (dw/dt) + (1/L) (dL/dt)$$

[Let us denote $(1/i)(di/dt) = \dot{i}$]

$$\Rightarrow 0 + \dot{C} = \dot{w} + \dot{L}$$

[since, p_c is a constant at equilibrium]

$$\Rightarrow \dot{C} = \dot{w} + \dot{L}$$

[since, $w/p = bL \Rightarrow \ln w - \ln p = \ln b + \ln L \Rightarrow \dot{w} - \dot{p} = \dot{b} + \dot{L} \Rightarrow \dot{w} = \dot{L}$ as p and b are constants]

$$\Rightarrow \dot{K} = 2\dot{L}$$

[since, $C = AK \Rightarrow \ln C = \ln A + \ln K \Rightarrow \dot{C} = \dot{A} + \dot{K} \Rightarrow \dot{C} = \dot{K}$ as A is a constant]

$$\Rightarrow \dot{Y} = 2\dot{L}$$

[since, $Y = C + K \Rightarrow Y = K(1+A)$ (as $C = AK$) $\Rightarrow Y = KA' \Rightarrow \ln Y = \ln K + \ln A' \Rightarrow \dot{Y} = \dot{K} + \dot{A}' \Rightarrow \dot{Y} = \dot{K}$ (as $A' = 1+A$ is constant)]

\Rightarrow So, growth rate of output = twice the growth rate of labor.

5. MODEL WITH CONTINUOUS INTRODUCTION OF NEW CONSUMPTION PRODUCTS WITH CLOSED ECONOMY AND FIXED POPULATION

Here we assume that the economy is closed, no government intervention, population is fixed and entire population falls within exchange economy i.e. entire population has purchasing power to consume all consumption goods and services. Moreover, a commodity caters to the entire market from the moment it is introduced. There is no lag period between the time of introduction of the model and the time when it is marketed to the entire population to the full extent.

Let K_i = total capital employed by commodity i for making it available to the entire population.

Commodity $i = i$ signifies the order of introduction of the commodity. First commodity introduced will be called commodity i .

a_{ij} = labor to capital ratio or technological coefficient of commodity i in period- j after $[j-i+1]$ phases of commodity i , i.e. in period- j commodity i is automated for $[j-i+1]$ times.

L_i = total labor amount needed to produce commodity i for making it available to the entire population at the time of its introduction.

Another important assumption is that at each and every period, a new commodity is introduced and older commodities' labor-capital ratio falls. In real world whenever there is an invention of new technology, the capitalist class uses the technology to maximize profit. Profit can be maximized in two ways i.e. introducing new commodities and mechanization of older commodities. Again there is no lag period between introduction of new commodity and automation of older commodities' production process.

TABLE 1: TECHNOLOGICAL COEFFICIENT MATRIX TABLE

K_i	K_1	K_2	K_3	K_4	\dots	\dots	\dots	K_{n-1}	K_n
Period-1	a_{11}								
Period-2	a_{12}	a_{22}							
Period-3	a_{13}	a_{23}	a_{33}						
Period-4	a_{14}	a_{24}	a_{34}	a_{44}					
\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots
\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots
\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots
Period- $n-1$	$a_{1\ n-1}$	$a_{2\ n-1}$	$a_{3\ n-1}$	$a_{4\ n-1}$				$a_{n-1\ n-1}$	
Period- n	a_{1n}	a_{2n}	a_{3n}	a_{4n}				$a_{n-1\ n}$	a_{nn}

Estimated technological coefficient of all commodities in their phase-1 or time of introduction

$$\alpha_1 = (a_{11} + a_{22} + a_{33} + \dots + a_{n-1\ n-1} + a_{nn})/n$$

Estimated technological coefficient of all commodities in their phase-2

$$\alpha_2 = (a_{12} + a_{23} + a_{34} + \dots + a_{n-1\ n})/(n-1)$$

Similarly,

$$\alpha_3 = (a_{13} + a_{24} + a_{35} + \dots + a_{n-2\ n})/(n-2)$$

$$\alpha_j = (a_{1j} + a_{2\ j+1} + a_{3\ j+2} + \dots + a_{n-j+1\ n})/(n-j+1)$$

$$\alpha_n = a_{1n}/1$$

We know that, $a_{11} > a_{12}$, $a_{22} > a_{23}$, $a_{33} > a_{34}$ and so on since, profit rate can be increased only decreasing labor-capital ratio.

$$\Rightarrow \sum_{i=1}^{n-1} a_{ii} > \sum_{i=1}^{n-1} a_{i\ i+1}$$

$$\Rightarrow \sum_{i=1}^{n-1} a_{ii}/(n-1) > \sum_{i=1}^{n-1} a_{i\ i+1}/(n-1)$$

$$\Rightarrow \sum_{i=1}^{n-1} a_{ii}/(n-1) > \alpha_2$$

$$\Rightarrow \alpha_1' > \alpha_2 \text{ [Where, } [\sum_{i=1}^{n-1} a_{ii}/(n-1)] = \alpha_1']$$

$$\text{Now, } \alpha_1 = \sum_{i=1}^n (a_{ii})/n = [\sum_{i=1}^{n-1} a_{ii} + a_{nn}]/n$$

$$= [\sum_{i=1}^{n-1} a_{ii}/(n-1)] + [\sum_{i=1}^{n-1} a_{ii}/n] - [\sum_{i=1}^{n-1} a_{ii}/(n-1)] + a_{nn}/n$$

$$= [\sum_{i=1}^{n-1} a_{ii}/(n-1)] - [\sum_{i=1}^{n-1} a_{ii}/(n(n-1))] + a_{nn}/n$$

$\alpha_1 > \alpha_2$, according to,

$$[\sum_{i=1}^{n-1} a_{ii}/(n-1)] - [\sum_{i=1}^{n-1} a_{ii}/(n(n-1))] + a_{nn}/n > \alpha_2$$

$$\Rightarrow \alpha_1' - [\sum_{i=1}^{n-1} a_{ii}/(n(n-1))] + a_{nn}/n > \alpha_2$$

[Where, $[\sum_{i=1}^{n-1} a_{ii}/(n-1)] = \alpha_1'$]

$$\Rightarrow n(n-1)\alpha_1' - [\sum_{i=1}^{n-1} a_{ii}] + (n-1)a_{nn} > n(n-1)\alpha_2$$

[Here, both sides are multiplied by $n(n-1)$]

$$\Rightarrow n(n-1)\alpha_1' - [\sum^{n-1} a_{ii}] + (n-1)a_{nn} \geq n(n-1)\alpha_2$$

$$\Rightarrow n(n-1)(\alpha_1' - \alpha_2) + (n-1)a_{nn} \geq [\sum^{n-1} a_{ii}]$$

$$\Rightarrow n(\alpha_1' - \alpha_2) + a_{nn} \geq \alpha_1' \text{ [Here, } \alpha_1' - \alpha_2 > 0 \text{]}$$

Now the larger the value of n , the higher the value of $n(\alpha_1' - \alpha_2) + a_{nn}$.

Hence, greater is the chance that $n(\alpha_1' - \alpha_2) + a_{nn} > \alpha_1'$

\Rightarrow higher the value of n , greater is the chance that $\alpha_1 > \alpha_2$.

\Rightarrow In matured capitalism where n is large implying $\alpha_1 > \alpha_2$.

The economic interpretation is that as the number of goods and services is small, the impact of a new good or service is quite visible and often leading. But as the number of goods and services rise, the impact of new technology on the overall economy is marginal in nature.

Similarly, $a_{12} > a_{13}$, $a_{23} > a_{24}$, $a_{34} > a_{35}$ then $\alpha_2 > \alpha_3$ when n is large.

Similarly, $\alpha_1 > \alpha_2 > \alpha_3 > \dots > \alpha_n$ as the value of n is large i.e. for matured capitalism.

Amount of labor used by commodity i at the time of introduction, $L_i = a_{ii}K_i$

Therefore, $\sum(L_i) = \sum(a_{ii}K_i)$

$$\Rightarrow nL_M = n\alpha_1 K_M$$

[Where, $L_M = \sum(L_i)/n$ & $K_M = [\sum(a_{ii}K_i)]/(n\alpha_1)$]

$$\Rightarrow L_M = \alpha_1 K_M$$

$$\Rightarrow a_1 L_M = \alpha_1 K_M$$

[Where, $a_1 = 1$]

Here, L_M and K_M denote the amount of labor and capital employed by any commodity at the time of its introduction. Here, the value of labor and capital employed by any commodity implies the mean value of total amount of labor and capital employed for all commodities.

Now, α_1 is estimated labor-capital ratio of all commodities in their phase-i.

So $\alpha_1 K_M$ implies the average of the total labor employed by all commodities in their phase-i.

$$\text{Now, let, } \alpha_2 K_M = a_2 L_M \Rightarrow a_2 = \alpha_2 (K_M/L_M)$$

Here, a_i denotes the average ratio of total labor employed by all commodities in phase-i and total labor employed by all commodities initially.

$$\text{Similarly, } \alpha_3 K_M = a_3 L_M \Rightarrow a_3 = \alpha_3 (K_M/L_M)$$

$$\text{Similarly, } \alpha_n K_M = a_n L_M \Rightarrow a_n = \alpha_n (K_M/L_M)$$

Since, $\alpha_1 > \alpha_2 > \alpha_3 > \dots > \alpha_n$ then, $1 = a_1 > a_2 > a_3 > \dots > a_{n-1}$

Now labor demand function in initial period is: $L_1 = L_M$.

In period-1, there is only one commodity more precisely oldest commodity i.e. commodity-1.

Labor demand function in period-2: $L_2 = a_2 L_M + L_M$.

In period-2, commodity-1 is automated for the first time and commodity-2 is introduced as well.

Labor demand function in period-3: $L_3 = a_3 L_M + a_2 L_M + L_M$.

Labor demand function in period-n: $L_n = a_n L_M + a_{n-1} L_M + \dots + a_2 L_M + L_M = (1 + a_2 + a_3 + \dots + a_n) L_M$

$$\text{Therefore, } ^\wedge L_n = (L_n - L_{n-1})/L_{n-1} = a_n / (1 + a_2 + a_3 + \dots + a_{n-1}) = a_n / \sum^{n-1} a_i$$

As n rises, a_n falls and $a_i > 0$ i.e. $\sum^{n-1} a_i$. Hence, $^\wedge L_n$ falls.

By mathematical deduction (1) it is proved that $^\wedge Y = 2 \text{ } ^\wedge L$.

So as n rises $^\wedge L$ falls which entails $^\wedge Y$ falls too.

So as capitalism matures i.e. more and more goods and services are formed, growth rate of output falls.

6. CLOSED ECONOMY WITH CHANGING POPULATION

Here, we assume that population changes at every period i.e. whenever one new production is introduced. Here $g(i)$ denotes the population change rate in period- i when also there are i number of commodities.

Labor demand function in initial period is: $L_1 = L_M(1+g(1))$

Labor demand function in period-2: $L_2 = (a_2 L_M + L_M) (1+g(2))$

Labor demand function in period-3: $L_3 = (a_3 L_M + a_2 L_M + L_M) (1+g(3))$

Labor demand function in period-n:

$$L_n = a_n L_M + a_{n-1} L_M + \dots + a_2 L_M + L_M = [(1 + a_2 + a_3 + \dots + a_n) L_M] (1+g(n)) = L_M \sum^n a_i (1+g(n))$$

Therefore, $^\wedge L_n = (L_n - L_{n-1})/L_{n-1}$

$$= [(\sum^n a_i) L_M (1+g(n)) - (\sum^{n-1} a_i) L_M (1+g(n-1))] / [(\sum^{n-1} a_i) L_M (1+g(n-1))]$$

$$= [(1+g(n))/(1+g(n-1))] [1 + [a_n / (\sum^{n-1} a_i)]] - 1$$

$$= \Phi [1 + ^\wedge L_n \text{ population}=\text{constant}] - 1$$

[Where, $\Phi = [(1+g(n))/(1+g(n-1))]$]

Here if $g(n) > g(n-1)$ then, $\Phi > 1$. Hence, $^\wedge L_n > ^\wedge L_n \text{ population}=\text{constant}$.

If $g(n) = g(n-1)$ then, $\Phi = 1$. Hence, $^\wedge L_n = ^\wedge L_n \text{ population}=\text{constant}$.

If $g(n) < g(n-1)$ then, $\Phi < 1$. Hence, $^\wedge L_n < ^\wedge L_n \text{ population}=\text{constant}$.

The larger the value of Φ , the higher is the value of $^\wedge L$.

Since, $^\wedge Y = 2 \text{ } ^\wedge L$, we can conclude that, the larger the value of Φ the higher is growth rate of output. This conclusion is in line with that of demographic dividend theory.

7. UNDER OPEN ECONOMY

Let the matured capitalist economy outsources its old commodities to developing countries while produces the new commodities. In each period, as a new commodity is introduced, one commodity is outsourced. Thus in period-1 of outsourcing, if commodity-($n+1$) is introduced, any one commodity- j will be outsourced. In period-2, as commodity-($n+2$) is introduced, commodity- j and commodity- $j+1$ will be outsourced as well. Hence, matured capitalist economy to produce n number of commodities since outsourcing begins. Commodity- j to commodity- $j+k$ will be outsourced in period- $n+k+1$ where there will be $(n+k+1)$ commodities in the total economy. Any of the commodities out of $(n+k+1)$ commodities can be outsourced according to profit maximization motive.

Let it starts outsourcing from period ($n+1$).

Labor demand function in period 1 is: $L_1 = \sum_{i=1}^{n+1-j} a_i L_M (1+g(n+1))(1+g'(j))$

Here,

L_M = amount of labor applied by any commodity at the time of its introduction in matured capitalist economy.

L_i = amount of labor applied by any commodity at the time of its introduction in developing economy.

$g(n+1)$ = population growth rate of matured capitalist economy in period ($n+1$).

$g'(j)$ = population growth rate in developing economy in period-1 of outsourcing.

Labor demand function in period-($n+2$): $L_2 = \sum_{i=1}^{n+2-j-(j+1)} a_i L_M (1+g(n+1))(1+g'(j+1))$

Here,

a_i denotes the average ratio of total labor employed by all commodities in phase-i and total labor employed by all commodities initially in matured capitalist economy.

Labor demand function in period-(n+n): $L_n = \sum_{i=1}^{n+n-j} a_i L_M (1+g(n+n))(1+g'(j+n-1))$

where, $J = j + j+1 + j+2 + \dots + j+n-1$

Labor demand function in period-(n+n-1): $L_{n-1} = \sum_{i=1}^{n+n-1-(j-1)} a_i L_M (1+g(n+n-1))(1+g'(j+n-2))$

where, $J-1 = j + j+1 + j+2 + \dots + j+n-2$

Therefore, $\Delta L_{n \text{ open eco}} = (L_n - L_{n-1})/L_{n-1}$

$= \frac{[(1+g(n+n))(1+g'(j+n-1))]/(1+g(n+n-1))(1+g'(j+n-2))}{[\sum_{i=1}^{n+n-j} a_i / \sum_{i=1}^{n+n-1-(j-1)} a_i]} - 1$

$= G [1 - \frac{[(a_{j+n-1} - a_{n+n}) / \sum_{i=1}^{n+n-1} a_i] - 1}{\sum_{i=1}^{n+n-1} a_i}] - 1$

$= G - G \frac{[(a_{j+n-1} - a_{n+n}) / \sum_{i=1}^{n+n-1} a_i] - 1}{\sum_{i=1}^{n+n-1} a_i}$

where, $G = \frac{[(1+g(n+n))(1+g'(j+n-1))]/(1+g(n+n-1))(1+g'(j+n-2))}{\sum_{i=1}^{n+n-1} a_i}$

The larger the value of G , the higher is the value of ΔL .

Since, $\Delta Y = \Delta L$, we can conclude that, the larger the value of G the higher is growth rate of output. This conclusion is in line with that of demographic dividend theory.

$\Delta L_{n \text{ closed eco}} = G [1 + \frac{a_n}{(\sum_{i=1}^{n-1} a_i)}] - 1$

where, $G = \frac{[(1+g(n))/(1+g(n-1))]}{\sum_{i=1}^{n-1} a_i}$

G is high if $(1+g'(j+n+1)) \gg (1+g'(j+n-2)) \Rightarrow$ demographic dividend from catering into developing economy's demand is substantially high.

Hence, $\Delta L_{n \text{ open eco}} > \Delta L_{n \text{ closed eco}}$

when, $(a_{j+n-1} - a_{n+n})$ is small. i.e. when outsourced commodity is less labor intensive (a_{j+n-1} is lower) while newly introduced commodity is more labor intensive (a_{n+n} is higher).

Hence, $\Delta L_{n \text{ open eco}} < \Delta L_{n \text{ closed eco}}$

when, $(a_{j+n-1} - a_{n+n})$ is high i.e. when outsourced commodity is more labor intensive (a_{j+n-1} is higher) while newly introduced commodity is less labor intensive (a_{n+n} is lower).

Again, $1 = a_1 > a_2 > a_3 > \dots > a_{n-1}$ and hence, $(a_{j+n-1} - a_{n+n}) > < 0$ if, $(j+1) < > n$ and accordingly, $\Delta L_{n \text{ open eco}}$ and hence output growth falls, remains constant, rises.

So it can be said that outsourcing makes matured capitalist economy better off when:

- 1) When demographic dividend from developing economy's market is substantially high.
- 2) When outsourced commodity is less labor intensive such that outsourcing does not generate much job loss in matured capitalist economy which reduces demand for consumption goods and hence reduce growth rate of output.
- 3) When newly introduced commodity is more labor intensive which generate demand for labor and hence demand for consumption goods and hence raise growth rate of output.

8. CONCLUDING OBSERVATIONS

In this analysis we reach our conclusion that as a capitalist economy matures its growth rate slows down due to its own inherent profit maximization logic. During the infant stage of capitalism, the power of new goods and services to generate new demand for labor and with new demand for consumer goods and services is quite strong. Then, profit maximization can go on along with high growth rate of output. But as the capitalism mature, the number of goods and services produced increase, the power of new goods and services to create new demand for labor and consumption becomes marginal in nature. On the other hand, in the infant stage, the number of goods and services are small, so their power to reduce demand for labor and with it consumption level of the economy by increasing automation is small. But as capitalism mature, the number of old goods and services are large, their power to reduce demand for labor and general consumption capacity through automation rise. Hence, there is an inherent tendency of falling growth rate of output as capitalist economy become mature.

Now, in matured level, under closed economy, the only factor that can increase growth rate of output is rising growth rate of population. If growth rate of population in a matured capitalist economy rises at every new period when one more commodity is introduced, then only growth rate of output can be higher than the previous period. Since, population growth rate usually rises with rise in per capita income up to certain level and then falls with rise in per capita income and ultimately becomes very low. So when n is large, when capitalism is matured, either population growth rate is low, even zero or falling then $g(n) \leq g(n-1)$. The growth rate of output is bound to slow down at every period.

Under open economy where outsourcing is allowed by matured capitalist economy, it can reap in demographic dividend from developing countries. But if the outsourced commodity is highly labor intensive, then outsourcing can cause severe job loss and hence matured capitalist economy can be worse off. Thus the matured capitalist economy must not outsource labor intensive commodities.

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