

Fei John C. H.; Ranis, Gustav

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ECONOMIC GROWTH CENTER

YALE UNIVERSITY

Box 1987, Yale Station  
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 40

AGRICULTURE IN THE OPEN ECONOMY

J.C.H. Fei

Gustav Ranis

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## Agriculture in the Open Economy\*

### Introduction

As we look about at economic progress--or the lack thereof--in the contemporary less developed world, it is no secret that we have increasingly come to the realization that it is the stagnation of agriculture which more often than not has proven to be the villain of the piece. Concern with the need to activate the agricultural sector and the related race between food and mouths is so widespread today, not only in the profession but among policy makers, that it need hardly be elaborated on. Nor, as we are equally quick to realize, is this really a new insight; in fact, it may be said that the very beginnings of economic science bear the distinct marks of a deep concern with this problem. The physiocrats had the notion of agrarian stagnation in which the produit net of the soil was used to finance the sterile classes outside of agriculture, permitting no marked upward deviation from the circular flow depicted in their Tableau Economique. The Classicists--especially Ricardo and Malthus--analyzed the course of stagnation more fully in predicting the long run cessation of progress. Later in the same century the Marxists focused more on the petering out of profits in early commercial capitalism as a causal factor, leading to similar somber predictions for the long run. All these essentially pessimistic views went unchallenged by any competing growth thesis for more than a century. It was not until after the Second World War that renewed efforts and interest was expended on the problems of long term growth. This renaissance has had its manifestations in the one sector models of growth for the industrially mature economy (Solow, Swan, Phelps, et. al.)--which we shall not be concerned with in this paper-- and the theories of development in

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\*John C. H. Fei, Cornell University and Gustav Ranis, Yale University.

a two sector underdeveloped world, (e.g., Lewis, Leibenstein, Jorgenson, Fei & Ranis, et. al.), which is of interest to us.

The Physiocrats, the Classicists and Marx were in search of regularities in the performance of the system they were observing, leading to the conclusion of ultimate stagnation. The modern view of growth in a vigorous dualistic society shifting its center of gravity tends to be more optimistic, even though the underlying concern with the departure from quasi-equilibrium continues to predominate. There can, in short, be little doubt that the assumptions as well as the growth-theoretic constructs of each period are imbedded in real world conditions of the times, as seen through the eyes of the contemporary analyst. From a long run historical perspective it may thus be instructive to think of four types of economic systems which occur in historical sequence: 1) the agrarian society; 2) the open agrarian society; 3) the dualistic society and 4) the industrially mature society.

It is our view that what we are witnessing in most of the contemporary underdeveloped world is countries attempting to make the transition between open agrarianism and dualism. Moreover, we must recognize as "normalcy" a condition in which such attempts are being frustrated by the inability to shake off the endemic structural characteristics of agrarianism. It is precisely for this reason that the study of the causes of stagnation in the open agrarian society--a major concern of this paper--is crucial for an understanding of the dynamics of the contemporary less developed world in its attempt to activate agriculture in behalf of the development process.

In section I we present a brief statement of the causes of long-term stagnation in the closed agrarian system. Section II deals with the breakdown of the closed agrarian system under the impact of penetration of foreign trade and the consequential restructuring of the economy. In section III the essential

economic functions which must be performed in open agrarianism will be analyzed. Section IV describes the propellant forces which dictate the performance of the open agrarian economy over time. Finally, in section V, the forces of stagnation which continue to grip the open agrarian economy will be identified and the conditions for successful transition to dynamic dualism elaborated.

### Section I. Causation of Agrarian Stagnation

Let us begin with some of the basic notions of the 18th century Physiocrats, who envisioned a circular flow mechanism between two sectors of the economy: a preponderant agricultural sector and a smaller service sector. As depicted in diagram 1a, the total output of food (Q-units) of the agricultural sector either flows back to that sector and is consumed by the farmers (H-units) or moves to the service sector (R-units) to be consumed by the workers in that sector. The output of the service sector (T), in turn, either flows back to the agricultural sector (in the form of consumer goods or subsidiary productive services) to sustain agricultural productivity (A-units) or is "consumed" by the nobility, the church and the aristocracy (C-units) to sustain their cultural life, religious activities, or the propensity to wage war. While, to the eternal credit of the Physiocrats, the regularity and stability of such a circular flow system is identified, it was left to the Classicists, some 60 years later, to give a causal explanation of the same phenomenon in their positive theory of stagnation.

From our point of view, the most important analytical contribution of the Classical economists is with respect to the role of labor and the (at least implied) existence of a labor surplus. Suppose the total labor force of L units is allocated to two sectors in such a way that  $\theta L$  units are workers in the service sector and  $(1-\theta)L$  units remain as farmers. Then

$$(1.1) \quad \theta = R/Q \quad (\text{or } R = \theta Q)$$

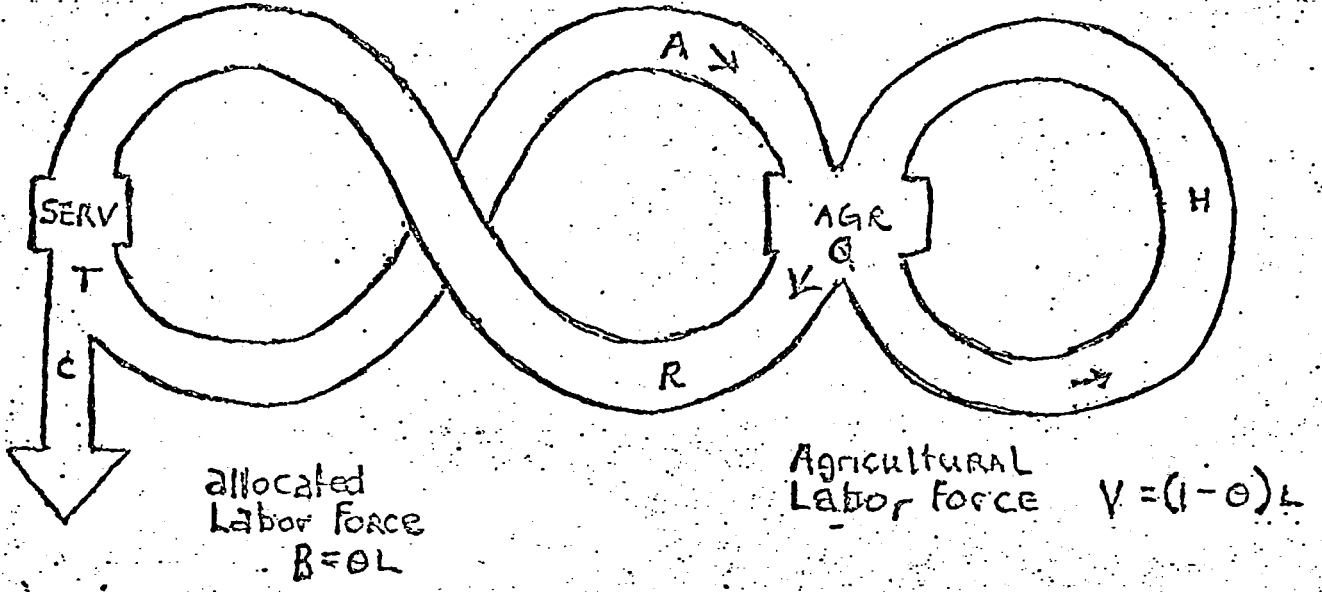


DIAGRAM 1

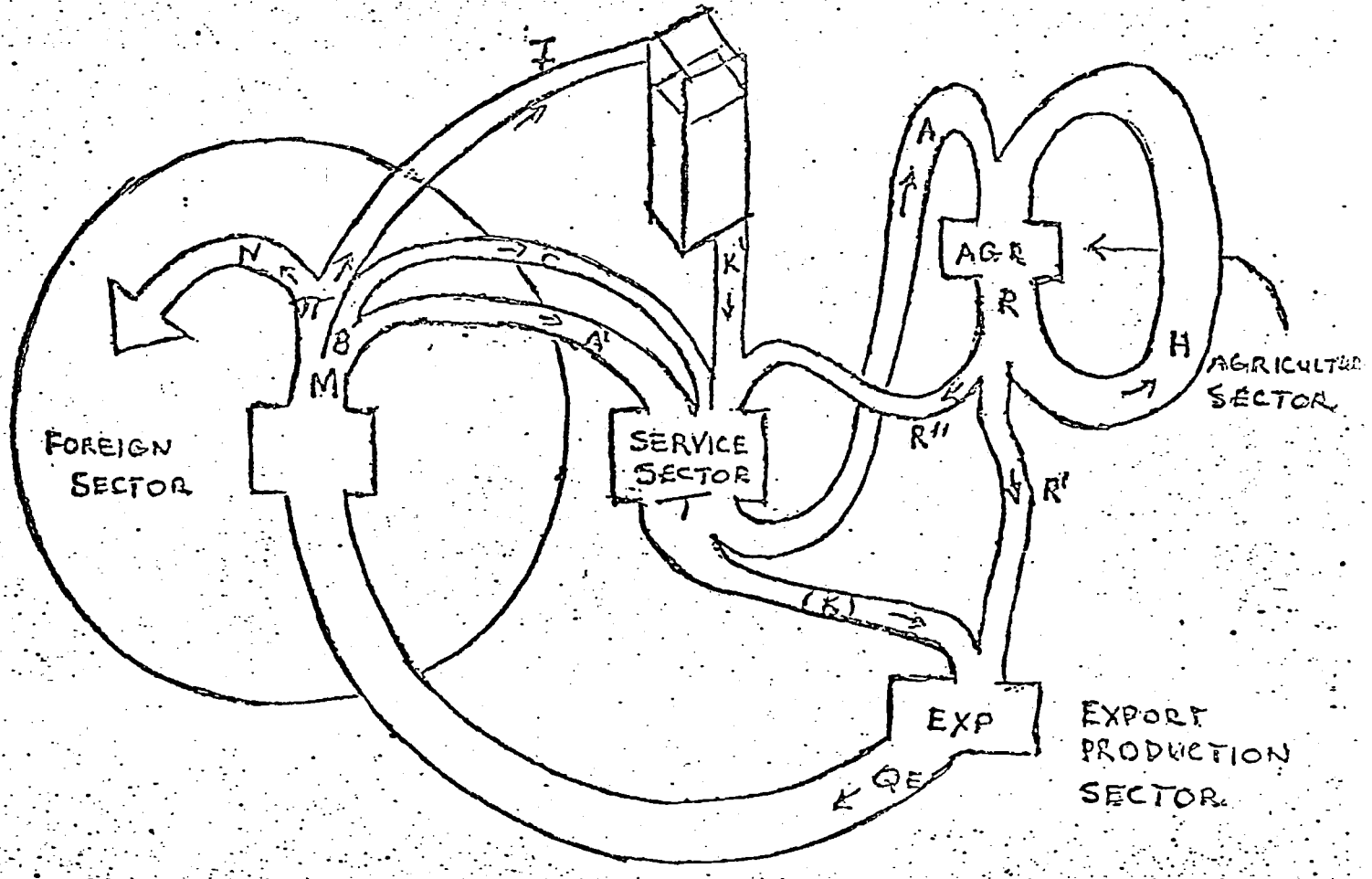


DIAGRAM 3

indicating a basic fact of agrarianism, namely, that food must be allocated to the two sectors in the same proportion as population is distributed.<sup>1</sup> It follows that the expansion of agricultural productivity leading to the availability of R as an agricultural surplus (to sustain the workers in the non-agricultural sector) is a prerequisite to the emergence of the service sector and the expansion of its relative size ( $\theta$ ). The physiocratic idea of an agricultural surplus is indeed a powerful tool for the analysis of growth phenomena for all economies with an agricultural base. It should be noted, moreover, that the agricultural surplus defined in this way is quite independent of whether or not the marginal product of labor in agriculture is zero or non-zero, on which question, in our view, all too much energy has been expended.

The basic arithmetic of an agricultural surplus can be summarized with the help of three indicators, namely ( $\theta$ ,  $p$ ,  $c$ ) where  $\theta$  is the surplus labor ratio, i.e., the fraction of  $L$  in the service sector,  $p = Q/L(1-\theta)$  i.e., the remaining farmers' average productivity and  $c = Q/L$ , i.e., the per capita consumption standard in the economy as a whole. From (1.1) we have

$$(1.2) \quad p(1-\theta) = c \quad (\text{or } 1-\theta = c/p)$$

which states that the farmers' fraction of the total ( $1-\theta$ ) must be equal to the consumption standard as a fraction of agricultural productivity  $c/p$ .

The relationships among this triplet ( $\theta$ ,  $p$ ,  $c$ ) can be quickly summarized in diagram (2a) in which the vertical axis is used to measure  $p$  and  $c$ , while the horizontal axis (measured to the left) is used to measure  $\theta$ . Let the distance  $oo'$  represent one unit (i.e., if the value of  $\theta$  is given by point "m" then  $o'm$  is  $1-\theta$ ). Suppose points  $p_o$  and  $c_o$  (with  $c_o \leq p_o$ ) are indicated on the vertical axis. Let point  $q_o$  be the point of intersection of the straight

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<sup>1</sup>Under the simplifying assumption of no wage gap or consumption standard differential between the two sectors. The (likely) existence of a real world differential could easily be accommodated.

lines  $o'p_o$  and  $c_o c$  (horizontal line), then the distance  $q_o c_o$  is the equilibrium surplus labor ratio  $\theta$  and  $c_o/p_o = 1 - \theta$ . (This is easily seen from (1.2)). Thus, when  $p$  increases (as in  $p_o, p', p'', p_e \dots$ ) the value of  $\theta$  will increase (as in  $q_o, z', z'', z_e \dots$ ) if  $c$  remains constant at  $c_o$ . On the other hand, the value of  $c$  will increase (as in  $q_o, q', q'', c_e \dots$ ) if  $\theta$  remains constant at  $\theta_o$ . The economic common sense is that higher agricultural productivity ( $p$ ) will lead either to a higher fraction of the population allocated to the service sector ( $\theta$ ) or a higher standard of consumption ( $c$ ). We may refer to the two alternative ways of using the increased agricultural surplus as the labor allocation adjustment (when  $c$  remains constant) and the consumption adjustment (when  $\theta$  remains constant).

Ideas related to the above arithmetic of agricultural surplus lead us directly to a thesis of agrarian stagnation. For, in the first place, the very phenomenon of agrarian stagnation itself must be defined in terms of the long run stability of the triplet  $(\theta, p, c)$ . Using a Cobb-Douglas production function (with fixity of land),<sup>1</sup> we may relate the rate of technological change "i" (i.e., the intensity of agricultural innovation) and the growth rate of agricultural population  $n_v = n(1-\theta)L$ <sup>2</sup> as follows:

$$(1.3a) \quad Q = e^{it} v^\alpha \quad (v \text{ is agricultural population})$$

$$b) \quad n_p = i - (1-\alpha) n_v \quad \text{where}$$

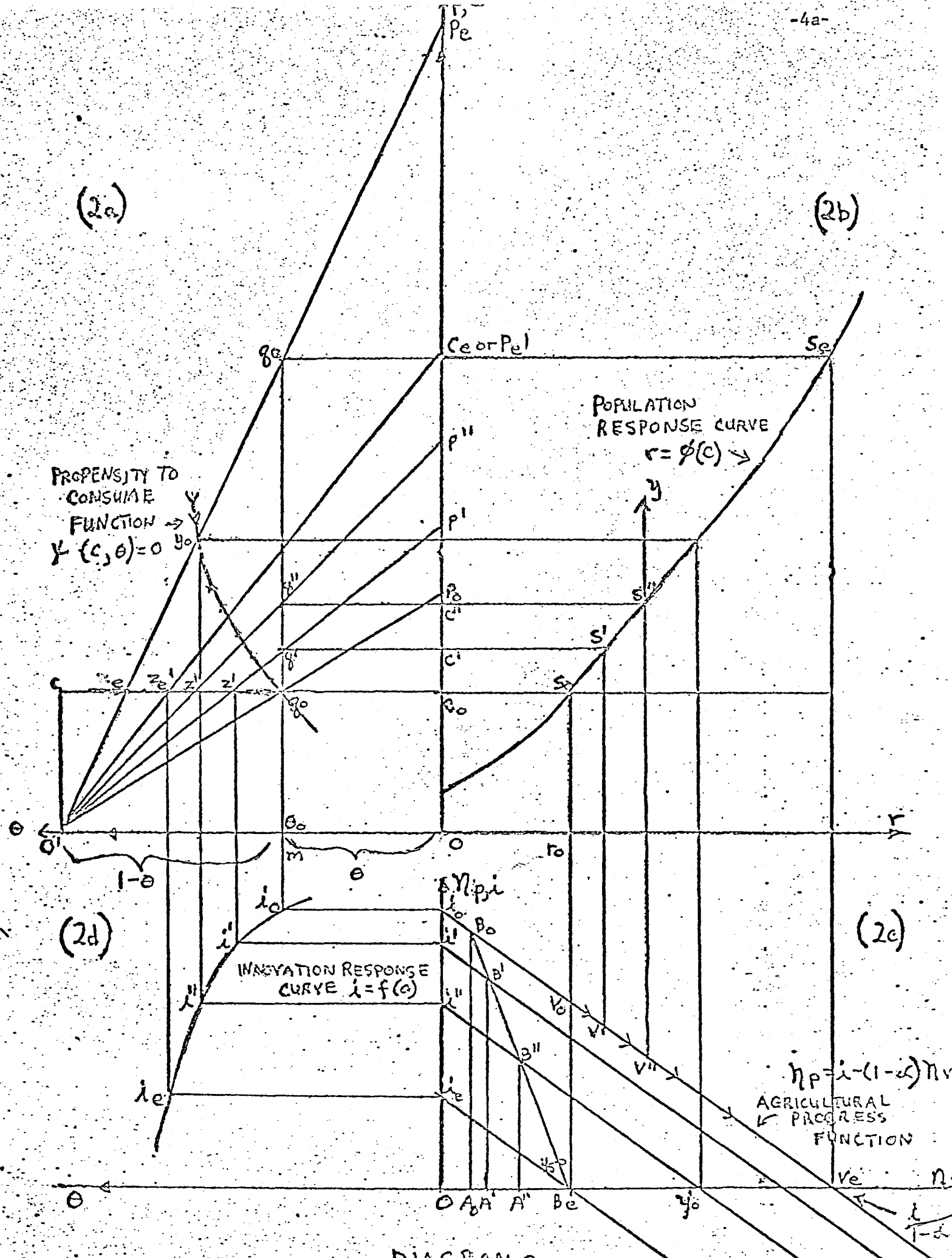
$$c) \quad p = \frac{Q}{v}$$

Equation (1.3b) is represented by the negatively sloped straight line (i.e., the line labeled  $\sqrt{L}_o$ ) in diagram 2c in which  $n_p$  is measured on the vertical and  $n_v$  on the horizontal axis. This curve may be called the agricultural progress function and depicts the struggle between innovation and the law of

<sup>1</sup>If land is a free good  $\alpha = 1$  and we have a special case of our model.

<sup>2</sup>Where  $n_x = \frac{dx}{dt} / x$





diminishing returns. Thus, for a given value of innovational intensity "i" (represented as the vertical intercept of the  $\mu_0$  line), the rate of increase in agricultural productivity declines as the population growth rate increases. The point  $v_e$  (where  $v = i/1 - \alpha$ ) on the horizontal axis is the point of "long run stagnation" as  $p$  and  $v$  take on stationary values (since  $\eta_p = c$  along the horizontal axis). The purpose of any thesis of long run agrarian stagnation must be to explain how such an equilibrium point on the horizontal axis is reached in the long run.

It is frequently argued that any initial productivity gain in agriculture is bound to lead to upward revisions of the consumption standard. When the increased agricultural surplus is used entirely for such consumption adjustment, to assume the extremal case of this alternative, we have the Jorgenson-Classical thesis of stagnation.<sup>1</sup> For this thesis a population response curve can be postulated by

$$(1.4a) \quad r = b(c) \quad \text{(population response)}$$

$$b) \quad r \equiv \eta_T \quad \text{where} \quad \text{(rate of growth of total population)}$$

and is represented by the positively sloped curve in diagram 2b. This relation simply states that the population growth rate is "controlled" by the consumption standard  $c$  (measured on the vertical axis in diagram 2b) and leads us to the conclusion that the operation of a "consumption adjustment" mechanism is likely to culminate in ultimate stagnation.

To illustrate this, let us start from our initial values of  $p_0, c_0, \theta_0$  in diagram (2a). We can then determine point  $s_0$  on the population response

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<sup>1</sup>See Jorgenson, D. W., "The Development of a Dual Economy", Economic Journal, LXXI, 1961; also his "Testing Alternative Theories of the Development of a Dual Economy" in The Theory and Design of Economic Development, I. Adelman, E. Thorbecke, editors, 1966.

curve in diagram (2b). In case no relative reallocation of labor occurs, i.e., if  $\theta$  is constant,  $n_v = r$ .<sup>1</sup> Thus we can obtain point  $v_0$  on the agricultural progress function in diagram (2c). Since  $n_p$  is positive at  $v_0$ , the value of  $p$  will increase to say  $p'$ , in the next period (diagram 2a), and the value of  $c$  will increase to  $c'$ . This, via points  $s'$  (diagram 2b) and  $v'$  (diagram 2c) further depresses the rate of increase of  $p$  (i.e., from  $v_0$  to  $v'$ ). Nevertheless, since  $v'$  is still positive,  $p$  continues to increase following the sequence  $p_0, p', p'', \dots$ . The long run stagnation equilibrium position is then given by the triplet  $(p_e, c_e, \theta_0)$  corresponding to the points  $s_e$  (on the population response curve) and  $v_e$  (on the agricultural progress function). (Conversely, starting from an initial value of  $p$  greater than  $p_e$ ,  $p$  will decrease to  $p_e$  in the long run.) Thus, according to the Classical-Jorgenson mechanism, the long run stability of  $(p_e, c_e, \theta_0)$ , as well as  $r$ , is due to the fact that the population growth rate is controlled by the consumption standard in such a way as to suppress (encourage) labor productivity gains when consumption and productivity levels are too high (low).<sup>2</sup>

The above represents a modified version of the Jorgenson-Classical thesis of stagnation. The modification comes about through our postulation of the coexistence of two sectors--a point strongly emphasized by the Physiocrats, but generally neglected in the classical writings. We have thus shown

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<sup>1</sup>  $n_v = n(1-\theta)L = n(1-\theta) + n_L$ . Thus  $n_v = n_L$  if  $\theta$  is constant.

<sup>2</sup> To be more precise, this is the Jorgenson "trap" case. Jorgenson, unlike the Classicists, also presents a "take-off" case according to which population growth is no longer responsive to increases in the consumption standard while  $n_p$  is still positive. For example, if the population response curve in diagram 2b has the shape  $s_0 s''y$ , the rate of growth of per capita output  $n_p$  will stabilize at level  $v''$  (diagram 2c) and continued growth, rather than stagnation, will result.

that, under the assumption of the constancy of  $\theta$  (the labor surplus ratio), the salient features of the Jorgenson-Classical thesis apply equally well to the two-sector economy.

On the other hand, if the increased agricultural surplus is "used" via a labor reallocation adjustment, we have a possible alternative thesis of stagnation.<sup>1</sup> For this thesis the essential assumption is that the innovation intensity "i" is inversely related to  $\theta$ , a relation described by

$$(1.5) \quad i = f(\theta) \quad \text{with } f'(\theta) < 0$$

and represented by the negatively sloped curve, labeled "innovation response curve", in diagram 2d. The justification for this relation is essentially that a part of the labor force in the agricultural sector is engaged in investment in overhead capital in the agrarian economy and that its presence in that sector is necessary to sustain technical progress. Technical change in the agrarian economy involves long-term, sometimes hardly perceptible improvements in crop practices over the centuries. But even those improvements are possible only where terracing, irrigation and drainage networks, for example, are kept from falling into disrepair. In fact, however, as more than one keen observer has noted, "besides revenue, they (feudal landlords and kings) need servants, body-guards and soldiers, and these requirements set an upper limit to the investment activity they are willing to organize. . . . Feudal landlords and government are likely to reduce the village population too much in their desire for soldiers, servants and luxuries."<sup>2</sup> It is the use of labor

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<sup>1</sup>See Fei and Ranis, "Agrarianism, Dualism and Economic Development," in The Theory and Design of Economic Development, *op. cit.* for a more systematic critical evaluation of the Jorgenson-Classical thesis.

<sup>2</sup>Ester Boserup, The Conditions of Agricultural Growth, Aldine Publishing Co., Chicago, 1965, p. 96.

in maintaining the agricultural infrastructure from one period to the next which may thus be measured. If too much labor is drawn out from the farm sector by the food surplus, the innovation intensity in agriculture declines.

The technology adjustment mechanism works as follows: starting again from the initial position at  $(p_0, c_0, \theta_0)$  or point  $q_0$ , we determine the point  $i_0$  (on the innovation response curve), and the point  $i_0$  on the vertical axis of diagram 2c. For this  $i_0$ , as we have seen, the agricultural progress function, labeled  $\pi_0$  in diagram 2c is determined. On the other hand, given the initial value of  $c_0$ , we can determine the total population growth rate at the point  $r_0$  (on the horizontal axis of diagram 2b) or point  $B_e$  (on the horizontal axis of diagram 2c). Since now  $\theta$  is not constant,  $r_0$  (i.e., the rate of increase of total population) and  $n_v$  (the rate of increase of agricultural population) are different, and must satisfy the relation  $n_v = r - n_p$ <sup>1</sup>. To satisfy this relation, let us construct, from the point  $B_e$ , a 45-degree line  $B_e B_0$  obtaining the point  $B_0$  on the agricultural progress function. It should be noted that  $A_0 B_0 = A_0 B_e = n_p$  by virtue of the 45° construction. Since  $OA_0$  on the horizontal axis measures  $n_v$ , it is true at point  $A_0$  (and only at point  $A_0$ ) that  $n_v = r - n_p$ . Thus the initial value of  $n_v$  is uniquely located at  $B_0$ . Since  $n_p$  is positive here,  $p$  will increase in the next period, say to  $p'$ , (diagram 2a) and, as long as the consumption standard remains constant, the value of  $\theta$  will increase (from  $q_0$  to  $z'$ , etc.) in diagram 2a. This calls into action the technology adjustment mechanism by depressing the innovation intensity (from  $i_0$  to  $i'$ ) on the innovation response curve. A new agricultural progress function  $\pi'$  (passing through the point  $i'$  on the vertical axis) is obtained at a position parallel to the  $\pi_0$  - curve. Using the same reasoning

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<sup>1</sup>This follows directly from  $n_v = n_{1-\theta} + n_L$  (as  $v = (1-\theta)L$ ) and  $n_p + n(1-\theta) = 0$  (by 1.2 when  $c$  is constant).

as before, given a constant  $r$ , the new value for  $n_v$  and  $n_p$  can then be located at  $B'$ . In this fashion the rate of increase of  $p$  is continuously depressed and the value of  $\theta$  continuously increased over time. The long run equilibrium position is then given by  $(c_o, p_o, z_e)$  with the relevant agricultural progress function  $\mathcal{L}_e$  (in diagram 2c) intersecting the horizontal axis at  $B_e$  at a point corresponding to the fixed population growth rate  $r_o$ .

Any explanation of long run stagnation in the agrarian system which relies wholly on either the consumption adjustment or the technology adjustment mechanism is bound to be off the mark. What is clearly called for is a synthesis of the two theses, a synthesis achieved rather naturally via the realization that, in the real world, any increase in the agricultural surplus will, in fact, be used partly to increase consumption ( $c$ ) and partly to induce greater labor reallocation ( $\theta$ ). A host of economic, institutional and political factors (the necessity for carrying on feudal wars, the nobility's desire for services, pressure from the cultivator, etc.) will operate at all times to determine this division, which may be described as a "propensity to consume" function.

$$(1.6) \quad \psi(\theta, c) = 0 \quad \text{with } d\theta/dc > 0 \quad (\text{propensity to consume function}).$$

This function is represented by the positively sloped curve in diagram 2a. All that is being assumed is that some of the agricultural surplus increase will be absorbed by the consumption adjustment mechanism and some by the allocation adjustment mechanism. The reader can easily see how the twin forces working toward stagnation can be depicted in diagrammatic terms. When labor productivity increases, for example, the increased consumption standard ( $c$ ) will induce additional population increase and the increased labor allocation ( $\theta$ ) will reduce innovational intensity; both forces operate to put a break on productivity expansion. In the case indicated in diagram 2, the long run equilibrium position is reached at some point  $y_o$  in diagram 2a and some point  $y_o'$  in

diagram 2c signifying the long run stability of the triplet ( $\theta$ ,  $p$ ,  $c$ ), as well as  $i$  and  $r$ .<sup>1</sup>

The above then represents our analysis of the economic forces which operate to lock the agrarian economy into a state of long run stagnation. The economy is getting bigger (as both  $i$  and  $r$  are positive), to be sure. However,  $r$  and  $i$  are so "regulated" that biological reproduction ( $r$ ) and economic progress  $i$  compensate each other in such a way that there will be no marked change in the structure of the economy in the long run. A steady stream of surplus labor supported by surplus food is constantly being funnelled into the service sector at a consumption standard ( $c$ ) which is often close to the subsistence level.

Long run stagnation in such an agrarian setting results in the establishment of certain institutional relations essential for discharging the basic economic functions of the system. Crucial among these functions is the delivery of the labor force to the service sector and the delivery of food ( $R$  in diagram 1) to sustain these workers. These magnitudes are not determined by pure market forces and the obligation of deliveries are not commercially contractual in nature. What usually happens is that the nobility which consumes the output of the service sector ( $C$  in diagram 1) is, at the same time, a landed aristocracy--whether they physically reside near the land (e.g., the feudalistic lords of medieval Europe, the daimyo of Japan) or not (e.g., the scholarly landed gentry in Chinese History, the Church in Europe). It is in their capacity as land owners that labor and/or agricultural output are exacted as a statutory obligation under the feudalistic system. The conversion of

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<sup>1</sup>As a check of the consistency of our reasoning, the four unknowns  $c$ ,  $\theta$ ,  $r$  and  $i$  are solved for simultaneously in 1.3b [with  $n_p = 0$ , and (1.4) (1.5) and (1.6)] to obtain their long run equilibrium values.

such a closed agrarian society into open agrarianism under the impact of forces from the outside must be accompanied by the development of new institutional arrangements to replace the old social order. It is to this aspect of the problem that we shall now turn.

## Section II. Transition into Open Agrarianism

For most underdeveloped countries with a colonial heritage--and this is true for almost all contemporary underdeveloped countries--what may be called open agrarianism appeared as a result of the penetration of the above (closed) agrarian system by a new economic agent, namely, the foreigner. Through time this foreigner took on successively more important economic functions. Typically, he first appeared as a trader instrumental in the creation of a new export production sector in the agrarian society. Thus (see diagram 3) there are now three domestic production sectors: agriculture, services and exports which must be dealt with. The export production sector is generally based on the exploitation of a cheap labor supply and/or specific climate or geology-based raw materials either in the form of fibers, tropical foods or minerals. Inputs flowing into this sector are food ( $R'$ ) produced by the agricultural sector and services produced by the service sector ( $K$ ). The output  $Q_E$ , of course, flows entirely to the foreign market, i.e., the foreign sector as indicated in diagram 3. (See above page 3a.)

Increasingly, the role of the foreigner expands from that of trader to that of entrepreneur, servicing or actually taking over the direction of activity in the export sector. The service sector gradually begins to turn from ministering to the feudal needs of the nobility or the Church to meeting the demands of the export sector for the services of banking, shipping, insurance, warehousing, etc. At a later stage this sector will also turn to the



construction of trade-related social overhead capital (electric power, transportation, housing, etc.). Such services flow into the export production sector as an input (K).

Another important outflow from the service sector is to the agricultural sector (A) as an inducement or compensation for the food supply (R' and R'') given up and provided to the workers employed in both the service and export sectors. The goods delivered, at least in the early stages, mainly include imported manufactured goods destined for rural consumption (e.g., cloth, kerosene, candles, sewing machines) which the service sector first imported from abroad (A') and on top of which certain domestic labor services (employed by the service sector) may be added in the course of the transfer process. For simplicity, we can let  $A=A'$ , i.e., there is not much value added.

The economic functions of this "new" service sector thus differ drastically from those of the "old". Instead of serving the interests and welfare of the landed aristocracy, its primary function now is to serve the interests of the export-oriented foreigners and their domestic commercial allies. This transition may not be without its struggle as the feudal aristocracy resists the inroads of the new commercial spirit, and the foreigners attempt to gain adherent allies within the local power structure. The struggle may go on for many decades, even centuries, with the foreigners ultimately likely to win out. Moreover, when the penetration from abroad isn't artificially delayed--as it was in Japan--it is often accompanied by political upheaval. As the new economic order of the open colonial economy is established, the inflow into the service sector includes, in addition to the already referred to food (R'') and imported consumer goods (A') ultimately destined for the agricultural sector, two other important items. The first is imported luxury consumer goods (C) for use by the foreigners and by the new domestic commercial class. The importation of these consumer goods may be important for the agrarian

system since it introduces a completely foreign way of material life into the traditional economy. The service sector thus becomes in essence a "port city" which is an enclave in the economic and cultural sense within the agrarian system. Secondly, there is the commercial capital stock ( $K'$ ) consisting of inventory, credit in foreign banks, warehouses, transportation equipment, etc.) the services of which are used primarily to facilitate the export trade. (Hence in diagram 3,  $K$  and  $K'$  can be identified.) The cause of the addition to the capital stock is "investment" ( $I$ ) which means the utilization of a part of the export proceeds ( $M$ ) for such trade-oriented capital accumulation.

The establishment of the new service sector introduces into the agrarian economy new agents (the foreigners and a new domestic commercial class), new factors of production (commercial capital stock  $K'$ ), new production activities (exports), and a new consumption horizon ( $A$  and  $C$ ). However, what is perhaps most important of all is the introduction of a new mode of rational economic behavior, which is gradually accepted. The new life is characterized by an unsatiated appetite for economic acquisition which, while taken for granted in contemporary elementary economic text books, nevertheless represents a radically different value system from the set of feudal relationships which preceded it. The export goods  $Q_E$  are converted into foreign exchange ( $M$ ) which is disposed of as either current expenses ( $B$  including  $A'$  and  $C$  introduced above) or as profits ( $\pi$ ). Moving out from his exclusive role of trader, the profit-oriented foreigner may take over some of the entrepreneurial tasks in the export production sector itself and not infrequently move into the political sphere as well in order to maintain the necessary minimum levels of government stability and administrative efficiency. All such additional expansion, the extent of which will vary from case to case, is guided by one primary motive, namely the enhancement and safe-guarding of export-related profits. This maximization of profit is the new basic purpose of economic life in open

agrarianism. This point is essential for a full understanding of the agrarian system.

Commercial profits ( $\pi$ ) which are the direct object of this activity can, in turn, be used either to reinvest (I leading to the accumulation of capital stock) or repatriated (N). The existence of the possibility of profit repatriation implies that not all the savings generated by the export activity will necessarily be used for capital accumulation within the system. If there is anticipation of continuously profitable export potentialities profits are likely to be reinvested in the service and/or export sector. To the extent such prospects are not bright, or uncertain, profits will be repatriated and capital accumulation declines or ceases. Thus, it would appear that profit repatriation could conceivably be blamed--as it, in fact, has been--as the primary economic evil of colonialism, since it signifies that the foreigners generally regard the economy as an enclave and refuse to invest beyond what is necessary to augment future repatriable profits. However, as we shall see below, the norm of performance of this open agrarian system as we witness it on the contemporary scene is frustration in the development effort for reasons quite separate from this phenomenon. Important as "profit repatriation" may be as a contributing factor, the vagaries of such exogenous forces as discovery, conditions in international markets, exhaustion of mineral deposits, etc. should not be regarded as a primary cause of long run stagnation. The thesis of long run stagnation in such a system holds, even if all-profits are reinvested. For this reason we shall assume from now on that  $\pi = I$  (or  $N = 0$ ) which means that all profits are, in fact, reinvested within the open agrarian system.

Section III. The Anatomy of Open Agrarianism

The new organization which we have just sketched is intended to carry out certain essential economic functions in the open agrarian society. There are four types of such functions:

- i) acquisition of the labor force
- ii) production of exportable goods
- iii) successful sale in the export market
- iv) accumulation of commercial capital

corresponding to the four sectors of diagram 3. We shall now proceed to briefly discuss each of these in order to clearly elicit the appropriate analytical assumptions which can be postulated for the successful performance of each of the functions.

Acquisition of the Labor Force

The notion of surplus labor (i.e., labor not employed in the agricultural sector) and agricultural surplus (i.e., the food consumed by surplus labor), which are important to the closed agrarian economy remain relevant, and in fact crucial, for the analysis of the open agrarian economy. As in section I, let  $\Theta L$  be the surplus labor, i.e.,  $\Theta$  is the fraction of the total labor force  $L$  which is now being employed in the service sector or the export production sector. The total agricultural surplus ( $R$ ) in diagram 3 consists of food supply to the service sector ( $R''$ ) and to the export production sector ( $R'$ ). Notice that regardless of the physical location of employment, such allocated labor is used, after a time, directly or indirectly to promote exports, and for all practical purposes, there is no need to distinguish between labor in the service sector and in the export production sector proper. It is quite evident that  $\Theta L$  and  $R$  (i.e., the labor surplus and the agricultural surplus) are the primary means of export production. The export-oriented

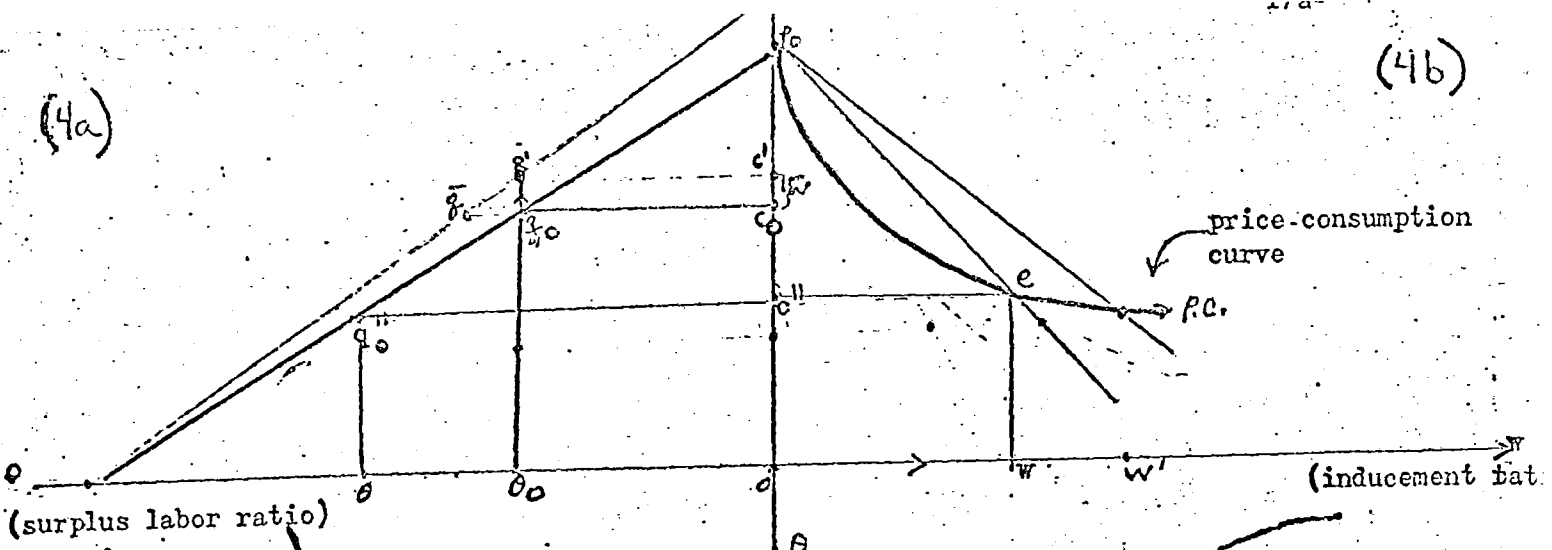
foreign entrepreneurs are obviously vitally interested in a steady supply of these factors. They are interested in breaking down both physical barriers to export expansion (i.e., through road construction, investment in warehousing and urban social overheads) and those more institutional in nature (e.g., through laws permitting the transferability of title to land, commercial codes, etc.) which stand in the way of a "free" mobility of these factors. However, at any moment in time, the major instrument in the hands of these entrepreneurs in their effort to induce the desired movement out of agriculture is through the delivery of imported consumer goods (A in diagram 3) not previously consumed by the cultivator. We shall refer to

$$(3.1) \quad w = A/L$$

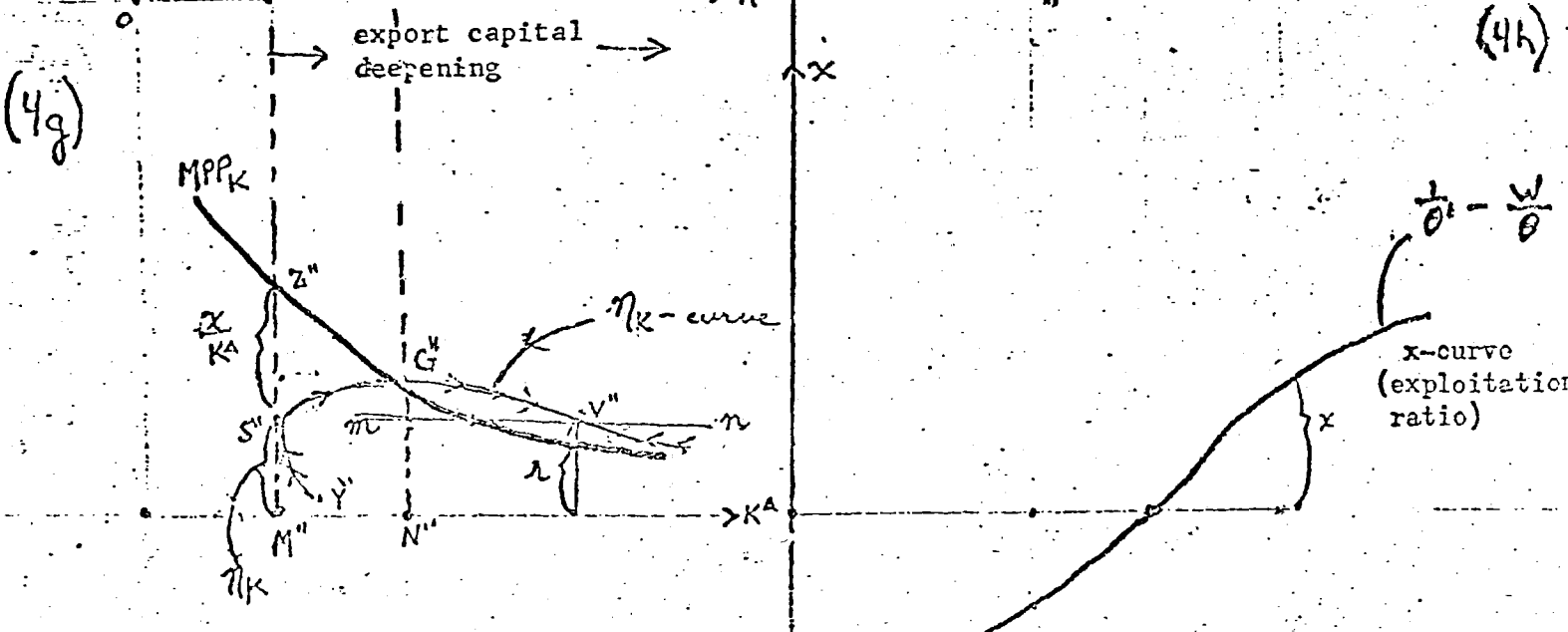
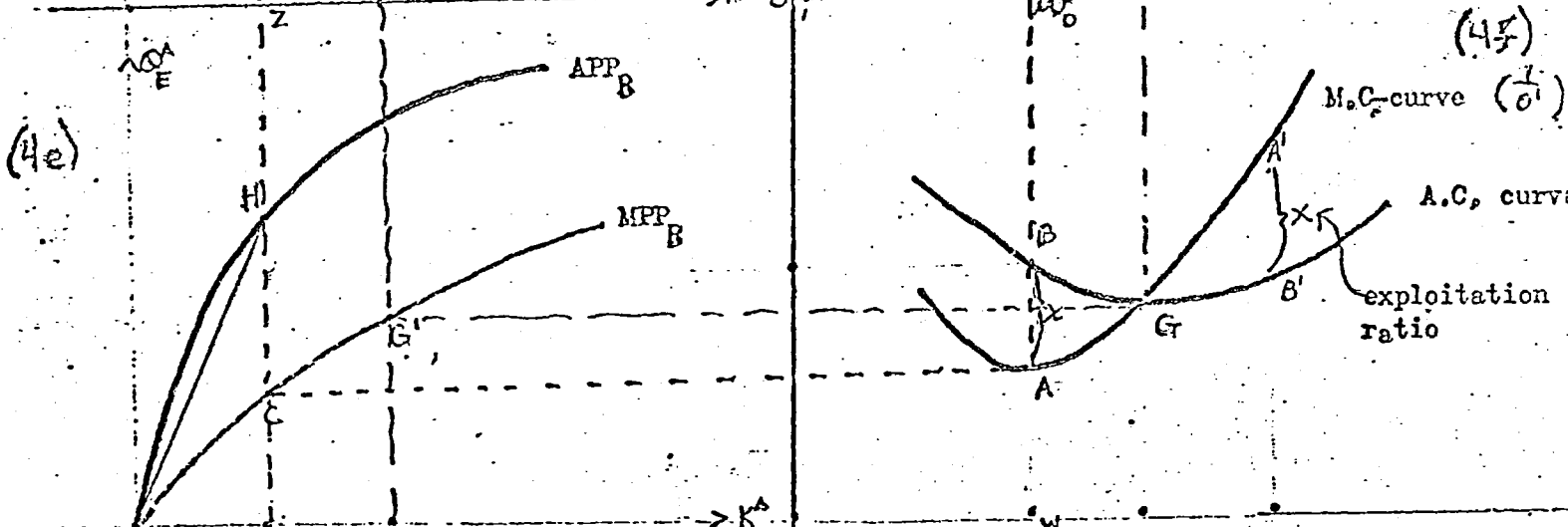
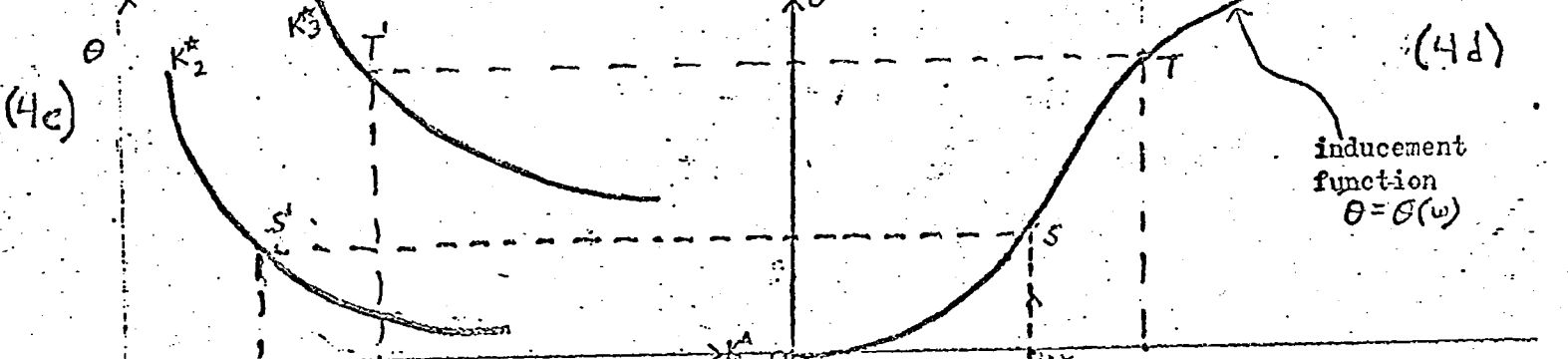
as the inducement ratio--since "A" is used to "induce" the giving up and delivery of surplus labor and food for export production. Notice that the inducement ratio is expressed as total imported consumer goods per unit of total population (L).

It should be noted that the prognosis of reaching long-run stationary equilibrium, in the sense of a constant per capita consumption standard  $c$  and a constant agricultural productivity  $p$  continues to be relevant in the open agrarian economy. In other words, the stand-off between the forces of population growth and technological change, as analyzed in section I, continues to hold. Thus diagram 4a is a reproduction of diagram 2a, in which the long run stagnation point is indicated at  $q_0$ --corresponding to the stationary triplet  $(\theta_0, p_0, c_0)$ . The question now is whether this stagnation can be broken by the importation of goods from abroad. For example, suppose food grains are imported to the amount  $\bar{w}$  as indicated in diagram 4a on the vertical axis. Then, with fixed values of  $(p_0, c_0)$ , the equilibrium allocation point shifts

(4a)



(4b)



from  $q_0$  to  $\bar{q}$  signifying an increase in  $\theta$ .<sup>1</sup> This corresponds to the intuitively obvious idea that "food imports" can substitute for "domestic productivity increase" as a factor causing the reallocation of a larger fraction of labor ( $\theta$ ). We then readily have:

$$(3.2) \quad \theta = \theta(w) = (1+(w-c)/p) \quad \text{with } \theta' > 0.$$

which simply states that the surplus labor ratio ( $\theta$ ) is an increasing function of the inducement ratio.

In the more general case, where the initial consumption standard  $c_0$ , is sufficiently above caloric minimum to begin with, the larger surplus labor ratio  $\theta$  can be induced through the delivery of industrial consumer goods-- (rather than food) to the agricultural sector. In diagram 4b let the indifference map of a typical farmer (as a consumer) be given. <sup>(not shown)</sup> As the farmer's productivity (and hence his income in terms of food<sup>2</sup>) is at " $p_0$ " a price consumption curve (labeled P.C.-curve) can then be drawn from  $p_0$ . Suppose then that the inducement ratio is  $w$  units of industrial goods as marked on the horizontal axis. Then the equilibrium consumption point is at  $e$  with  $c''$  units of food consumed. Returning to diagram (4a) we see that the new equilibrium allocation point is then established at  $q''$ , again signifying an increase of  $\theta$ . In this way we can see that the surplus labor ratio remains an increasing function of  $w$ , the inducement ratio, as postulated in (3.2) when the inducement takes the form of imported industrial goods.

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<sup>1</sup>In diagram 4a,  $c' = c_0 + \bar{w}$  is the "total availability of food per unit  $L$ " due to domestic production ( $c_0$ ) and imports ( $\bar{w}$ ). Equation (3.2) below readily follows from (1.2) by replacing " $p$ " by " $p + w/(1-\theta)$ " where  $w/(1-\theta)$  is imported food per unit of farmer (and  $p + w/(1-\theta)$  is availability of food per unit of farmer).

<sup>2</sup>Abstracting from the possibility that disposable income may be lower by some fraction due to feudalistic tithe remnants or taxes.

In general, we shall refer to (3.2) as the surplus labor inducement function. It is presented in diagram 4d, with  $w$  on the horizontal and  $\theta$  on the vertical axis. This function predicts the manner in which surplus labor (and agricultural surplus) can be induced to leave the rural sector through the delivery of imported consumer goods. Based on the above discussion, we may assume that the inducement curve is positively sloped; furthermore, that the excitement of new goods appearing on the taste horizon and spreading has its strongest cumulative effects initially, both in terms of choice between food and industrial goods and between leisure and industrial goods, and finally, that ultimately a "law of diminishing returns to the seduction process" begins to set in (after some point S).

We may thus legitimately think of  $\theta$  (measured on the vertical axis in diagram 4d) as a measure of the relative "availability" of surplus labor to the export sector and of  $w$  (the inducement ratio) as a measure of the cost to the entrepreneurs in the export production sector. Given this inducement function we can readily define

$$(3.3a) \quad u = w/\theta \quad (=wL/\theta L) \text{ as the average cost of labor (in terms of imported goods per unit of surplus labor induced)}$$

and

$$b) \quad m = dw/d\theta \quad (= 1/\theta')$$

From the point of view of the export-oriented entrepreneurs, the total cost of labor is, simply, the total volume of imported goods used to induce the flow of surplus labor.

Notice that this inducement is strictly a "market phenomenon". If " $w$ " represents the units of imported industrial consumer goods per unit of  $L$ , the terms of trade between imported industrial and domestic agricultural goods established in the market are represented by the slope of  $p_o e$  (diagram 4b). The total value of consumption (of  $w$  units of industrial goods and  $c$  units of food) of a typical worker, at the established terms of trade, has the same



market value as  $p_0$  units of food. Moreover, the total value of imported goods is equivalent to  $\overline{c''p_0}L$  units of food, which value enables the trading entrepreneur to buy  $\overline{c''p_0}L/p_0$  units of labor<sup>1</sup>, or, as a fraction of  $L$ ,  $\theta = \overline{c''p_0}/p_0$ .

(This can be measured horizontally in diagram 4a as  $c''q$  or vertically in diagram 4d as  $w_0S$ ). Thus, under open agrarianism, labor, for the first time,

becomes a marketable commodity--a heretofore completely unknown phenomenon.

The relevance of this new maximizing calculus to the labor market can be shown more directly by representing varying levels of  $u$  (and  $w$ ), i.e., the average (and marginal) cost of surplus labor, by an AC (average cost) and an MC (marginal cost) curve in diagram 4e.<sup>2</sup> Comparing diagrams (4d) and (4f),

we see that the MC-curve reaches a minimum point (at A) as the laws of diminishing returns set in (at S) and that the MC-curves crosses the AC-curve at the minimum point of the latter (at G) when the inducement curve has unit elasticity (at T). Intuitively, we expect the profit maximizing entrepreneur to carry out his "labor seduction" according to a marginal principle.

For this reason, let us define the vertical gap between the MC-curve and the AC-curve, i.e.,

$$(3.4) \quad x = M.C. - A.C.$$

as the exploitation ratio which will be shown to be an important concept in the open agrarian society. The exploitation ratio, as a function of  $w$ , is plotted in diagram 4b, i.e., the x-curve, and is positive (negative) as the inducement curve is inelastic (elastic).

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<sup>1</sup>Since  $p_0$  is equivalent to the real wage.

<sup>2</sup>At the point  $w_0$  (diagram 4d), the slope  $ow_0/os$  is equal to the height  $wB$  (diagram 4f) while the inverse slope at point S (in diagram 4d) is equal to the height  $wA$  (diagram 4f).

Production of Exported Goods

Surplus labor is acquired to provide first the necessary overheads, roads, warehouses, etc., and then direct inputs into the production of exportable commodities.<sup>1</sup> It is possible to classify various subtypes of open agrarian economies by differentiating among the production conditions prevailing in specific export activities. For example in the "...export dominated economies of South East Asia, two rather distinct subtypes can be identified for the historical pre World War II period..... For one type, export production continued to emphasize traditional, labor intensive methods applied to an indigenous crop--rice being the outstanding example. For the other type, export production was associated with capital-intensive methods introduced from abroad. Most commonly these were applied to products which were also implanted from abroad--rubber and sugar representing two important examples... Exploitation of mineral rather than agricultural resources for export (e.g., tin and petroleum) may be considered as a variant of the second case."<sup>2</sup> Such further sub-classification of the South East Asian export production sector undoubtedly has more general applicability.<sup>3</sup> It is obvious that, on the whole, the initial contact of the traditional economy--and indeed, the initial growth promoting force of the open agrarian economy--is via the production of agricultural

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<sup>1</sup>As Fisk put it (E. K. Fisk, "Planning in a Primitive Economy," Economic Record, Dec. 1962, p. 472) "where external factors, such as the development of European commercial enterprise..... have brought marketing facilities within reasonable reach of the subsistence units, the labor surplus has been used first to complete the linkage with the markets, and then to increase agricultural production for sale."

<sup>2</sup>Paauw, D. S. and Fei, J. C. H., "Development Strategies and Planning Issues in South-East Asian Type Economies", The Philippine Economic Journal, 1965, Vol. IV, No. 2, pp. 204-205.

<sup>3</sup>e.g., with special reference to Africa, see Robert E. Baldwin, "Patterns of Development in Newly Settled Regions", Manchester School, XXIV, No. 2, May 1956.

goods for export--a heritage still apparent in most contemporary under-developed economies.

Distinctions among particular types of crops and related organizational configurations are of importance--and must be dealt with in any complete analysis of the ease or difficulty of transition from open agrarianism to dualism. However, for purposes of this paper, they need not distract us from the basic fact of production, namely, that it is through the joint effort of surplus labor (B), and commercial capital (K) that output for export ( $Q_E$ ) is generated. Thus we may postulate a production function of the type

$$(3.5a) \quad Q_E = f(K, B) \quad (\text{export production function})$$

$$b) \quad B = \theta L$$

In case the exportable good is based on an exhaustible mineral source, the production function is subject to the condition of long run decreasing returns. In that case, it is intuitively obvious that stagnation is more likely to occur. But, under the more general (neutral) assumption of constant returns to scale, the productivity of surplus labor  $Q_E^A \equiv Q_E/B$  is an increasing (and convex) function of capital per unit of surplus labor  $K^A \equiv K/B$ . This production function

$$(3.6a) \quad Q_E^A = f(K^A, 1) \quad \text{where}$$

$$b) \quad Q_E^A \equiv Q_E/B \quad \text{and}$$

$$c) \quad K^A \equiv K/B$$

is represented by the  $APP_B$ -curve in diagram (4e). In the same diagram, the marginal productivity of surplus labor is represented by the  $MPP_B$ -curve. The marginal productivity of capital, as a function of  $K^A$ , is shown in diagram (4g) by the curve with a negative slope. When  $K^A = K/B$  increases (i.e., as more capital is combined with labor), export sector capital intensity increases, referred to as export capital deepening, (conversely as  $K^A$  decreases).

The average product curve in diagram (4e) shows the effect of the laws of diminishing returns to capital in the process of export capital deepening.

#### Selling in the Export Market

All exported goods are, by definition, destined for the foreign market. If the terms of trade are  $t$ , then the total amount of exported goods ( $Q_E$ ) can sell for  $M = tQ_E$  units of "foreign goods"--which may be viewed as the revenue in real units of foreign exchange. Thus we have:

$$(3.7) \quad M = tQ_E$$

A whole set of factors may affect the conditions in foreign markets. If the exporting open agrarian economy is a major supplier of a commodity (e.g., cocoa for Ghana), " $t$ " is a decreasing function of  $Q_E$ ; if the economy is a price taker " $t$ " tends to take on a constant value in the short run. However, in either case, the terms of trade are likely to change in the long run depending on patterns of world demand (the availability of natural or synthetic substitutes) and a variety of other considerations which have been discussed at great length in the Prebisch vs. Kindleberger literature. It is therefore rather difficult to come up with any really satisfactory generalization about the likely behavior of " $t$ ". Nor is this paper the appropriate place to make the attempt. For the purpose of emphasizing the internal logic of open agrarianism independent of these admittedly important exogenous considerations, surely being treated in other papers for this Conference, it is simplest to make the assumption of a constancy of " $t$ " through time. Under this assumption, we can through a redefining of the unit of measurement of the imports, assume that  $t = 1$  which will simplify our later exposition. Notice, however, that if some law of change of " $t$ " over time can be discovered this can be incorporated without difficulty in our framework of analysis.

Accumulation of Commercial Capital

As is evident from the flow chart of diagram 3, the proceeds from the export sale can be used in three ways: for investment (I), for the luxury consumption (C) of the export-related entrepreneur, and for the importation of incentive consumer goods destined eventually for rural consumption.<sup>1</sup>

It may be reasonable (but not necessary) to assume that C is proportional to K (i.e.,  $C = gK$ ) for the obvious reason that the luxury consumption of foreign entrepreneurs tends to be proportional to the stock of commercial capital managed by such entrepreneurs. Finally, since investment leads to capital accumulation, we can summarize this relation as

$$(3.8a) \quad I = M - A - C$$

$$b) \quad C = gK$$

$$c) \quad \frac{dK}{dt} = I$$

$$d) \quad n_K = I/K$$

where (3.8d) is the growth rate of capital.

We must also recall that in performing these four economic functions just outlined the open agrarian economy must do so in the face of certain conditions inherited from the closed agrarian system. One of the most important of these is the persistence of population pressures. Let us assume that population continues to grow at a constant rate:

$$(3.9) \quad n_L = r$$

We should recall here that the long run stagnation thesis of closed agrarianism (above) provides us with the stability of the population growth rate (r), the consumption standard (c) and labor productivity (p). As is evident from our discussion, these conditions ensure that a steady supply of surplus labor and of agricultural surplus can be induced to flow

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<sup>1</sup>If we continue to neglect the possibility of capital repatriation.

into the export sector in the open agrarian setting. In other words, the demographic factors inherited by open agrarianism are such that they are "right" for the open economy in which the labor will be induced to move into the export market. It is intuitively obvious that such population pressure must be weighed in terms of the overall factor endowment of the economy as measured by capital per head  $K^*$  ( $=K/L$ ). Thus we readily have

$$(3.10a) \quad K^{\Delta} = K^*/ \theta \quad \text{where}$$

$$b) \quad K^* = K/L \quad \text{(by 3.5b, 3.6c)}$$

which shows a simple relation between overall factor endowment ( $K^*$ ) export capital intensity ( $K^{\Delta}$ ) and the surplus labor ratio ( $\theta$ ). We can imagine that, at any point in time, the economy's overall factor endowment ( $K^*$ ) is fixed. Then (3.10a) shows that  $K^{\Delta}$  is inversely related to  $\theta$ , i.e., a larger surplus labor ratio (larger  $\theta$ ) leads to less capital deepening (small  $K^{\Delta}$ ) in the export sector. This relationship can be shown in diagram 4c by the system of rectangular hyperbolas--where a fixed rectangular hyperbola represents a fixed value of  $K^*$  in (3.10a). <sup>IP</sup> Diagram 4 may now be used to briefly summarize our description of the open agrarian economy up to this point. To begin with, let us suppose that as the total stock of capital and the labor force are fixed at any point in time,  $K^*$  is fixed (e.g., represented by the  $K^*_2$ -curve in diagram 4c). Using the inducement ratio "w" as an instrument to acquire surplus labor, entrepreneurs tentatively set a "trial" value of w as indicated on the horizontal axis (diagram 4d). This determines the (tentative) values of the surplus labor ratio (i.e.,  $w_0$  S in diagram 4d), the level of export capital intensity ( $z$  in diagram 4c) and the marginal and average productivities of surplus labor (points C and H in diagram 4e). This enables the entrepreneur to calculate his total revenue ( $M=tAPP_B$ ) in terms of the foreign exchange that can be earned. On the other hand, when "w" is chosen the entrepreneur can also readily calculate the total labor cost (in terms

of the foreign exchange ( $wL$ ) expended on imported consumer goods). Thus, profits, as the difference between total cost and total revenue, are seen to be determined by "w", the inducement ratio.

As we pointed out earlier, the most conspicuous new institutional aspect of open agrarianism is that the society is dominated, for the first time, by the unsatiated acquisitive commercial spirit of the entrepreneurial class. This spirit translates itself concretely into their desire to maximize total profits, or, since at any point in time, the capital stock is fixed, their desire to maximize profits per unit of capital or the rate of return to capital. Thus, the entrepreneurs either through calculation or through trial and error experimentation will tend to set w at that level which maximizes total profits at each point in time.

In order to deduce an explicit expression of the rate of return to capital as a function of w, notice that investment I in (3.8a) is precisely the definition of profits and that "the rate of growth of capital"  $n_K$  in (3.8d) is precisely the definition of the profit rate (i.e., profits per unit capital). The profit rate can be written as

$$(3.11) \quad n_K = \frac{tf(K^*, \theta(w)) - w}{K^*} - g$$

$$\text{Proof} \quad n_K = \frac{M-A-C}{K} = \frac{tQ_E - wL - gK}{K} \quad (\text{by 3.8ab; 3.1; 3.7f})$$

$$= \frac{tQ'_E - w/\theta}{K^*} - g \quad (\text{by 3.6bc; 3.5b})$$

$$= \frac{t\theta f(K^*/\theta, 1) - w}{K^*} - g \quad (\text{by 3.6a; 3.10a; 3.2})$$

$$= \frac{tf(K^*, \theta) - w}{K^*} - g \quad (\text{by CRTS property of 3.5a})$$

which shows that for a fixed  $K^*$  ( $t, g$ ) the profit rate is a function of w. To maximize the profit rate, with respect to w, we have, by setting  $d n_K / dw = 0$ ,

$$(3.12) \quad tf_B = \frac{1}{\theta}, \quad \text{or } tMPP_B = M.C. \quad \text{and } MPP_B = M.C. \quad (\text{if } t = 1)$$

which is the condition of maximization of profits (i.e., at equality between

$MPP_B$  (the marginal value product of surplus labor in export production) and  $MC$  (the marginal cost of surplus labor in terms of imported consumer goods).

It should be recalled that any such equilibrium condition is relative to a fixed value of  $K^*$  (the factor endowment of the economy). Under our assumption that  $K_2^*$  (diagram 4c) represents the current value of  $K^*$ , the equilibrium condition of (3.12) can thus be represented by the "equilibrium rectangle"  $S'SAC$  signifying the equality between  $MPP_B$  (at point C in diagram 4e) and  $MC$  (at point A in diagram 4f).

Section IV. Operation of Open Agrarianism

For an understanding of the internal logic of open agrarianism, it is illuminating to understand the origin of profit which is, at once, the inducement to capital accumulation as well as the source of investment finance. First of all, let the optimum (i.e., the maximized) rate of profit be written in the following way:

$$\begin{aligned}
 (4.1) \quad \text{optimum } \eta_K &= \frac{MPP_K + \frac{x}{K^\Delta} - g}{\phantom{MPP_K + \frac{x}{K^\Delta} - g}} && \text{or } \eta_K + g = MPP_K + \frac{x}{K^\Delta} \\
 \text{Proof } \eta_K &= \frac{f_K K^* + f_B \theta - w}{K^*} - g && \text{by (3.11) and CRTS.} \\
 &= f_K + \frac{f_B - w/\theta}{K^*/\theta} - g \\
 &= f_K + \frac{\frac{1}{\theta} - w/\theta}{K^\Delta} - g && \text{by (3.12)} \\
 &= f_K + \frac{x}{K^\Delta} - g && \text{by (3.4)}
 \end{aligned}$$

Notice that "x" (the exploitation ratio) as introduced in (3.4) --i.e., the vertical distance AB in diagram 4f--is equivalent to the modern (i.e., Joan Robinson) definition of labor exploitation defined as the "deviation of the actual wage from the competitive level of the real wage". To see that this is so we know that  $wL/B = w/\theta = AC$  (i.e., the distance  $wB$  in diagram 4f) is the actual average wage cost (per unit of surplus labor)



while the competitive wage cost is  $MPP_B = MC$  (i.e., the distance WA in diagram 4f). Hence "x" (defined as the exploitation ratio earlier) represents the tax (or subsidy) of surplus labor and hence the term  $x/K^A = xB/K$  can be called exploitation per unit of capital. Notice that x can be negative as well as positive, i.e., labor can be subsidized as well as taxed. Referring to diagrams (4d and 4f), we see that in case the inducement function is elastic,  $MC < AC$ , and both x and  $x/K^A$  are negative, i.e., there is a subsidy of labor to the left of point G in diagram (4f). In case the inducement function is inelastic,  $MC > AC$ , x and  $x/K^A$  are positive, i.e., there is a tax on labor to the right of point G.

We can now attempt an economic interpretation of (4.1). Referring to the underlined expression, we see that the term  $MPP_K + x/K^A$  is the "gross income" per unit of capital which is the sum of the competitive income per unit of capital ( $MPP_K$ ) and exploitation per unit of capital. On the other hand, the term  $r_K + g$  is the "disposition of capitalist income". In the case of the equilibrium rectangle S'SAC just described, x is negative, i.e., labor is subsidized and hence the profit rate  $r_K$  which may be indicated by distance S''M'' (in diagram 4g) falls short of the  $MPP_K$  by the amount S''Z'' which is the sum of consumption (g) and the subsidy per unit of capital  $x/K^A$ .<sup>1</sup>

Let us now suppose that the factor endowment of the economy as a whole changes in such a way that  $K^*$  increases from  $K^*_2$  to  $K^*_3$ --as represented by the upward shift of the corresponding rectangular hyperbola. The new optimum solution is now represented by the equilibrium rectangle T'TGG' and the new rate of return to capital by the vertical distance N''G'' (diagram 4g). Notice that this is the special case when the inducement function (diagram 4d)

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<sup>1</sup>We are letting  $g = 0$  in diagram (4g). Notice that if  $g > 0$ , point S'' will shift downward by the constant amount "g" and our entire analysis below will hold after suitable (but easily accomplished) modification. We shall assume for now that  $g = 0$ .

is of unitary elasticity and hence the exploitation ratio is zero (i.e.,  $x = 0$  in diagram 4h). For this special case the profit rate is  $MPP_K - g$ . However, since we have assumed, for simplicity of exposition that  $g = 0$ , the profit rate  $\eta_K$  coincides with  $MPP_K$  in diagram (4g). In like fashion, as increasing values of  $K^*$  are successively postulated (i.e., by a system of rectangular hyperbolas in diagram 4c), the successive equilibrium values of the profit rates  $\eta_K$  will generate a locus of points, such as the  $\eta_K$ -curve in diagram (4g) passing through the points  $M''$ ,  $S''$ ,  $G''$ ,  $V''$  .... as  $K^*$  increases.

There obviously exist many different sub-cases of open agrarian economies in the real world--both on the contemporary scene and in the historical context. It is our hope that the analysis of section III, by identifying the four economic functions required for execution in an open agrarian economy, will help to make possible the elucidation of subcases by (hopefully empirical) references to how these functions are, in fact, performed. It is then obvious that depending upon the special characteristics of such subtypes, open agrarianism may exhibit a wide variety of behavior patterns in the process of growth. Specifically, as the factor endowment of the economy changes (i.e., as  $K^*$  increases), the changes in certain essential observable characteristics may be in different directions for such reasons. Our model (and diagram 4) has been designed to attempt an answer to only some of these problems (i.e., the problem of the impact of change of  $K^*$  on other observable characteristics). We shall now briefly indicate some of the comparative static results of our analysis--leaving all proofs to the appendix.

Referring to diagram 4d once again, we see that the two equilibrium rectangles indicated earlier--i.e.,  $S'SAC$  and  $T'TGG'$ --correspond to two special cases, i.e., where the point of inflexion of the inducement function, at point  $S$ , occurs, and where the inducement function is unit-elastic, at point  $T$ .

Corresponding to these two special "land-mark" cases, the points S and G divide the  $\eta_K$ -curve (in diagram 4g) into three segments: the segment Y"S" (where the MC-curve in diagram 4f is falling), the segment S"G" (where the MC-curve is rising and lies below the AC-curve), and the segment G"V" (where the MC-curve lies above the AC-curve). Keeping these landmark points in mind, our comparative static conclusions may be summarized as follows:

- 1) As  $K^*$  increases, the value of  $w$  increases.

This means that in case of overall capital deepening (i.e.,  $K^*$  increases), the  $w$  set to maximize profits and the inducement ratio always increase. Thus, in case the inducement function is positively sloped, the surplus labor ratio ( $\theta$ ) also increases. Diagram (4b) shows that the terms of trade (i.e., between food and imported goods) tend to move against the entrepreneurs in the export sector.

- 2) As  $K^*$  increases, the value of  $K^a$  will decrease (increase) if the inducement function is elastic (inelastic)--i.e., before (after) point S.

This is shown in diagram (4g) by the fact that the  $\eta_K$ -curve moves to the left (right) before (after) the point S". The economic interpretation is that there will be capital shallowing in the export sector as long as surplus labor can be pried loose with ease from the subsistence agricultural sector. This turns to capital deepening once the inducement function becomes inelastic. Intuitively, it is obvious that as the "law of diminishing returns" sets in in the labor acquisition process, i.e., if it becomes difficult to acquire labor, capitalists will naturally be forced to use less labor per unit of capital in the export production sector.

- 3) As  $K^*$  increases,  $\eta_K$  increases (decreases) if  $x < 0$  ( $x > 0$ )

This is indicated in diagram (4g) by the fact that the  $\eta_K$ -curve takes on a maximum value as it crosses the  $MPP_K$  curve, with the economic significance

that the profit rate increases when labor is subsidized and declines when labor is taxed. This is seen from the fact that the vertical gap between the  $MPP_K$ -curve and the  $n_K$ -curve shrinks to zero before the point  $G''$  which signifies that in the process of increasing export capital intensity the diminishing need to subsidize labor more than compensates for the unfavorable effort of a lower  $MPP_K$  due to the laws of diminishing returns to capital. Conversely, the profit rate will decline after point  $G$  when labor is taxed.

In the above, we have emphasized a reasonable behavioristic pattern of the inducement function as an illustration of the flexibility of our framework of analysis. Clearly other a priori hypotheses as to the slope of the inducement function are admissible and would lead to different conclusions. Moreover, other applications of our framework of analysis are possible, e.g., by a fuller identification of the behavioral characteristics of the production functions, by "richer" assumptions on the terms of trade or the value of  $g$ . Let us now turn to the long-run prognosis for the open agrarian system and the requirements for its emergence into vigorous dualism.

#### Section V. Prognosis for Open Agrarianism

We are now in a position to inquire about the likely long-run prospects for the type of open agrarian system we have tried to depict. To help us in this regard, let us show a horizontal line  $mn$  in diagram 4g at the height of the population growth rate  $r$  in (3.9). Suppose the point of intersection of that curve with the  $n_K$  curve is at point  $v''$ . Then to the left of  $v''$ , since the rate of growth of capital,  $n_K$ , exceeds the rate of growth of labor,  $r$ , there must be eventual capital deepening, i.e., a rising  $K^*$ ; similarly to the right of  $v''$  there must be capital shallowing. With a stable equilibrium obtaining at  $v''$ , the long run stationary value of  $K^*$  in turn, implies long run stationary values of all the essential economic magnitudes (e.g.,  $K^*$ ,  $MPP_K$ ,  $MPP_L$ ,  $\theta$ ,  $w$ ) we are concerned with.

It should be noted that this conclusion is valid quite irrespective of the detailed framework presented earlier; that is to say, the long run stagnation result is independent of the precise transitional stages through which the long run stationary state is reached. All that is really essential is that the  $n_K$ -curve (in diagram 4g) is declining in the long run, a phenomenon which, as we have shown, can be traced to the fact that the inducement function becomes inelastic for higher values of  $w$ . Notice that the inelasticity of the inducement function at large values of  $w$  is compellingly reasonable since  $\theta$  can't exceed 1. In other words, the attempt by the foreign-oriented entrepreneurs to take advantage of the existing labor surplus in the open agrarian economy ultimately runs up against physical limitations. The stagnant  $p$  and  $c$ , inherited from the closed agrarian system, cannot be shaken off. The growth which does take place may be substantial, but as long as it is restricted to the export production sector as an enclave in an otherwise stagnant, still preponderant, agricultural hinterland, the prospects are for ultimate stagnation. The only way this conclusion can be avoided is if the opening up of the closed agrarian system brings with it additional dynamic benefits relating to the appearance of technological change as a routinized behavioral pattern. The ability or inability to effect a successful implementation of such technological dynamism is, in fact, what marks off stagnant open agrarianism from vigorous dualism.

In summary, there are a number of reasons why the structure of open agrarianism is closer to dualism than that of the closed variety. First and foremost among these is the advent, for the first time, of profit maximization as the motive propellant force, displacing feudal and kinship relationships. As Georgescu-Roegen put it "from the middle of the nineteenth century, if not before, these [agrarian] countries began . . . to receive the impact of Western capitalism. Increasing trade with the West revealed the existence

of other economic patterns and at the same time opened up new desires for the landlords and new ambitions for the bureaucracy. Under this influence the feudal contrat social began to weaken".<sup>1</sup> Secondly, while surplus labor may have been employed to satisfy culturally or religiously important values, open agrarianism succeeds, for the first time, in making productive use of such labor in the modern sense, that is, the commercialization of labor by mobilization via the price mechanism instead of by feudal edict. As labor mobility results in response to changes in the commodity flow, the foundation of what could eventually develop into a full-blown inter-sectoral labor and inter-sectoral commodity market in the dualistic setting are laid. Thirdly, physical capital formation in the social and economic overheads servicing the export sector and, second, in the export production sector proper, makes its appearance for the first time. Finally, a new class of economic agents, acquisitive foreign entrepreneurs and their local counterparts with whom they form flexible alliances, makes its appearance on the scene, gradually replacing a reluctant landed aristocracy in position of economic and political power.

The environment has thus changed markedly under the impact of foreign trade and the workings of the profit-maximizing calculus. There nevertheless remains a considerable gap between the operation of open agrarianism and the workings of a vigorous dualistic system.<sup>2</sup> All we have to do is look about us to see that a considerable number of less developed countries continue to be caught in the open agrarian trap. While the chances for transition into dualism are clearly and substantially enhanced, there remain a number of crucial points of difference tending to keep the less developed economy.

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<sup>1</sup>Georgescu-Roegen, "Economic Theory and Agrarian Economics", Oxford Economic Papers, Feb. 60, p. 33.

<sup>2</sup>As described, for example, by Arthur Lewis, "Development with Unlimited Supplies of Labor", Manchester School, Jan. 58, & Fei and Ranis, Development of the Labor Surplus Economy: Theory and Policy, Irwin, 1964.

in the grip of stagnation over the long haul. Dominant among these is the fact that development in the export enclave does not really touch the life of the agricultural production sector in any really meaningful or pervasive fashion. Industrial capital formation in the dualistic or mature economy sense has not really as yet put in an appearance. In this context the required routinized interaction between a small, but relatively expanding industrial sector and a large but relatively shrinking agricultural sector does not have a chance to take hold. As a direct consequence, the most important single link in the chain of successful dualistic growth which has a chance to culminate in graduation to economic maturity, namely the ability to count on a dependable routinized innovation inducement mechanism in both sectors (but especially agriculture), is missing. There is, as yet, no dualistic entrepreneur, with one foot in each sector, making his maximizing investment and innovative decisions so as to ensure balanced forward progress. As one keen observer has aptly put it, "technological change is, itself, one of the more difficult products for a country in the early stages of economic development to produce. In fact, it sometimes appears that an industrial economy is a prerequisite for technological change in the agricultural sector".<sup>1</sup>

The analysis of this paper is thus intended to shed some light on both the reasons for continued stagnation as a norm, as well as on the elements which must be focused on to achieve departure from that norm. It will be clear to the reader that the transition to dualism has been substantially eased by the opening up of the closed agrarian economy. A more

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<sup>1</sup>Vernon Ruttan, Comments on "Subsistence Agriculture and Economic Growth", Agricultural Development Council Seminar on Subsistence and Peasant Economies, East-West Center, Hawaii, p. 6. See also the contribution of Nicholls and Tang, on this subject. (For example, W. Nicholls, "Industrialization Factor Markets & Agricultural Development," Journal of P.E., LXIX (1961), 340; W. Nicholls & A.M. Tang, Economic Development in the South Piedmont, 1860-1950: Its Importance for Agriculture, (Nashville, 1958.)

precise definition of what it takes, additionally, in terms of trade, aid, and the flow of technological change to be able to translate the enhanced opportunities of open agrarianism into vigorous dualistic growth and, ultimately, economic maturity is clearly a question of the utmost importance-- and one which we hope to turn to in our future work.



Appendix

Succinctly, the model for the open agrarian economy may be summarized by the following six equations presented in the text.

$$(A1) \text{ a) } \theta = \theta(w) \quad (3.2)$$

$$\text{b) } m = \frac{1}{\theta'(w)} \quad (3.3b)$$

$$\text{c) } Q_E^\Delta = f(K^\Delta, 1) \quad (3.6a)$$

$$\text{d) } K^\Delta = K^*/\theta \quad (3.10a)$$

$$\text{e) } \eta_K = \frac{tf(K^*, \theta(w)) - w}{K^*} - \varepsilon \quad (3.11)$$

$$\text{f) } m = t f_B(K^\Delta, 1) \quad (3.12)$$

which can be used to solve for the six unknowns ( $\theta$ ,  $w$ ,  $m$ ,  $Q_E^\Delta$ ,  $K^\Delta$ ,  $\eta_K$ ) when  $K^*$  is given. Thus conceptually, for any fixed value of  $K^*$ , the optimum values (i.e., maximized values) can be written as

$$(A2) \quad \bar{\theta} = \bar{\theta}(K^*); \quad \bar{m} = \bar{m}(K^*); \quad \bar{w} = \bar{w}(K^*), \quad \bar{Q}_E^\Delta = \bar{Q}_E^\Delta(K^*), \quad \bar{K}^\Delta = \bar{K}^\Delta(K^*), \\ \bar{\eta}_K = \bar{\eta}_K(K^*)$$

which merely shows that the optimum values (indicated by the upper bar) are all functions of  $K^*$ . The comparative static conclusions relevant to open agrarianism and referred to in the paper are obtained by investigating the signs of the derivatives of the functions in A2. For purposes of the dynamic aspect of our model, we have the additional equation:

$$(A3) \quad \dot{K}^* = \bar{\eta}_K - r = \phi(K^*) \quad \text{by (3.7)}$$

where the notation  $\phi(K^*)$  simply states that the rate of growth of  $K^*$  is a function of  $K^*$ . Thus (A3) is a differential equation in  $K^*$ , the solution of which is the time path of  $K^*$ . When this is substituted in (A2), the time paths of all the variables are determined. The theorem of long run stagnation of section V is a dynamic theorem referring to the properties of these time paths. (Notice that in A1, 2, 3, we have formulated the problem such that only "ratios" are involved and that the absolute magnitudes

K, L,  $Q_E$ , I, M, .... are all dispensed with by taking advantage of the constant returns to scale property of our model.)

The model structure defined above is similar, at least from a purely mathematical point of view, to what may be called a socialist "Maximum Speed Development Model".<sup>1</sup> Readers interested in the detailed proofs of the above are referred to the appendix of that paper.

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<sup>1</sup>John Fei and Alpha Chiang, "Maximum Speed Development through Austerity" in The Theory and Design of Economic Development, op. cit.