

IMPERIALISM AND UNDERDEVELOPMENT IN A SEMIFEUDALISTIC PERSPECTIVE : A MODEL FOR ANALYSIS

by

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1. Introduction

The international causes of underdevelopment in poor countries are often viewed in a process perspective. The process theorists are interested in explaining the persistence of underdevelopment rather than the method of dissolving its causes. Therefore, they seem to work within the bounds of closed-system assumptions; what they produce is highly static. The difficulties in developing dynamic models are largely due to the failure to recognise dynamic variables and establish dynamic relations. A key dynamic variable that has not received its due treatment is technology. The model presented here suggests a method of relating the technology variable into the internationally-caused process of underdevelopment.

The study of underdevelopment today is generally based on the premise that modern international relations are evolved from capitalism and imperialism. Notably, the classical and neo-classical theories of international trade, theories of international conflict, alliance formation and integration, and theories of neo-colonialism and expectations about a new international economic order accept that the economic, political, ideological and institutional foundations are primarily capitalistic. However, it is argued here that capitalistic relations between developed and underdeveloped nations operate on rules which are similar to those which governed the relations between land-lord and peasant in semi-feudal agriculture, rather than those of the free market system under capitalism. A model based largely on these rules is presented here for the purpose of analysing external relations of poor countries, in a search for patterns hidden so far and for a break-through, with the help of technology variable, in the seemingly closed-system process of underdevelopment

2. Neo-Marxist Theories of Underdevelopment

A short view of some theories relating underdevelopment to international phenomena may provide a perspective to the conceptualization of the suggested model. The emergence of a 'neo-Marxist' school of development theory, typified for many by Andre Gunder Frank, constitutes a paradigm change (in the Kuhnian sense) in the field of development studies. To summarize, the new

paradigm stresses the interconnectedness of development and underdevelopment. The concepts of dependence and domination are in the center of analysing the totality or wholeness of the phenomenon. It sees many conflicts or disharmony of interests in the development process, both between nations and between social classes within underdeveloped countries.

For Frank, underdevelopment "was and still is generated by the very same historical process which also generated economic development: the development of capitalism itself".¹ As opposed to the generally accepted thesis in the economic development literature that development in the underdeveloped countries follows from the greatest degree of contact with the diffusion from the metropolitan developed countries, Frank hypothesizes that underdeveloped countries "experience their greatest economic development and especially their most classically capitalist industrial development if and when their ties to their metropolis are weakest"². In support of this hypothesis, he uses historical experience of several Latin American countries. On the same logic he hypothesizes that the regions which are the most underdeveloped and feudal-seeming today are the ones which had the closest ties to the metropolies in the past. He has examples for this from the West Indies, Latin American countries and regions. Frank has yet to develop a theory of economic development, however. From his writings Frank emerges simply as another economist arguing for big industries, high-technology, high rates of growth etc. which are the characteristics of any developed economy which can be considered rather indicative of the problem of underdevelopment itself.

Dependency theorist Cello Furtado views underdevelopment as a state of factor imbalance reflecting a lack of adjustment between the availability of factors and the technology of their use, so that it is impossible to achieve full utilization of both capital and labour simultaneously.³ He believes that a suitable orientation of the capital formation process is a prerequisite of achieving internal and external stability of an underdeveloped economy. However, it can be argued that the orientation of types of product being produced, supplied and demanded or preferred in the society, and the technological as well as organizational methods employed are more important than the process of capital formation or the capital itself.

The neo-Marxist approaches to under development are largely found in the literature on imperialism. In this literature, Johan Galtung's Structural Theory of Imperialism has had a remarkable influence on neo-Marxist thinking in the 1970s.⁴

1. Frank, A. G. *The Development of Underdevelopment* (Monthly Review Inc. 1966), p.9
2. Ibid., p. 10
3. Furtado, Cello, *Development and Underdevelopment* (Berkeley, Univ. of California Press; 1971)
4. Galtung, Johan, 'A Structural Theory of Imperialism' in *Journal of Peace Research*, Vol. 8, 1971, pp. 81-117

Galtung's structural theory of imperialism inherits the most criticized⁵ static nature of his model from two premises- the gap in living condition (LCgap) and harmony of interests between the center in center nation and the center in periphery nation. The harmony of interests (imperialism) requires, by definition, a decreasing LC gap between center of the center nation (C_c) and center of the periphery nation (C_p). The problem is that the decreasing LC gap between C_c and C_p does not explain the transition of stages of imperialism in his theory. The model presented below can be considered an alternative to Galtung's Structural Theory of Imperialism.

3. Technology and Underdevelopment

Some historians who have studied the facts, without being imprisoned in a theoretical framework for understanding historical processes of change, have indeed recognized the obvious and simple fact of the central importance of scientific and technological change in the process of economic development⁶. How this permissive factor interacts with institutional and ideological change in a sort of chain-reaction to generate a total process of change is still little understood. However, what comes out of historical analysis is that although there may be some degree of universality about technological knowledge- as indeed there must be because of the common inheritance of scientific and technological knowledge - the institutional and ideological counterparts are much more specific to the cultural traits and social structure of the given countries and civilizations.

It is fairly accurate to say that an increasing awareness of the 'importance' of science and technology in achieving national objectives began to appear, at least in some less-developed countries, from the early 1960s. Due to the nature of this awareness as well as to the continued interests of the developed countries in the less-developed, concern of the policy-makers and research communities of the both sides has been directed mainly to the *transfer* of science and technology from the developed to the less-developed. Apparently the underlying assumption in this endeavor is that science and technology in the developed

5. This criticism first came from Bentheim G. Van Den Bergh. See 'Theory or Taxonomy'? Some critical notes on Johan Galtung's A structural theory of imperialism', in *Journal of Peace Research* Vol. 9, 1972, pp. 77 - 85.

6. See Kuznets Simon, 'Modern economic growth: findings and reflections,' in *American Economic Review*, Vol 63, No.3, June 1973. Kuznets writes: 'A country's economic growth may be defined as long-term rise in capacity to supply increasingly diverse economic goods to its population, this growing capacity based on advancing technology and the institutional and ideological elements that it demands. All the components of the definition are important'. p. 247.

countries constitute the prime propellant to societal objectives anywhere in the world. Thus, the United Nations Conference on the Application of Science and Technology for the Benefit of Underdeveloped Areas, for example, produced hundreds of papers evidencing this line of thought. As Charles Cooper says⁷:

Until quite recently there was very little analysis of the *role* of science and technology in the underdeveloped countries.....By and large the prescriptions were based on the most superficial kind of diagnosis if indeed there was any at all.

In 1971 a group of researchers originated a comparative research effort to identify and assess the different *instruments* available for *implementing* science and technology policies in the industrial sectors of underdeveloped countries.⁸ There is also a proposed study by a group of reserchers from Northwestern University to study the factors affecting the *utilization* of technological *innovation* in underdeveloped countries.⁹ Similarly, the other known work on this subject either lack comprehensiveness in approach or rigour in analysis as will be shown later in this section.

There are serious dangers of continuing an outward-looking approach to science and technology in less-developed countries, i.e.a continued stress upon technology *transfer*. Unless the whole approach to science and technology is balanced in the near future by incorporating an inward-looking approach, i.e. re-assessment of societal objectives, capabilities and resources; the consequences of an unbalanced approach may be costly. The fastly increasing attention to technology transfer is clearly manifest in the interests of many of the international conferences. The Sixth Pacific Trade and Development Conference 1974 took the transfer of technology as the theme of the conference.¹⁰ Technology transfer was a major item at the third session of United Nations Conference on Trade and Development (UNCTAD) 1972 at which the widely known Resolution 39(III) Transfer of Technology¹¹ was passed, and an Intergovernmental Group on the Transfer of Technology was established to implement Resolution 74(X)¹².

7. Cooper, Charles, 'Science policy and technological change in underdeveloped economies' in *World Development*, Vol. 2, No.3, March 1974, pp. 55 - 64.
8. The study group is known as 'The Science and Technology Policy Instruments (STPI) Project' with a field coordinating office in Lima, Peru.
9. See 'The Science and Technology Policy Instruments (STPI) Project' an introductory paper prepared by the comparative research group studying the ways and means of implementing science and technology polices in the industrial sectors in underdeveloped countries, Office of the Field Coordinator, Lima, Peru, May 1974.
10. The Sixth Pacific Trade and Development Conference was held in Mexico city from 15 to 20 July 1974. For papers and proceedings, See *Technology Transfer in Pacific Economic Development*, Kiyoshi Kojima & M.S. Wionczek (eds), Tokyo : The Japan Economic Research Center, 1975.
11. See *Report of the Working Group III (TD/164)*, UNCTAD.
12. See *Official Records of the Trade and Development Board*, Eleventh Session, document TD/B/365 UNCTAD. Resolution 74(X) identifies UNCTAD's functions that are to be performed on a continuing basis.

Resolution 39(III) requires working towards the attainment of two objectives, which might often be in conflict. On the one hand a large-scale transfer from the vast fund of technological knowledge in the developed market economy and planned economy countries to the less-developed countries is *necessary* for accelerating the *rate of economic growth* of the latter and for a rapid improvement of their social structures through eradication of mass poverty, illiteracy and inequality. On the other hand, it requires to ensure that the technology receiving less-developed countries are not overburdened with such unbearable costs that their external balance of payments would become severely strained; with such restrictive conditions in transfer agreements that their potential for exporting manufactured products would not be developed; or with such technology as is not suited to their own factor endowment at present and to the requirements for growth over the years to come. It has been estimated that the direct costs of the transfer (covering only two of the six headings under which such costs need to be measured), amounted for all the less-developed countries to some \$ 1,500 million in or around 1968.¹³ These costs were equal to 5% of the exports of the developing countries (excluding the major oil exporting ones), two-fifth of their debt-servicing costs and some 56% of the flow of direct private foreign investment (including reinvested earnings). This study also showed that the foreign exchange costs of the transfer of technology were increasing much more rapidly than other sectors of the economies of the developing countries. The direct costs of the transfer have, in general, increased about two and one half times faster than manufacturing output in the developing countries. The annual growth rate was in the neighbourhood of 20 per cent. At this rate these costs may rise some six times in a decade - or, say from \$ 1,500 million at the end of 1960s to about \$ 9,000 million by the end of the 1970s. All these signal nothing but the timeliness for a comprehensive view or a new philosophy of development in less-developed countries of which technology transfer is only one aspect.

4. The Model: (A) Basic concepts and initial conceptualization

The principal problem in poor countries is to generate a process of progressive improvement of productive power of the economy through sectoral re-arrangement of the economy, through appropriate scientific and technological changes and such changes in the institutional and ideological framework as are consistent with this process. The principal instrument for the purpose has to be a science and technology strategy and an institutional and ideological strategy that can sustain a cumulative, self-reinforcing process of resource creation and allocation. Such processes are prevented by the existing patterns of external relations of the poor country.

13. For details, see *Transfer of Technology*, A Report by the UNCTAD Secretariat (TD/106) and *Transfer of Technology : An UNCTAD View* in *Journal of World Trade and Law* No . 2, pp. 252 - 68.

International relations are viewed in this model as a structure characterized by a *semi-feudal relationship*¹⁴ between two sectors in the world - an *advanced sector* and a *semi-feudal sector*.* The advanced sector is characterised by its high capacity to produce, as well as its extensive and intensive application of, advanced science and technology. The semi-feudal sector is identified by the lack of inventions and innovations and, therefore, by the lack of advanced sector characteristics. The two sectors are thus separated by a science and technology gap.

The advanced sector (AD) of the world is controlled and directed by actors referred here as *Lords* (i.e. decision makers in advanced countries). The semi-feudal sector (SF) is constituted of two *sections* - *backward* section and *forward* section. Both of these sections are looked after by actors referred here as *compradors* (i.e. so-called decision makers in poor countries). The backward section is the larger section; it produces less-processed products; it is dominated by export oriented items; it uses the labour intensive methods out of the available techniques of production; and is the least informed of the world of knowledge. The forward section includes the comprador and his organizational machinery, the educated, and a value-system oriented toward the advanced sector; it produces mostly domestic consumer oriented final products; employs foreign technology; it has a market which is fragmented and largely monopolized and backward linkages are predominantly foreign and forward linkages are domestic and foreign.

There are four types of basic interests which the two sectors strive to maximize: (1) defence interests (2) economic interests (3) external order interests - the maintenance of a favourable configuration of interests in the external environment, and (4) ideological interests - the protection and furtherance of a set of values which one believes to be universally good.¹⁵

The semi-feudal relationship between sectors AD and SF is brought about by the sector-characteristics which determine the most efficient and effective methods of maximizing the satisfaction of basic interests of each sector. Since the sector-characteristics are different, the best method of inter-sector relationship to one sector is not necessarily the best method to the other sector. There

* Value-laden terminology is preferred here in order to preserve the Flavour of Semi-feudalism.

14. The principal features of semi-feudalism in Indian agriculture are explained by Amit Bhaduri, 'A Study in Agricultural Backwardness under Semi-feudalism', *The Economic Journal*, March 1973. Some aspects of the relationship between landlord and peasant in the semi-feudal agriculture, as Bhaduri explains and as they prevail in the agricultural sector of Sri Lanka, are adapted to suit the conceptualization of semi-feudal relationship in the theory.

15. Four types of national interests are discussed by D.E. Nuechterlein in his article 'National interests and foreign Policy' in *British Journal of International Studies*, Vol 2, 1976, pp.246-66. His third type of interest, 'world order interests' is different from my definition of 'external order interests'.

fore the maximization of satisfaction of interests by one sector invariably results in less than maximization of interests satisfaction in the other sector. There are two methods which will maximize the satisfaction of basic interests of sector AD in its relationship with sector SF, (the semi-feudal relationship):

- (a) Semi-colonization method, and
- (b) Semi-feudal method

The semi-colonization method can be explained in terms of the function of its instruments - capital, technology, organization and methods, and societal values of sector AD - in the process of disarticulation of structural characteristics of sector SF in favor of the satisfaction of demands that emanate from the maximization efforts in sector AD. In other words, the semi-colonization method is the element of *domination* in the semi-feudal relationship.

The semi-feudal method has three prominent features. They are derived from the rules which prevailed in the semi-feudal society. In the semi-feudal agriculture, the harvest was shared between the landlord and the peasant in a proportion determined by the former. The landlord determined the proportion due to peasant in estimating the subsistence requirements of the peasant labour. This enabled the landlord to keep a continuous and stable supply of labour at his hand. Alternatively, if the peasant was allowed to receive a surplus he might subsequently become independent of the landlord which made his labour supply unstable. It was in the interest of the landlord to tighten the grips over the peasant by making the latter dependent upon him. The dependency of the peasant on the landlord increased as the former turned to the latter to obtain seasonal loans to meet additional needs. High rates of interest charged on debt enabled further the landlord to maintain the dependency relationship. The landlord did not introduce new technology into the production system which would increase the output share of the peasant, to the degree that he could become independent. Thus, technological change, if any, under semi-feudalism tended to favour the landlord rather than the peasant. Based on these rules of behaviour, it is suggested that there are three prominent features of the modern international relations between sectors AD and SF, which can be called the relations of a semi-feudal method:

- (i) total interests generated in the semi-feudal sector are shared between the two sectors as determined by the advanced sector,
- (ii) permanent under-satisfaction of interests of the semi-feudal sector,
- (iii) the advanced sector imposes a service charge on the semi-feudal sector for the use of interests supplied by the former to the latter, and for the former's ownership rights to the interests in the latter.

In other words the semi-feudal method is the element of *exploitation* in the semifeudal relationship.

Under the assumption of monopoly behaviour by sector AD, the *Lord* of the advanced sector performs the function of the selection and direction of the methods of maximization of basic interests of the sector, and therefore, is the one who determines internal and external behavior of the sector. It is the function of the comprador to carry out those methods-to act or behave accordingly.

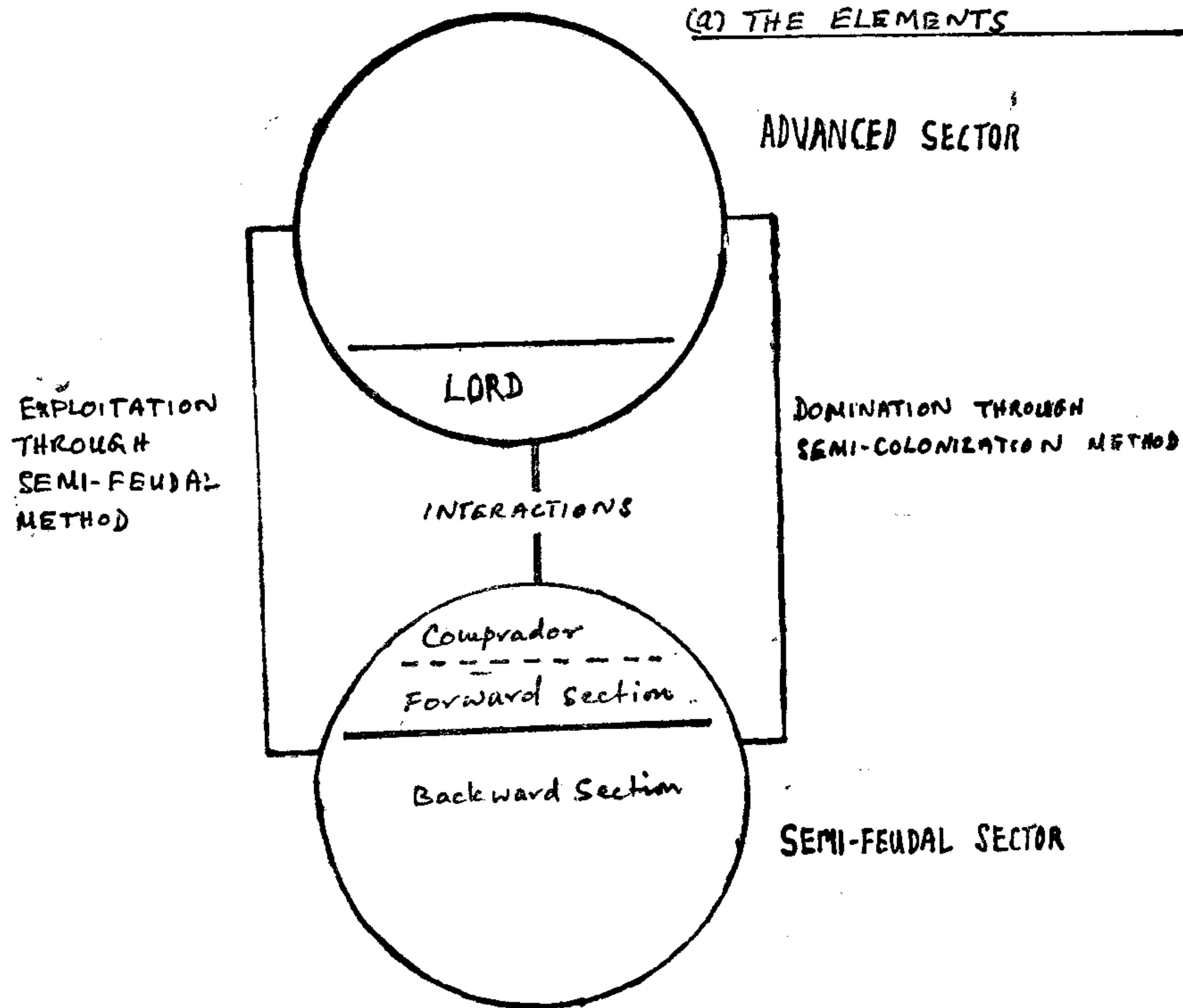
The relationship between decision-makers in the advanced sector and those of the semi-feudal sector is similar to that between the landlord and the peasant described above. However, a distinction has to be made between the positions and roles of the agricultural peasant and comprador of the SF sector. The distinction emanates from the fact that the comprador is only representative of the actual peasants (and labour) in sector SF in relation to sector AD. In other words, there exists a lord-peasant relationship between the comprador and the labour within the context of sector SF. The monopoly power of sector AD over SF requires that the comprador does exactly what the lord in AD wishes. Under such conditions, comprador's function can be called a **positive derivative** of the lord's function.

The performance of a function which is entirely a positive derivative entails no freedom of choice. However, if the semi-feudal relationship is not strong enough to impose a positive derivative function in its entirety on the comprador, the comprador will use the lever to perform a function that of the lord. In other words, the positive derivative function contributes to the appearance of harmony of interests in lord-comprador interactions, and the lever to perform a non-derivative function may contribute to disharmony of interests in lord-comprador interactions.

The power of sector AD over SF enables the former to dominate the rational behaviour of the latter. Under domination, the advanced sector imposes its rational behaviour on the other sector. Pure rationality, in the present context, is defined as the maximization or optimization of interests under a given set of constraints in a particular environment. The advanced sector operates under pure rationality and this rationality - conditioned by that sector's constraints - is imposed on the semi-feudal sector, and therefore, it becomes **derived rationality** in the semi-feudal sector. The essential characteristic of the derived rationality is that its set of constraints is external to the semi-feudal sector; and there is a difference of constraints between the two sectors because they are two different environments. Since the criterion of maximization or optimization of interests is universal, domination takes place in fact through the imposition of one set of constraints on the other. The derived rationality could be seen now as representing a basic difference between capitalism and underdevelopment. These fundamental concepts and their relations are depicted in Figure 1.

Imperialism and Underdevelopment in a Semifeudalistic Perspective: A Model for Analysis

FIG 1. IMPERIALISM AS A STRUCTURE
OF SEMI-FEUDAL RELATIONSHIPS
(a) THE ELEMENTS



(b) THE RELATIONS

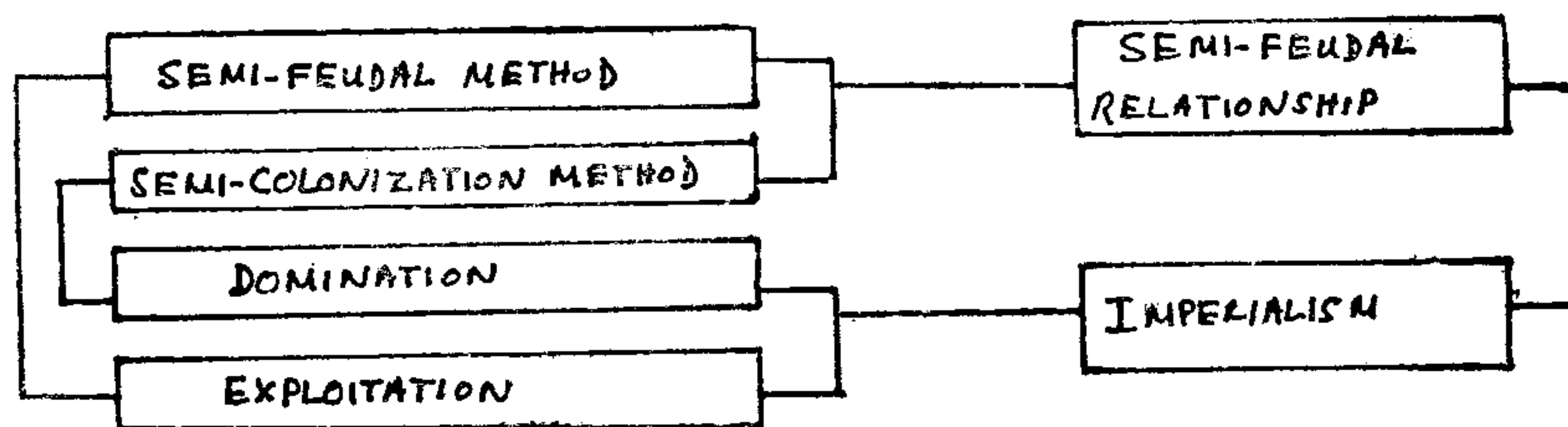
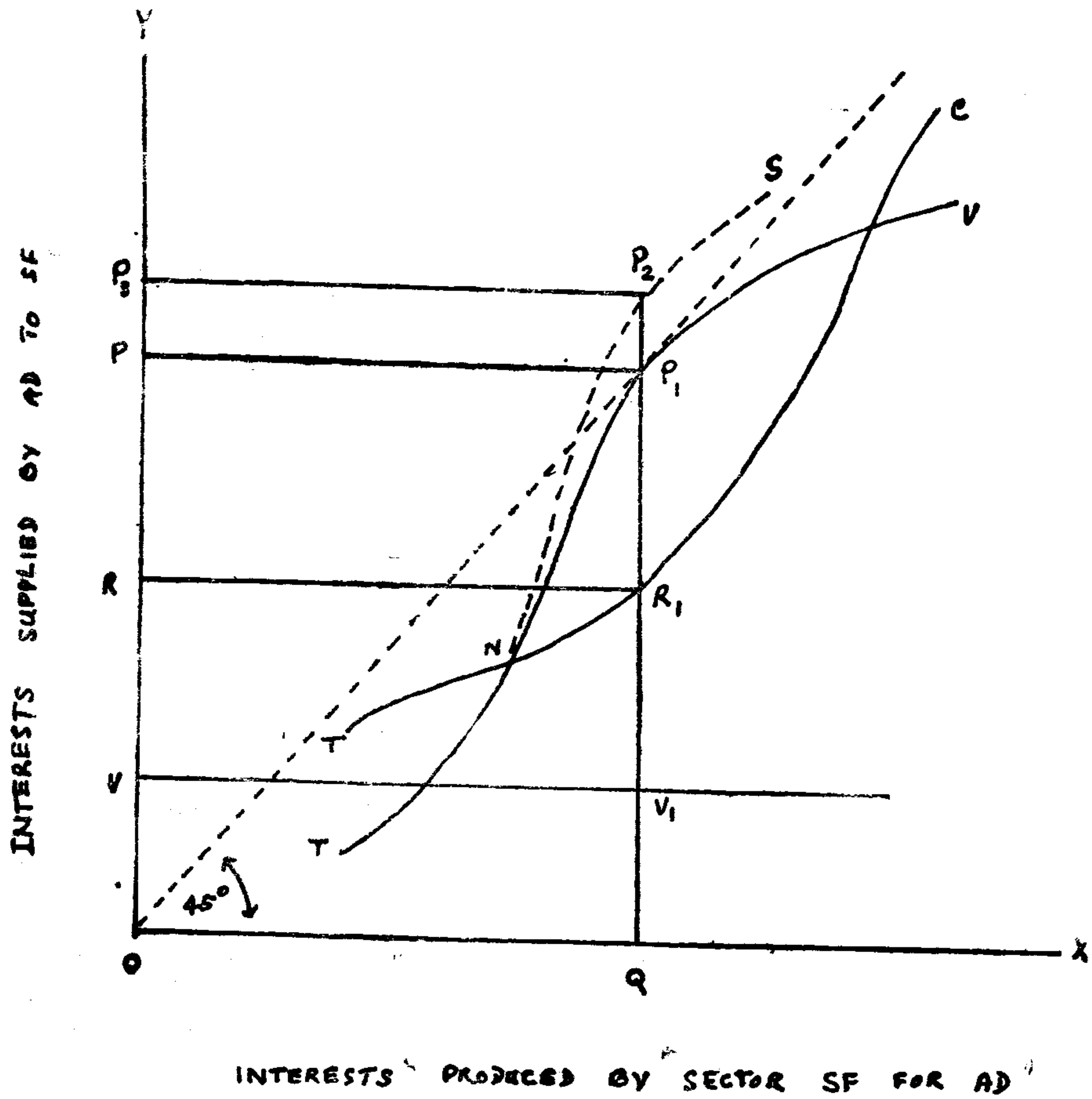


Fig. 2: MODEL "A" - THE SEMI-FEUDAL RELATIONSHIP



(B) The Semi-feudal Relationship

Based on the fundamental elements of the semi-feudal relationship between landlord and peasant, the following model considers the relationships of production or generation of interests (i.e. security, economic, external order, and ideological) and supply of and demand for these interests within and between the two sectors. (See Figure 2) The model is constructed on the following assumptions:

- a. the ratio of interest sharing between the two sectors is given and fixed,
- b. the semi-feudal sector is assumed to have a minimum necessary satisfaction requirement - a subsistence level of interests. The satisfaction requirement at this level provides the basis for determining the share of interests of the semi-feudal sector,
- c. the model shows the situation at the beginning period (t_0) which means the establishment of the semi-feudal relationship goes back to period $t-1$,
- d. at period t_0 the capacity of the semi-feudal sector to repay service charges on the claims held by the advanced sector in the semi-feudal sector is nil, which means the discharge of service charge obligations leads to the accumulation of claims of the advanced sector, and
- e. individuals can reveal their preferences and demand for various basic interests, but to differing degrees of course. And, for simplicity, the two sections of the semi-feudal sector- backward and forward are not differentiated in the model here.

The total value curve TV represents the value of different amounts of interests produced in the semi-feudal sector measured in terms of the interests of the advanced sector at a particular point in time. For example, OQ amount of interest produced in the semi-feudal sector is equal to the value of OP amount of advanced sector interests. Therefore, OP is the maximum value of interests receivable by the semi-feudal sector in exchange of OQ amount of its interests.

TC, the total cost curve represents the value of interests of sector AD that would be actually supplied by sector AD in exchange of sector SF interests. For example, for OQ amount of interests, AD is ready to exchange only OR which is the minimum level of satisfaction for survival of sector SF. Sector AD which operates with monopoly powers determines how much of interests must be produced in sector SF in terms of marginal cost and marginal receipts.

If sector AD behaves rationally to maximize its surplus from the exchange process it must produce OQ amount of interests in sector SF.¹⁶ The exploitation in this mode equals RR_1P_1P . This amount of exploitation can also be attained by either one, or combination, of the following:

- i. Allow the value of OQ to be OP, the real value, but raise the face value of OR upto OP, or
- ii. Bring down the face value of OQ from OP to OR.

The second mode of exploitation takes place in the form of service charges on sector AD claims in sector SF. Curve NS represents the level of service charges payable at the level of total interests OQ and total claims OV. At the level of total interests OQ the total service charge payable equals $PP_1P_2P_s$ and, since this is a 'charge', it would be simply deducted from OR, the amount of interests supplied by sector AD. Since such a step would push down the level of satisfaction below survival it may cause additional AD claims to occur in sector SF.

An important question that remains open for explanation is how the semi-feudal relationship continues. The following mathematical models attempt to provide some explanations to this question.

Additional assumptions:

1. The introduction of advanced technology in sector SF raises production of total interests in that sector.
2. From sector AD point of view, the backward section in sector SF uses optimum techniques of production of interests. Therefore, new technology is directed to the forward section.

16. The following calculation proves this:

If x is the amount of interests sacrificed by sector SF and if Y is the value of that interest, in terms of sector AD interests,

$$Y = f(x)$$

then the average value of x is $Y \div x = f(x) \div x$, and the marginal value of x is $dY/dx = df(x)/dx$. Thus average value is a maximum when

$$\frac{d(Y/x)}{dx} = \left\{ \frac{dY}{dx} - \frac{Y}{x} \right\} \frac{1}{x} = 0$$

which means that dY/dx must equal Y/x when the average value is a maximum. Since dY/dx is the marginal product and Y/x is the average product, this proves that when the average value is a maximum, the average value equals the marginal value. The point of maximum average value in TS curve is the tangent to a straight line from the origin 0. Conversely, the lowest average cost is found where curve TC is tangent to a line from the origin. The difference between the highest average value and the lowest average cost equals maximum exploitation.

3. Introduction of new technology increases total claims of AD in section SF.
4. The rate of payment for services charged by sector AD is fixed.
5. When the total share of interests of sector SF rises above the minimum requirement level, total interests owned by sector AD in SF declines, because sector SF acquires or pays back for the claims, or the significance of the claims declines because the surplus of interests creates new claims in the sector owned by the sector itself.
6. The unit of time in the model is the calendar year.

Notations:

I = total interests generated by sector SF per period in terms of real value
(= OQP_1P , fig. 2)

C = Survival requirements of sector SF as supplied by sector AD
(= OQR_1R , fig. 2)

c = sector SF balance of interests, after payment for services
(= $OQR_1R - PP_1P_2P_s$, fig. 2)

E = sector AD share of sector SF total interests plus payment for its services. i.e. total exploitation (= $RR_1P_1P + PP_1P_2P_s$, fig. 2)

α = sector SF proportional share of its total interests $0 < \alpha < 1$
(OQR_1R / OQP_1P , fig. 2)

s = the rate of sector SF payment for sector AD's services (= PP_s/OV , fig. 2)

V = value of the total obligations held by sector AD in sector SF, and payable or dischargeable by sector SF.

Since the semi-feudal sector has to pay for services, its balance of interests in period t_1 is less than the minimum requirement level:

$$c_1 = \alpha I - sV \quad (1)$$

$$E_1 = (1 - \alpha) I + sV \quad (2)$$

Since SF has now to depend on sector AD to reach minimum requirement level c , in which case sector AD raises its claims in the former

$$\Delta V_1 = C - c_1 = sV \quad (3)$$

If, at period n ,

$$\alpha I = s(V + \Delta V_n) \quad (4)$$

then, $c = 0$, which means that the whole of sector SF share of interest at period n is paid back to sector AD by way of repayment of service charges, which means sector SF's total dependence on sector AD for survival requirements. The minimum condition required to hold if sector SF is to become independent, by liquidating all claims held by sector AD and thus eliminating one corner stone of exploitation, in the long-run:

$$\lambda = \frac{sV_1(1+s)^{n-1} + C}{\alpha I} \quad (5)$$

where λ is the lowest growth factor in total interests that will allow sector SF to break free eventually, for conditions outlined above. Therefore, continued perpetual semi-feudal relationship even after the adoption of new technology requires that,

$$\lambda > \bar{\lambda} \quad (6)$$

where $\bar{\lambda}$ is the actual net growth factor associated with the technological improvement being considered for adoption by sector AD is SF. From the above it follows that:

1. the semi-feudal relationship allows the adoption of new technology as the increase in total interests will not threaten the semi-feudal relationship and
2. the greater the value of n (i.e. the more longstanding the total claims) the higher is the value of λ (i.e. the greater is the sector AD's freedom with regard to the adoption of new technology). This simple deduction is of crucial significance to the whole argument for what in effect it states is that given the advanced sector's freedom to choose the **timing**, virtually **any** output raising technology can be adopted without violating the required condition(6).

(C) The semi-feudal relationship and the science and technology gap:

Having provided an explanation to the continuation of the semi-feudal relationship even under persistent adoption of new technology, we may concern ourselves with the science and technology gap between the two sectors. For this purpose we shall postulate several different adjustment processes and examine their implications.

For the purpose of this model, assumptions 1,2 & 3 of part (B) of the model above are retained and assumptions 4 to 6 relaxed.

Notations:

A = system of science and technology in producing total interests in the advanced sector

F = system of science and technology in producing total interests in the semi-feudal sector

L = difference between the two systems of science and technology (i.e. A & F)

x = variables relating to the semi-feudal relationship between sectors AD and SF

I = gross investment in sector AD

g = adjustment coefficient for sector SF, $0 < g < 1$

λ = change factor, sector AD, $0 < \lambda < 1$

Subscripts refer to time periods.

The science and technology gap between sectors AD and SF can be stated in a simple model as

$$A_t - F_t = A_t - A_t - L_t \quad (1)$$

and

$$L_t = f(x_{1t}, x_{2t}, x_{3t}, \dots, x_{nt}) \quad (2)$$

which means that the lag must be explained in terms of x - for example, type and level of education and communications, international movement of inputs, patent rights, external military presence.

A more sophisticated view of the stock of technology is that it is a consequence of investment and that the effect of each investment decreases exponentially in time.¹⁷ We may write this as

$$A_t = \beta (I_t + \lambda I_{t-1} + \lambda^2 I_{t-2} + \dots) \quad (3)$$

the science and technology gap in this case will be

$$A_t - F_t = \beta (I_t + \lambda I_{t-1} + \lambda^2 I_{t-2} + \dots + \lambda^{L-1} I_{t-L+1}) + (\lambda^{L-1}) F_t \quad (4)$$

It follows, then, that the gap will be the greater the higher the levels of recent investment in A, and will be smaller as the level of science and technology in F becomes higher. (This conclusion has some empirical support from the research and development (R&D) investment behavior under private capitalism. However, further thoughts are needed here to speculate what would be the effects of decreasing exploitation on the growth of science and technology in the advanced sector).

We may consider a model which allows for persistent but only partially successful efforts to close the technological gap:

$$A_t - F_t = \beta I_t + (\lambda - g) A_{t-1} + (g-1) F_{t-1} \quad (5)$$

The gap depends on current investment (positively) and the level of science and technology in AD during the preceding period and the degree of adjustment of SF's level of technology. The role of g in the model is very similar to that of the lag L in the simple model(1), because the determinants of g are the same as those of L . The lag, or the gap, should decline if SF as a whole learns faster from AD than AD learns from its investment acts which partly depend on semi-feudal exploitation:

$$\lambda < g \quad \text{or} \quad \bar{\lambda} = \lambda \quad \text{seems impossible to take place.}$$

Therefore, the way to liquidate dependency grips by the poor country seems to lie in the understanding of this crisis phenomenon and the development of alternative technological strategy which can be implemented when and where a freedom of choice exists, how little it may be.

5. Conclusion

The global market place is not a capitalist free-market for the nation state "entrepreneur". The majority of nation states, large and small, is not free to produce and sell what it can. It has no freedom of choice as a consumer or supplier. This is because, the relations among nation states, i.e. the rules of the global market place, are semi-feudalistic than capitalistic. Under capitalism, at least theoretically, everyone is free to grow. Even this theoretical freedom does not exist under conditions of semifeudalism. Only a few, the landlords, enjoy that freedom and the freedom of the rest, the peasants, is determined by the landlords. In the global market place, there are a few countries which are like landlords, and the rest are like peasants. Every individual as well as every nation state is interested in its own security, economic needs, opportunity for growth, and ideological freedom. As in semi-feudal agriculture, these interests of the majority of poor (peasant) countries are determined and constrained by rich (lord) countries.

The semi-feudal relationship between rich and poor countries does not allow the latter countries to produce a surplus of their interests: (a) ability to defend self (b) ability to upgrade economic quality of life. (c) external harmony and opportunity for growth, and (d) promotion of own ideology and value systems. The continuation of semi-feudal relationship increases the dependence of poor countries on the rich countries. Any progressive change in the level of interests of poor country is determined by the type of technological change introduced in that country by the rich ones. The criterion of introducing technological change and its timing is the maximum exploitation of interests subject to stability in the dependency relationship. Thus, the rationality of technological change is governed by the dependency structure. Therefore, expectations about bridging the technological gap while the dependency-relationship exists seem unrealistic.