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STRATEGY OF FOREIGN TRADE UNDER PLANNED ECONOMIC DEVELOPMENT—WITH SPECIAL REFERENCE TO CHINA'S EXPERIENCE*

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I. *Introduction*

This paper aims at investigating in terms of efficiency the choice of commodity patterns of export and import trade in an economy under planned economic development. By efficiency, the writer means in this paper simply what is consistent with an assumed objective of the planners; namely maximization of the level and the growth rate of national income. With the criterion thus set forth, it is easily seen that the problem of the choice under question necessarily involves the dimension of time, and it is inseparably related to the problem of choice of industries in the domestic aspect. In the discussions thus far made of the economic growth of the socialist countries, the domestic and international aspects seem to have been dealt with independently and in isolation, at least in the analytical side.¹ Therefore this paper may be said to represent the writer's humble attempt to combine these two aspects in an empirical as well as an analytical framework.

On the other hand, it may be mentioned that, while the paper mainly deals with the problem of the socialist economies with special reference to Mainland China, not a few aspects of the discussion would be relevant to the same problem in some of the present day developing countries such as India. Therefore, when they are found to be useful for better understanding of the main topic, the writer occasionally refers to the Indian experience.

II. *Basic Facts*

First, let me describe briefly what have been (and will be) main features of the commodity patterns of the export and import trade of Mainland China during her planning period; what have been (and will be) the corresponding patterns of industrial growth, and what seem to be some of the significant phenomena related to the above. Though these are questions mainly of statistical observations, the task is necessarily related to interpretation of the economic

* The writer wishes to thank Professor Leon Hollerman for correction of English in the original draft of this paper.

¹ In this respect, the writer has in mind particularly Evsey Domar, *Essays in the Theory of Economic Growth*, Oxford Univ. Press, N. Y., 1957, Ch. 9 (A Soviet Model of Growth) and Maurice Dobb, *An Essay on Economic Growth and Planning*, Routledge & Kegan Paul, London, 1960, both of which discussed the problem under the assumption of a closed system. In the field of foreign trade, a series of articles published by Franklyn Holzman on the terms of trade of socialist countries, and Frederic L. Pryor, *The Communist Foreign Trade System*, M. I. T. Press, 1963 are to be mentioned.

policy of the government and this must also be summarized to the extent that it is crucially involved in determining such patterns.

Before doing so, however, a word about the foreign trade statistics used is in order. Since the published statistics about foreign trade are scanty and the statistical examination of our own is yet to be completed, we shall rely in the following upon the statistics compiled or estimated by the United Nations as far as mainland China's foreign trade and its structure by commodities and areas of destination are concerned.² But one has to be very careful about these figures, since, on the one hand, they are expressed in foreign prices,³ and on the other hand, they involve errors of a degree which, through seemingly relatively small, is not negligible. The latter is caused first by a specific procedure of the U. N. compilation to include North Korea, North Vietnam and Mongolia, all in Mainland China⁴ and second by the fact that China's exports and imports as listed are simply the accumulated totals of the amounts of import and export trade with China of all of China's trade partners, thus the adjustment problem of freight and insurance is left behind. We assume, however, that they can be used as crude indexes of the foreign trade behavior of Mainland China itself.

Now, with these reservations in mind, the following observations could be made:

1. As is suggested in Table 1, covering two benchmark-years: 1955 and 1959, the commodity pattern of import is characterised by a dominant and yet still increasing weight of machinery and equipment, secondly by intermediate goods and fuels. Food and consumers' goods are relatively insignificant. On the other hand, the commodity pattern of exports is marked by the predominance of food and agricultural raw materials, but the weight of manufactured consumers' goods is increasing.⁵ While these patterns are quite similar to those of the Soviet Union during her first Five Year Plan period,⁶ they also resemble fairly closely the Indian pattern as added to column (3), Table 1, with the difference that the weight of food imports is considerable in the latter.
2. The fact that the weight of the machinery and equipment imports is dominant and increasing seems to correspond to a high and increasing level of fixed capital investment in these years; but a closer look will make it clear that this is accompanied by another significant trend where the ratio of the imported machinery and equipment to their total demand in the economy is declining, as seen in Table 2. The same table also indicates that this declining ratio is not limited to machinery and equipment; it is even more marked in the field of intermediate goods such as steel products. These observations will again induce us to pay

² Foreign trade statistics as published by Mainland China's government are limited to the annual series of combined total export and import trade until 1958, and even separate export and import figures are not revealed. Cf. State Statistical Bureau, *Ten Great Years*, Peking, 1959, p. 155.

³ This is not because the figures in UN statistics are expressed in US dollars. If it only meant that, we could easily derive the figures in domestic prices by using exchange rates. However, this problem is involved even in the officially published foreign trade statistics of Mainland China, which are evidently expressed in foreign prices.

⁴ Upon the writer's check by using 1958 data, Mainland China seems to occupy about 90% of the total value as listed in UN statistics under the name of Mainland China.

⁵ For the observations in this part, the official statistics of commodity structure in a different classification method as published in *Ten Great Years*, p. 156 is used as supplementary information.

⁶ Franklyn D. Holzman, "Foreign Trade", in A. Bergson and S. Kuznets (ed.), *Economic Trends in the Soviet Union*, Harvard Univ. Press, 1963, pp. 292 and 296. This article represents a most exhaustive work on the foreign trade structure and its changes in the Soviet Union during the plan period.

TABLE 1. COMMODITY STRUCTURE OF WORLD'S TRADE WITH MAINLAND CHINA
(Unit: %)

	(1) World exports to China		(2) World imports from China		(3) India (1959)	
	1955	1959	1955	1959	Import	Export
1. Food, beverage and tobacco [0·1]	4.4	2.5	33.4	27.6	17.7	33.8
2. Crude materials exc. fuels and oils and fats [2·4]	11.3	13.4	43.7	31.8	11.2	21.5
3. Mineral fuels and related materials [3]	6.7	7.3	.8	.6	8.9	1.3
4. Chemicals [5]	8.0	7.5	1.7	2.1	9.6	.8
5. Machinery and transport equipment [7]	44.0	45.0	.8	1.2	30.0	.4
6. Other manufactured goods [6·8]	24.4	23.6	19.0	34.1	22.2	40.8
7. Total [0~9]	100.0	100.0	100.0	100.0	100.0	100.0

Sources: UN; *Monthly Bulletin of Statistics*, March 1961; UN, *Yearbook of International Trade Statistics 1960*, N. Y., 1962.

Note: (i) Figures in [] show the first digit code number of SITC; (ii) In the figures of India's import, that part of import of agricultural products which is paid by the Government account is excluded.

TABLE 2. RATIOS OF IMPORT DEPENDENCY OF SELECTED PRODUCERS' GOODS

	1952	1953	1954	1955	1956	1957	1958	1959
Total machinery and equipment	50 ¹⁾					40 ²⁾	22 ³⁾	15 ⁴⁾
Forging equipment		<i>31.6</i>	<i>27.7</i>	<i>26.9</i>	<i>28.1</i>			
Metal-cutting machine		<i>35.8</i>	<i>40.8</i>	<i>29.1</i>	<i>24.1</i>			
Transformer		<i>19.4</i>	<i>28.2</i>	<i>25.9</i>	<i>15.2</i>			
Steel product ⁴⁾		54.8	41	35	17.5	11.9		
		<i>36.4</i>	<i>28.8</i>	<i>24.7</i>	<i>14.2</i>	(14) ²⁾		
Steel pipe ⁴⁾		14.8	14.1	3.7	1.97	1.22		
Non-ferrous metal		<i>38.2</i>	<i>34.2</i>	<i>11.9</i>	<i>8.2</i>			
Caustic soda		<i>19.6</i>	<i>11.2</i>		<i>0.7</i>			
Soda ash		<i>10.2</i>						
Refined oil product			49		56			

Notes: Figures in *italics* denote that they are computed within the categories of goods under the "State Unified Distribution" scheme. With regard to the "unified distribution" scheme, refer to the text (Sect. 3).

Sources: For the figures not documented, Material Room of *T'ung-chi Kung-tso*, "Summarized Situation about the Annual Distribution of Commodities under 'State Unified Distribution'", *T'ung-chi kung-tso*, 1957, No. 13. 1) Fang Mu-han, "Enforce the Technical Reform of the National Economy", *Chi-hua yü T'ung-chi*, 1960, No. 2, p. 7. 2) State Statistical Bureau, "Communique on the Results of the First Five Year Plan", *Ibid.*, 1959, No. 7, p. 6. 3) Chao Er-lu, "Machine-Making Industry for the Past Ten Years", *Hsin-hua Pan-yüeh-kan*, 1959, No. 19, p. 38. 4) Chin Fu-hsiang, "Positively Adopt Measures to Solve the Problem of Shortage in Kinds of Steel Products" *Chi-hua Ching-chi*, 1957, No. 9, p. 16.

attention to the priority pattern of investment allocation among the domestic production sectors. As was described and partly estimated in previous work,⁷ this priority pattern is characterised by an extremely high value set forth upon the allocation coefficient of investment in the investment goods sector—a value which seems even higher than that in the Soviet Union in the pre-war plan period. Such correspondence among commodity patterns of import, the ratio of import dependency of investment goods and the priority pattern of investment allocation can also be seen in the Soviet Union in the pre-war plan era,⁸ and, though in much lesser degree, in India as well.⁹ On the other hand, the changing relative importance of agricultural products and manufactured consumers' goods in total export may possibly be regarded as corresponding to the small allocation of investment in agriculture, and this consideration may be further strengthened by the fact that, since 1961, Mainland China began importing a considerable amount of food grains; even though there are admittedly many other factors involved in that event.

3. As is seen from Fig. 1, exports and imports were each less than 1 billion US dollars (in foreign prices) in 1950; but they increased at the average annual rates of growth of 11.5% (export) and 8.4% (import) to a level of over 2 billion US dollars in 1959, after which, however, the amount declined sharply. The reasons behind this decline seem to be multi-sided, but most experts will agree that a major one is the general economic retardation caused by agricultural calamities in this period. Therefore, in this paper which is concerned with policy matters in normal situations, we may possibly ignore this period, and we already did so when choosing the bench-mark years in Table 1. However, even excepting this abnormal period, it is still difficult to answer an interesting question in this paragraph: what are the proportions and their changes in the relation of export and import to the national income? This is mainly due to the non-availability of export and import figures expressed in terms of domestic prices. What may be said in this respect is limited simply to the fact that the proportion of the foreign trade total to the national income may be larger than 10%, as computed from the official figures of these two variables.¹⁰ On the other hand, as one might have noticed, the difference of exports and imports is relatively small in these years. This corresponds in the financing aspect of foreign trade to the fact that the amount of long-term credit and loans China has obtained from abroad was small. It was limited in fact to those obtained from the Soviet Union totalling only 430 million US dollars, received between 1950

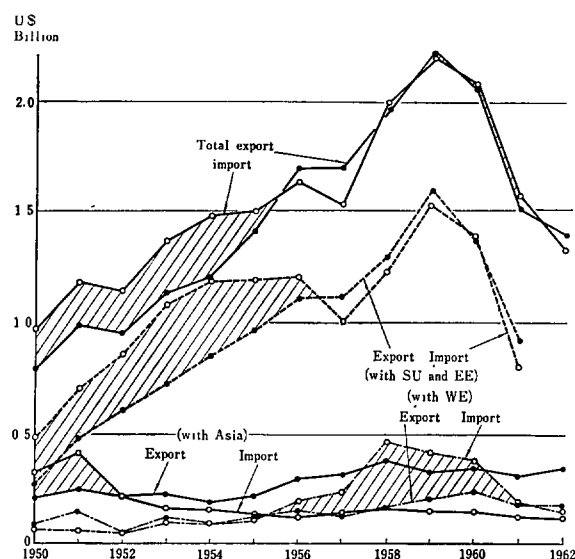
⁷ Preliminary findings are published in Ishikawa, "Capital Accumulation in Mainland China", in Sze-sepanik (ed.), *Symposium on Economic and Social Problems of the Far East* Hong Kong Univ. Press, 1962, Tables 1 to 5. A more detailed study will be published soon in Part 2 of Ishikawa (ed.), *National Income and Capital Formation*, Institute of Asian Economic Affairs, Tokyo.

⁸ Holzman *op. cit.*, especially the table in p. 299 for the import dependency ratio. With respect to the investment allocation, Cf. Norman Kaplan, "Capital Formation and Allocation", in A. Bergson (ed.), *Soviet Economic Growth*, Row, Peterson & Co., 1953.

⁹ With respect to the priority of investment allocation placed on heavy industry, see P. C. Mahalanobis, "Draft Recommendations for the Formulation of the Second Five Year Plan 1956-1961", in Government of India, *Papers Relating to the Formulation of the Second Five Year Plan*, New Delhi, 1955. The decline in the ratio of import dependency does not seem to be marked, though the ratio of imported machinery to the total fixed investment is recorded as declined from 24.0% in the first Five Year Plan period to 18.2% in the second Five Year Plan period (and 18.3% projected for the 3 FYP). Government of India, *The Third Five Year Plan*, Delhi, 1961, pp. 32, 59 and 112.

¹⁰ As for the official national income figures, Cf. Ishikawa (ed.), *National Income etc.* The reason for this contention lies in Table 4 and the related discussions.

FIG. 1. MAINLAND CHINA'S EXPORTS AND IMPORTS



Source: UN, *Statistical Yearbook, 1960 and 1961*.

Notes: (i) The limitation of the original figures in this table is described in the text. (ii) SU, EE and WE denote the Soviet Union, Eastern Europe and Western Europe, respectively.

and 1954.¹¹ This contrasts to the fact that the foreign economic aid extended to India amounted to 410 million US dollars during the IFYP period, 3.1 billion during the 2FYP period, and 6.76 billion (including the amount of the remaining years the Indian Government expects to obtain during the 3FYP period).¹²

4. The policy line that the government of Mainland China has invariably pursued in connection with foreign trade could perhaps be most conveniently summarized by referring to the term: "an integral industrial structure", which was first used by the Prime Minister in 1956 as indicating the fundamental objective to be attained by the end of the 3FYP period.¹³ By "integral industrial structure" is probably meant a structure in which the country is self-sufficient in all the important commodities. In order to attain this aim sooner, all the branches of metallurgical as well as machine-making industries should be given first priority. This requires the capital goods of a highly *round-about* nature be placed in the priority columns of the import commodity list. Export is considered as crucial only to the extent that they are required to earn foreign exchange to pay for such imports. It could be said that the identical policy line has long been pursued by the Soviet Union, and only recently going to be changed to the extent that the "Socialist division of labor" has become a subject

¹¹ Other than this, there are other forms of aid from the Soviet Union, which, together with that mentioned above, amount to 1,340 million US dollars. But the latter are either not economic in nature, or are, though economic in nature, not to be used for import financing.

¹² *The Third Five Year Plan*, pp. 107-112. The figures are inclusive of aid under P.L. 480.

¹³ Chou En-lai, "Report on the Recommendation on the Second Five Year Plan of National Economic Development", *Hsin-hua Pan-yueh-kan*, 1956, No. 20, pp. 39-40.

of active discussion and enforced on a partial basis among the CMEA countries.¹⁴ In India as well, we are surprised to find that a quite similar idea of policy is popular in economic planning.¹⁵

Having summarized above some of the basic facts, the practical significance of our problem seems to have now become clarified. This is first to ask the question: Whether a policy is efficient or not that places the first priority of imports on capital goods, especially of a more *round-about* nature, in order simply to accelerate the speedier development of the domestic capital goods sector than the other production sectors, so that the ratio of import dependency of capital goods requirement may possibly decline as soon as possible? For the sake of convenience, let us name this policy as that of "reducing the import dependency ratio sooner", though we must be careful not to be misled by the impression spuriously given by the name, since this policy has many facets static and dynamic, domestic and external.

III. Constraints of Inelastic Foreign Demand for Exportable Goods

For an attempt to answer the above question, it seems convenient to start with a familiar theoretical model of planned economic growth developed by Fel'dman and Domar.¹⁶ This model clarified in an elegantly simple formula a possibility that, under a closed system without foreign trade, the larger allocation of a given investible resource to the investment-goods sector (as represented by a higher value of coefficient) yields in a longer-run the higher growth of national income as well as national consumption (*Mathematical Appendix 1*). Though different assumptions, even within the domain of the closed system, yield different conclusions, this model has come to be regarded as a model reflecting a most important aspect of the growth mechanism of the socialist economies, perhaps mainly because it has been strengthened by a result of independent empirical research showing that the higher rate of growth corresponds in fact to the higher coefficient of investment allocation.¹⁷

Among the assumptions of the model that are crucial to this conclusion it may be well to mention that of the complete elasticity of labor supplies, or the complete flexibility of wage rates; and it should be noted in this regard that the conclusion of Fel'dman=Domar Model is in actuality applicable only to the extent that the wage rate can be changeable without hindering

¹⁴ Pryor, *op. cit.*

¹⁵ A most explicit expression of this idea is found in Prof. Mahalanobis's works. Especially relevant to the present context is his famous hypothesis to the effect that it is better to import fertilizer than to import food grains; better to import machinery required to set up a fertilizer factory than to import fertilizer; better to import the machinery required to set up a heavy machine building factory than to import the machinery just to set up a fertilizer factory. P. C. Mahalanobis, *Talks on Planning*, Indian Statistical Institute, Calcutta, 1961, pp. 73-74. A theoretical verification of this case is given as an implication in K. N. Raj and A. K. Sen, "Alternative Patterns of Growth under Conditions of Stagnant Export Earnings", *Oxford Economic Papers*, Vol. 13, No. 1, Feb. 1961.

¹⁶ Domar, *op. cit.* As is known, Fel'dman=Domar Model is one refined and developed by Prof. Domar on the basis of an article published in 1928 by G. A. Fel'dman, a Soviet economist in the Gosplan. A similar Model is independently formulated by Prof. C. P. Mahalanobis in "Some Observation on the Process of Growth of National Income", *Sankhya* 12(4), 1953.

¹⁷ The first study of this kind was made by Prof. Kaplan in *op. cit.* as a comparative study of the investment allocation ratio between U. S. and the Soviet Union. See further the writer's "Capital Accumulation etc." *op. cit.*

the elastic supplies of labor. The assumption that the technical form adopted and, with it, productivity of labor are fixed and constant seems also too rigid. These reservations should be kept in mind since we use this model as the base structure of the following discussion.

Fel'dman=Domar Model Extended

However, the most important change required for the analysis of this paper is to make this system open to external trade in such a way that at least a crucial role in the immediate future of imported investment goods may be realistically reflected in the model. How, in this case, will the implications of Fel'dman=Domar Model have to be modified? Upon examination, it becomes clear that the answer depends upon further specific assumptions as regards the conditions of export and import trade.

In the first place, we assume that the structure of costs and prices in the domestic and foreign economies are similar—an assumption which we shall fundamentally adhere to until we come to the examination from the viewpoint of Comparative Advantage Doctrine in the next section. Throughout this section also, it is assumed that exports of the economy in question consist solely of the consumers' goods and imports of investment goods. This assumption might seem to be too extreme to be realistic; but it seems to reflect precisely a planners' ideal with respect to foreign trade and, at the same time, it is convenient for analysis, since the choice problem of the commodity structure of exports and imports will be reduced by it simply to that of the magnitude of such exports and imports.

The most simple case conceivable under these assumptions is the one where exports and imports can take place in perfect elasticity, though exports and imports should strike balance. A theoretical examination indicates that the above-mentioned implication of Fel'dman=Domar Model is nullified in this case, since here the value of γ coefficient has no unique correlation with the long-term growth rate, though a higher γ will make speedier the decline of imports; major determinant of growth will instead be identical, as is usually the case, with the ratio of savings to national income (*M. A. 2*).

On the other hand, however, it should be noted that the implications of Fel'dman=Domar Model evidently revive when the additional assumptions of the above case are modified as far as that of the completely elastic export is concerned, and instead a new assumption of limitational foreign demand for exportable goods of this country is introduced. Among the specific cases of such limitational foreign demand, the most extreme case may be one where the foreign demand for the exportable goods is fixed and constant over time; the next conceivable is the case where the growth rate of foreign demand is fixed and constant. In these cases, the larger value of γ leads to the higher growth rate as in the original Fel'dman=Domar Model, but, more important to notice here, it also results in the smaller and, in many cases, more rapidly declining ratio of import dependency of investment goods. (*M. A. 3*). Perhaps a more realistic case of the limitational foreign demand is where exports can be increased at will, though it is subject to the counteracting tendency that the export price declines in response to it. In this case, the causal relationship will become a little bit more complicated, but the unique relation as seen above among the γ coefficient, the growth rate (here, the level as well) of national income and the ratio of import dependency seems to remain fundamentally effective (*M. A. 4*).

Empirical Testing of Constraints

As a practical implication of the above analysis, it will become clear that the problem of

whether or not the policy of "decreasing the ratio of import dependency sooner" is efficient, may depend upon whether or not the actual conditions of foreign demand for the exportable goods are limitational. While this is a problem of empirical determination of such scope as cannot successfully be dealt with in this paper, the observations which have recently been gaining force in discussions of the same topic with regard to under-developed countries as a whole,¹⁸ seem to be generally applicable in China's case as well.

First, as a very general observation which abstracts from geo-political factors involved in a particular way in each area of destination, Table 3 seems to indicate that the area of

TABLE 3. THE RATES OF GROWTH OF WORLD IMPORTS AND WORLD IMPORTS FROM MAINLAND CHINA

Index level in 1959 (1955=100)

	(1) Total world imports	(2) World imports from MC	(3) Proportion of world imports from MC to total world import (1959) %	(4) Proportion of the EE and SU imports from MC to world imports from MC (1959) %
1. All commodities				
World total	123.5	152.8	1.9	100.0
EE and SU	158.3	161.5	13.3	71.4
2. Food & beverage				
World total	116.6	126.3	2.8	100.0
EE and SU	134.3	128.1	19.8	60.8
3. Crude materials (exc. fuel)				
World total	108.3	111.3	3.7	100.0
EE and SU	130.9	117.4	22.0	78.2
4. Chemicals				
World total	140.6	191.7	0.5	100.0
EE and SU	200.0	203.3	4.8	56.5
5. The other manufactured goods				
World total	127.3	274.1	2.4	100.0
EE and SU	230.7	294.7	17.7	60.8

Source: UN, *Monthly Bulletin of Statistics*, March 1961.

Note: MC, EE and SU denote Mainland China, Eastern Europe and Soviet Union, respectively.

¹⁸ Among the literature in this regard, UN, *Toward a New Trade Policy for Development, Report by the Secretary of the United Nations Conference on Trade and Development*, E/CONF. 46/3, Feb. 1963 is well known. Also important is that discussion on the Bellagio Conference, Sept. 1963 and a related paper by Prof. Shigeto Tsuru, "Conditions to Promote Trade with Under-developed Countries", *Keizai Kenkyu*, 15(2), April 1964. These are persuasive about the fact that the "limitational" foreign demand is not simply a phenomenon of price changes, but also ones that exist in various forms of quantitative import restrictions, differential tariff rates, domestic indirect taxes, etc. It may also be noted that recent empirical analysis made by U. N. on the problems of industrialization and import substitutions in underdeveloped countries are done from the standpoint of considering this limitational demand as taken for granted. UN *World Economic Survey* 1963, (Part 1) and UN(ECAFE), *Economic Survey of Asia and the Far East in 1963*, (Part 1).

destination to which the rate of growth of China's exports is higher than that of the same area's imports from the total world, are characterised by the fact that the share of the same area's imports from China to their total imports is very small; and in the East European markets where the share of import from China to the total is considerable, the rates of increase in import both from China and the total world are relatively closer. Behind such behavior are of course working the price elements. And with respect to trade with East European markets in which China's share is considerable, there is likely to have been price discrimination that are generally unfavorable to China's products—a phenomenon which has recently become a subject of active empirical studies among Western experts of Mainland China.¹⁹ As regards trade with Western markets, systematic study on the terms of trade has not yet started, but it is suggestive to notice that in the course of an active export campaign in 1958, Chinese textile products had to be sold in Southeast Asian markets at a price level that was generally 10%~15% lower than for comparable Japanese products.²⁰

Apart from such economic considerations, there are politically determined trade barriers of various kinds, which are too well known to dwell upon. And taking into consideration the Sino-Soviet dispute since 1956, trade with Eastern Europe may not be an exception to these additional constraints. However, it may not be appropriate to direct one's attention too much to these political aspects, since the argument for limitational foreign demand may perhaps hold simply on the basis of the economic observations as described above.²¹ And it

¹⁹ The study is first attempted by Mr. Yoshio Akeno, stimulated by Mendershausen's well known article in the *Review of Economics and Statistics*, May 1959, Cf. Akeno, "Terms of Trade of China and Underdeveloped Countries in Relation to their Trade with the Soviet Union", *ECAFE Bulletin*, No. 257, March 1, 1961. Recently more comprehensive research is done by Prof. Fen-hwa Mah in his *Communist China's Foreign Trade: Price Structure and Behavior 1955-1959*, the RAND Corporation (RM-3825-RC), Oct. 1963. Kang Chao and Feng-hwa Mah, "A study on the Rouble-Yuan Exchange Rate", *The China Quarterly*, Jan.-Mar. 1964 seems in part a study along a similar line, though attention here is focussed on the "discriminating" exchange rate.

²⁰ "The Survey Report on Southeast Asian Market by the Team of All Japan Cotton Spinners' Association", *Nippon Boseki Geppo*, 1958, No. 18, pp. 2-23.

²¹ It is interesting to note in this regard that Prof. Holzman mentioned three possible factors responsible for a peculiar trend in Soviet foreign trade after 1931, as is shown in the chart. (One may notice that the pattern of the movement of trade figures looks very much like that of Mainland China as shown in Fig. 1. This, however, does not necessarily imply a resemblance of the reasons as well, and as was indicated before, China's case may better be explained by the general economic setback since 1960) They are (i) Soviet fear of conflict with the West that led her toward autarkic direction; (ii) the huge producers' goods imports plus large domestic investment in basic plant and equipment of the 1928-1932 period made her much more independent of other countries than before; (iii) the terms of trade with the West became extremely unfavorable to her. Holzman, *op. cit.*, pp. 304-305. If one follows Holzman in regarding the first factor as less important than the others, the rising and declining phases of Soviet foreign trade in this chart must be fairly directly explained by our models. But whether or not this extreme foreign trade performance will be repeated in China as a result of her policy of "reducing the import-dependency ratio sooner", is a problem further to be studied, and some of our thinking about it will be described in Section 4.

FOREIGN TRADE OF THE
SOVIET UNION (1913-1940)
billion Rs. at 1950
exchange rate



Source: Ministerstvo Vneshnei Torgovli SSSR, *Vneshniaia Torgovlia SSSR za 1918-1940 gg.*, Moscow, 1960, p. 14.

should be emphasized that, even if such observations are regarded in economic term as indeterminate as a judgement of past experiences, it is quite possible that the planners are suspicious about the future economic possibility of limitational foreign demand. The policy of "reducing the ratio of import dependency sooner" can not be considered as entirely inefficient, even when the limitational foreign demand does exist only in the planners' suspicion.

Indian and Chinese Cases Considered

While the above discussion may be enough under the present assumptions to answer the question about the efficiency of the policy of "decreasing the ratio of import dependency sooner", it seems worthwhile to supplement it by additional examination of what may be called the Indian and the Chinese Cases. These two cases may be considered as representing additional efforts paid by the planners further to reduce the unfavorable effects of the restricting export and hence, import conditions.

As one of such additional efforts, the Indian case seems to emphasize receiving a considerable amount of foreign economic aid. As a matter of fact, India has succeeded in obtaining such aid and its amount occupies as was suggested earlier a major share of the international flow of current economic assistance. In the analytical dimension, however, if the amount of foreign aid is exogenously given, the case does not add much to the previous findings. An interesting case is where the amount of aid is a function of the receiving country's extra effort for it. If we assume it, the results are not only that the larger effort will yield the larger level, and the higher growth rate of national income; they are also that, by raising at the same time the γ coefficient, the ratio of import dependency is likely to decline more rapidly and the condition is likely to be created sooner whereby the requirement for aid is reduced and repayment becomes possible (*M. A. 5*). While this can be considered as a variant of the previous cases, it is in fact a policy idea that is clearly identified in the Indian planning.²² However, this policy is successful only when an increase in foreign aid receivable is possible by an extra effort, and this may not usually be the case.

While Mainland China might have also conceived the Indian Case as a remedy of her difficulty, it does not seem to have been in use; and the Chinese Case may be better represented by an extra effort of placing a greater emphasis on the choice of those technical form of fixed capital investment which is much more labor-intensive and at the same time with much less import-content than before. This was in fact practiced since the end of 1957 up until about 1961 under the policy known as the "small-enterprise method".²³ A main reason for the discontinuance of this policy may perhaps lie in the fact that a huge expenditure of budgetary subsidies was involved for compensating losses of these small enterprises though it might have succeeded in raising the level of national income at least temporarily.

In analytical terms, this is related more directly to the problem of choice of techniques under the condition of variable productivity and inflexible wages of labor which we assumed away in the beginning of this section following the original Fel'dman=Domar Model; and the

²² Compare Indian long-term plan of export, import and external assistance (as well as their past trends) as described in *the Third Five Year Plan*, pp. 107, 133-4 and 29, with M(4) of App. Fig. 2.

²³ It should be noted that the "small-enterprise method" was characterised by its application to the capital goods production as well as the consumers' goods production, as is contrasted to the Indian policy of protecting the small-scale and cottage industry which belongs mostly to the consumers' goods sector. Cf. Ishikawa, "Choice of Techniques in Mainland China", *The Developing Economies*, Preliminary Issue No. 2, Sept.-Dec. 1962.

Chinese Case may be considered as representing one where one of the worst choices in this framework is made from the growth point of view.²⁴ However, what will be the result if the small-enterprise method is enforced in a more moderate way?²⁵ It seems quite possible that the rate of growth of the economy will increase and the rate of import dependency will decrease than otherwise. But, if it is realistic in this context to assume that there is a distinct category of capital goods for which technique is high and fixed and which constitutes a major part of imports at the initial period, it is quite likely that the above policy will not contribute to reduce the import dependency ratio of this particular type of capital goods sooner, and even the gain of national income accrued by choosing lower techniques will become much smaller than expected if the time-period is taken in the long-run [cf. *M. A. 6*].

IV. *Viewing in Terms of Comparative Advantage Doctrine*

In the above examination of the efficiency of the policy of "reducing the import dependency ratio sooner", we have deliberately left aside the point of view of Comparative Advantage Doctrine by assuming that the structures of costs and prices in the domestic and foreign economies are similar. The reader might have wondered whether this policy would not entail a great loss to the economy, or at any rate, an abandonment of a benefit that could have been obtained by choosing a lower γ coefficient and importing a larger amount of capital goods for a longer period in exchange for a larger amount of consumer goods exported; this loss might be great enough to counterbalance the possible gain obtained by the above policy internally. Behind this question is of course the notion that, in developing countries such as Mainland China, capital goods are most probably subject to comparative disadvantage, while consumers' goods and agricultural products enjoy comparative advantage—a notion perhaps further enhanced by commonsense influenced by the theory of factor proportions.

However, we have to emphasize that the relevance of the Comparative Advantage Doctrine may be much more restricted than usually thought of under the circumstances where the chance of increasing exports of goods enjoying comparative advantage is limited by an inelastic foreign demand, and hence, that of increasing imports of goods subject to comparative disadvantage, too. And an assumption that this is in fact the case was the main reason why it was thought in the above discussion that the viewpoint of the Comparative Advantage Doctrine could be left aside without serious harm. In the absence of these circumstances, a universal applicability of the doctrine and especially its dynamic version (but excepting its variant, the Heckscher-Ohlin theorem) could not be doubted; and there is even evidence that the Chinese planners seem to consider it in a similar way.²⁶ Therefore it is now in order to take the viewpoint of the Comparative Advantage Doctrine and to examine to what extent our evaluation of the said policy requires revision.

Pattern of Static Comparative Advantage

As a first step of this task, we have to observe empirically the pattern of China's com-

²⁴ The most clearcut analysis of this aspect is given by Dobb. *op. cit.*, Chaps. III and IV. See also Ishikawa, *op. cit.*

²⁵ i. e., to the extent that the wage rate can be correspondingly reduced.

parative advantage *vis-à-vis* the world as a whole. Since, however, relevant data are not directly available, we utilize as a starting point a comprehensive estimate done by Dr. T. Mizoguchi about the comparative price structure of Mainland China and Japan. Table 4

TABLE 4. COMPARATIVE CHINESE AND JAPANESE PRICE LEVEL AND ITS CHANGE

	(1)		(2)
	Comparative Chinese price level with respect to Japan (expressed as ratio to the Japanese price, when the latter is converted to <i>yuan</i> by the exchange rate)		Ratio of change in comparative Chinese price level with respect to Japan (expressed as 1957 index, when the level of 1951 is taken as 100)
	1951	1957	
1. Textile materials	.52	1.01	193
2. Fuels (coal)	.94	.79	74
3. Metal and its products	4.06	2.24	55
4. Building material	1.44	1.23	86
5. Chemical products	1.38	2.41	174
6. Miscellaneous producers' goods	1.22	2.63	216
7. Agricultural products for food	.53	.54	102
8. The other food	1.05	1.17	111
9. Textile products	2.20	3.35	152
10. Miscellaneous ordinary consumers' goods	2.07	1.96	94
11. Miscellaneous durable consumers' goods	4.06	2.24	55

Source and remarks: Toshiyuki Mizoguchi, "Comparison of Chinese and Japanese Prices", in Part III of Ishikawa (ed.), *National Income etc.*. The figures are estimated by using the wholesale price data in Tokyo (compiled by the Bank of Japan) and in Shanghai (compiled by Shanghai Economic Institute of Accademia Sinica, *Collected Prices Materials Before and After the Liberation of Shanghai, 1921-1957*, Shanghai People's Publishing Co., 1958 <hereafter abbreviated *Collected Shanghai Prices*>).

Note: The exchange rate used is ¥ 1=0.06836 yuan.

shows a recomputed version of one of his findings, and as is easily seen, these figures reflect the possible pattern of China's comparative advantage to the world, provided that (i) Japanese wholesale prices can be regarded as representing world prices; (ii) there are no differentials of cost-price ratios among commodities; and (iii) the relative prices of machinery and equipment, the data of which are lacking in this table, are similar to those of, say metal and its products. For, in this case, each figure in column (1) represents $\frac{P(d)}{P(f) \cdot x}$ (where P

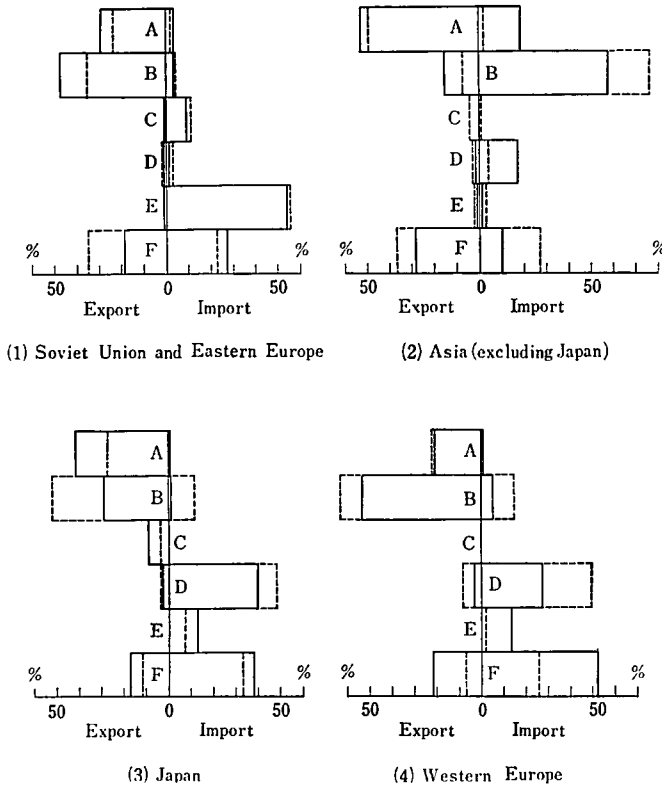
²⁶ While the recent discussions of the "foreign trade profitability" and the calculations of the "export profitability coefficient" in CMEA (Council of Mutual Economic Assistance) countries are considered in this respect to obtain at least partially the benefit accruing from comparative advantage (Pryor *op. cit.*, Ch. IV) Mainland China is reported to have sent a delegate and presented her own proposal for the calculation method of the "export profitability coefficient" in a CMEA conference held in Nov. 1957 (Tao Yü-ssu, Brief Description on the Conference on the Problem of National Economic Institute in Czechoslovakia, *Ching-chi Yen-chiu*, 1958, No. 2). Unfortunately his proposal is in the source only briefly stated: to derive the "profitability coefficient" of export trade by calculating the domestic value of exportable goods on the basis of wages and the average "accumulation" ratio and by comparing the value accruing by exports.

denotes the wholesale price, suffixes d and f denote the domestic and foreign prices respectively and x denotes the foreign exchange rate expressed in domestic currency), and the ratio p_{ij} of any two set of figures in the same column:

$$p_{ij} = \frac{P_i(d)}{P_i(f) \cdot x} \bigg/ \frac{P_j(d)}{P_j(f) \cdot x} \quad \text{where } i=j=1, 2, \dots, 11 \text{ but } i \neq j,$$

can be considered as an index of comparative advantage for these two goods. Profitable trade will of course take place between the goods i 's (as exports) and j 's (as import) for which

FIG. 2. COMMODITY STRUCTURE OF CHINA'S EXPORT AND IMPORT BY AREA OF DESTINATION (1955 and 1959)



Notes: (i) In the diagram, commodity structure of trade is measured in terms of percentage ratios of Commodity groups A, B, C, ... F; A represents "food, beverages and tobacco" (SITC Sections 0 and 1); B, "crude materials, excluding fuels, oils and fats" (2 and 4); C, "mineral fuels" (3); D, "chemicals" (5); E, "machinery and transport equipment" (7); D, "other manufactured goods" (6 and 8). (ii) In the diagram the area enclosed by the solid line represents the percentage ratio for 1955 and that by the dotted line for 1959 (in case of Japan, 1957 and 1963). (iii) The above percentage ratios are computed from the data given in UN, *Monthly Bulletin of Statistics*, March 1961 (for 1955) and March 1964 (for 1959) except with regard to Japan. As for Japan, MITI, Japanese Government, *Tsusho Hakusho* in 1960 and 1964 gives original figures. The commodity classification with respect to 1957 is crude.

P_{ij} 's are less than unity, neglecting the transporting costs; and the gain is larger in exchange of goods for which P_{ij} is the smaller.

A comprehensive examination of Table 4 along this line will suggest a probable pattern of China's comparative advantage in the static sense, and it will be found further by comparing it with China's commodity pattern of exports and imports as shown in Table 1 that the former corresponds remarkably with the latter. Thus for instance, between the largest export goods: crude materials excluding fuels, and the largest import goods: machinery, P_{ij} exhibits the smallest value of 0.128.²⁷ The only notable exception seems to be the textile products included in line 6 of Table 1, an explanation of which will be made later.

However, to what extent will this observation have to be modified when the three reservations described above are taken into account?

First, with respect to the representativeness of Japanese prices as world prices, the answer is necessarily complicated. However, we would like to note that, as is shown by Fig. 2, the commodity structure of China's trade with Japan is fairly similar to that with Western Europe, Eastern Europe and the world as a whole (the last is shown in Table 1);²⁸ and notably dissimilar only to that with Asia excluding Japan. It may be permissible from this to consider at least as an approximation that the price structure of Japan is relatively similar to that of other advanced areas.²⁹ While a different price pattern is imagined as regards Asia, its impact upon the overall picture of comparative prices is minor, since trade with this area is relatively small (Fig. 1).

Second, as regards the uniformity of cost-price differentials among commodities, our examination of China's situation suggests that, (i) there seems to be a fairly systematic bias of the said differentials as between agricultural products and capital goods in the direction where P_{ij} will become much smaller than in Table 4, if P is expressed in real cost, (ii) as between consumers' and capital goods, it is not likely that P_{ij} will become much larger than as shown above under the same change, though precise comparison is not possible due to the lack of relevant data and (iii) the value of overall P_{ij} expressed in cost term seems accordingly to be much different from the original P_{ij} and the probable direction of the difference seems to be on the smaller side, if it is permissible to assume that the cost-price differentials abroad are fairly uniform among commodities.

Whereas space does not permit a full description of the process of arriving at these findings, a few comments are necessary for those who are not familiar with the price formation procedure in Mainland China and especially those who are familiar with the Soviet procedure and consider that any attempt to discover the *real* cost relations among commodities is formidable for socialist countries.

1. China's procedure of price formation with respect to industrial products is formulated as:

$$\text{wholesale price of } TC (P_2) = \frac{\text{Factory delivery price of } PE (P_1)}{\text{price of } PE (P_1)} + \frac{\text{Circulation cost of } TC (C_2)}{\text{price of } PE (P_1)} + \frac{\text{Commercial Tax } (T_2)}{\text{price of } PE (P_1)} + \frac{\text{Profit of } TC (R_2)}{\text{price of } PE (P_1)}; \text{ where}$$

$$P_1 = \text{Factory Cost } (C_1) + \text{Industrial Taxes } (T_1) + \text{Profit } (R_1)$$

where TC denotes domestic trade companies and PE production enterprise. In this formula,

²⁷ Computed by taking textile materials and metals and metal products in Table 4 as representing these two categories respectively.

²⁸ With exceptions, particularly of the import of machinery; the reason, however, is the Western embargo.

²⁹ I am indebted to Prof. K. Kojima for such diagrammatic observation of comparative advantage position.

P_1 is in itself an effective final price in case producers' goods under "unified distribution" of the government are allocated directly to the users: TE . Part of the same category of producers' goods are allocated to TC at the same P_1 ; but only to be resold to the market at P_2 . Since the ratio of the producers' goods coming under this category has increased rapidly during the 1FYP period, the weighted effective price of producers' goods must have got closer to P_1 , rather than P_2 . In this regard, it should be noted that the price of producers' goods based in Table 4 is not P_1 , but solely P_2 .

2. In evaluating the actual price and cost structure according to the above formula, it

TABLE 5. PRICE-COST STRUCTURE OF SELECTED INTERMEDIATE GOODS, AND COMPARISONS WITH JAPANESE WHOLESALE PRICES

	Year quoted	(1) Mainland China						(2) Japan	
		Factory cost		Planned allocation price		Whole sale price of the state-trade company		Japanese whole sale prices	
		yuan	\$	yuan	\$	yuan	\$	yen	\$
1. Pig iron 1 met. ton	1957	75	30.4	152	61.8	220	88.4	32,417	90.1
2. Steel Sheet 1 met. ton	1957			1,350	54.9			68,889	191.0
3. Coal 1 met. ton	1957			12.7	5.2	32.6	13.5	7,000	19.4
4. Electricity 1000 KWH	1956	32.4	13.3	64.5	26.2			5,160	14.6
7. Lumber 1 m ³	1955	55.1	22.4	120	48.4	182.9	74.3	13,335	37.1
8. Cement 1 met. ton	1955			40	16.5	80.06	32.5	7,977	22.2

Sources and Remarks

Line 1: China—Ishikawa, "Choice of Techniques in Mainland China", *The Developing Economies*, Preliminary Issue No. 2, Sept.-Dec., 1962, p. 50. Japan—*Toyo-keizai Bukka Soran (Price Almanac of Oriental Economist)* 1958, simple average of pig iron for making steel and casting.

Line 2: China—Li Yung-hsing, "Measures of Unifying the Distribution and the Price Fixation of Imported Goods", *Chi-hua Ching-chi*, 1958, No. 4, p. 28. The listed price 1,350 yuan is the price at which the importer of steel sheet transferred to the Ministry of Domestic Trade. It was said to be fixed on the basis of domestic price level, independently of import cost; accordingly it may be better to consider it the planned allocation price. Japan—Same as in Line 1.

Line 3: China—Planned allocation price by Fang Jo-i, "A Second Discussion on the Policy of Prices of Heavy Industry's Products", *Ching-chi Yen-chiu*, 1957, No. 3, p. 65. This is the national average price and there are regional differentials, such as 13.3 yuan in Middle-South Region, 11.31 yuan in North-East Region and 13.2 yuan in North-West-Region. Whole sale price by *Collected Shanghai Prices*. Japan—Same as in Line 1; Simple average of non bituminous coal, bituminous coal, *Kyushu* coal, *Hokkaido* coal.

Line 4: China—Industrial Statistics Branch, SSB, *Present and Past of Our Country's Iron and Steel, Electricity, Coal, Machine-Making, Textile and Paper-Making Industries*, Statistics Publication Co., Peking, 1958; p. 73. Japan—Nippon Keizai Shimbun Co. (ed.), *Japanese Economic Yearbook 1952*, p. 178.

Line 5: China—Jen Jui-lin "A Study on the Problem of Current Lumber Prices" *Ts'ai-cheng*, 1956, No. 2 gives the national average of planned allocation prices. It also indicate that the average profit rate of the state-owned lumbering enterprises in 1955 was 98% and the turnover tax rate of lumber 10%. Wholesale price is represented by that of cedar long in Shanghai, taken from *Collected Shanghai Prices*. Japan—Same as in Line 1: average price of cedar logs of small and large sizes.

Line 6: China—In the same sources as in Line 5. Japan—Same as in Line 1.

should first be noted that, unlike in the Soviet Union, there has not been in Mainland China any systematic state subsidy to compensate for the negative differences between the price and cost of producers' goods, except for the case of "small-enterprise" policy as mentioned above and some others.

3. T_1 , R_1 , T_2 , R_2 are all evidently large relatively to P_1 and P_2 . A crude idea of these magnitudes may be obtained from Table 5, which indicates the resultant ratio of P_1/C_1 is around 200% and that of P_2/P_1 from 150% to 250%. Here two additional comments are in order. The first is rather technical: in China the proportion of R_1 to T_1 is almost equal, while in the Soviet Union T_1 is dominant. But a major part of R_1 in China seems to be playing the same function as T_1 . Second, while in the Soviet Union the weight of (T_1+R_1) in P_1 and that of (T_2+R_2) in P_2 are negligible in case of producers' goods but large in consumers' goods, there are evidences showing, though partially, that in China the weights are not much different between these two categories of goods.³⁰

4. As regards the cost-price structure of agricultural products, the formula of paragraph 1 can be applied when C_1 is read as price at farm yard and T_1 as agricultural tax, and it may be safely observed that in China P_1 is simple and unique and the difference between P_1 and P_2 is made minimum under a constant policy of stabilizing especially the prices of staple food. In the Soviet Union, P_1 is multiple depending upon the marketing channels and a large T_2 exists.

Finally on the third reservation with respect to the relative price of machineries. Though the data are scanty, the check of Table 6 which was constructed with the collaboration of some Japanese engineers, indicates rather surprisingly that the cost position (C_1) is likely to be not much inferior in China than in Japan. Of course, even with the identical P_1 , P_1/C_1 may be as large as was suggested in Table 5 as against about 65% that is generally considered as average ratio in Japan. Again, there must be many other items for which C_1 is significantly larger in China than that in Japan. However, it seems that the consideration of machinery costs will not require substantial revision of our findings in the above.³¹

Dynamic Elements of Comparative Advantage

Although we have examined a probable static pattern of China's comparative advantage and pointed out a fairly close correspondence of it to the commodity pattern of exports and imports, these are of course not enough to evaluate a policy of investment allocation with priority placed upon the investment goods sector. When the examination comes to this phase, however, it necessarily involves the dynamic aspect of the Comparative Advantage Doctrine,

³⁰ In China, the cheaper-price policy of producers' goods relative to consumers' goods that has long been enforced in the Soviet Union has been disliked, or, though existing in theory, relaxed in application. Turnover tax is not exempted in producers' goods, unlike in the Soviet Union. For the ratios of R_1/C_1 , it is even higher in the producers' goods sector than for the consumers' goods sector. Fan Jo-i, "Brief Discussion of Ratio of Profit to Capital and the Policy of Development with Quicker Tempo and More Economy", *Chih-hua Ching-chi*, 1958, No. 8, p. 22-23.

³¹ Though space does not permit me to dwell upon it, there is another approach to check upon the comparative advantage position. This is by use of the data, though fragmental, of the profit or loss account of the foreign trade companies resulting from the export and import business, and the results seem to be consistent generally with the above. However, this suggest the additional finding that the existing foreign exchange rate is an overvaluation of the yuan vis-à-vis currencies of Western countries, though it does not affect the P_i position as is evident from its definitional equation. About this, see a detailed examination in Ishikawa (ed.), *National Income etc.*, Chap 1.

TABLE 6. COMPARISON OF FACTORY COSTS OF SELECTED CATEGORIES OF MACHINES AND EQUIPMENT IN MAINLAND CHINA AND JAPAN
(Unit: Japanese ¥ 1,000)

	Pattern	Mainland China		Japan		
		Name of factory	Factory cost (yuan converted to yen)	Japanese Pattern similar to that of China, name of factory	Factory Cost	Sale Cost
Machine-Tools	Lathe S. 630 (300× 1,500 mm)	Sheng Yang First Machine-Tools Co.	834	Ikegai (520×1500 mm)		2,850
		Tung Fang Machine-Making Co.	1,954	Ohkuma (630×2000 mm)		4,200
		Chang An Machine-Making Co.*	2,028			
Transformer	1,000 KVA	Shanghai Electric Machine Co.	1,344	A Co.	1,240	1,450
		Sheng Yang Electric Machine Co.	1,542	B Co. Single Phase (3,000 V)	1,100	
		Chia Ling Watch Co.	2,588	Three Phase (60,000 V)	2,000	
	750 KVA	Shanghai Electric Machine Co.	1,140	A Co.	1,080	1,260
		Sheng Yang Electric Machine Co.	1,180	B Co.	910	1,700
		Chia Ling Watch Co.	2,080			
Mortor	JS 115 KW 4 Poles	Shanghai Electric Machine Co.*	302	A Co. Cage type Winding type	550 710	640 830
		Hsiang Tan Electric Machine Co.	365	B Co. Three Phase	450	600
	J-91, 100 KW 2 Poles	Chang Kiang Electric Machine Co.*	246	A Co. Cage type	620	720
		Sun Kiang Electric Machine Co.*	302	B Co. Three Phase	370	500
	A 051-4 4.5 KW	Shanghai Hsien Feng Electric Machine Co.	33	A Co. Cage type	26.7	31
		Sun Kiang Electric Machine Co. Chang Kiang Electric Machine Co.	44 46	B Co. Three Phase	50	67
Electric Power Equipment	Steam Turbin	Shanghai Steam Turbin Co.*	12,630	A Co.	51,700	60,000
		Sun Kiang Machine-Making Co.*	14,554	B Co.	10,000	15,200
	Electric Generator	Harbin Electric Machine Co.*	9,871	A Co.	34,400	40,000
		Chien Shou Machine-Making Co.	14,813	B Co.	8,000	12,000
Boiler	35 ton, 39 air pressure	Harbin Boiler Co.*	39,207	A Co.	129,000	150,000
		Shanghai Boiler Co.*	45,860			

Source: China's data is given in Chi-Chieh Kung-yeh, 1959, No. 19. The figures with * attached are those for 1959; those without are for 1958. The columns on Japan were added by collaboration of Mr. Takio Kanai and Mr. Ken Suzuki.

and it seems in order to note at least two elements which are crucial in determining the dynamic comparative advantage.

The first is the ease of learning, or the accessibility to, the advanced technique that seems to have been accelerated by recent technical innovation in a differential degree among sectors in favor generally of producers' goods. To describe this more generally, the form of the production function in the manufacturing sector could be thought of as shifting in the order of :

1. Technology $a: O=f(K, L_2, L_3, \dots, L_n, E_a, N)$
2. Technology $b: O=f(K, L_1, L_2, \dots, L_n, E_b, N)$
3. Technology $c: O=f(K, L_2, L_3, \dots, L_n, E_c, N)$

where O stands for output, K capital, L_i ($i=1, \dots, n$) labor with different qualities, E_i ($i=a, b, c$) entrepreneurship and N natural endowment. In this set of production functions, it is assumed that technology c is most advanced and a most backward, and L_1 represents labor with the highest quality, L_2 labor of next highest quality and so on. As is seen, the technological development from a to b requires not only transformation of E_a to E_b , but also a new factor L_1 , however, with the development from b to c , L_1 becomes no longer necessary, though the transformation of E_b to E_c is crucial. The elimination of L_1 is exemplified by the case where an automatic device installed in Anshan blast furnaces has replaced the specially skilled workers whose job was to inspect the change in the colour of burning iron ore and decide the exact time to take out the smelting pig iron. The transformation of E_b to E_c requires the advancement of technical ability, but, as far as the borrowing of techniques is concerned, it is said to be comparatively easy nowadays; and according to a Japanese technician who studied the techniques of Chinese industry, she seems to have attained the level of the designing technique where the copying of most of the advanced machines developed in foreign countries is not very difficult, though the material technique and the operation technique are relatively lagging behind.³²

In the case of agriculture, the forms of successive production functions seem to be similar to the above in various ways, but they differ evidently in that L consists mostly of unskilled labor. And though the importance of the shift of E may not be disputed here as well, technological advance seems to be relatively less easy and less rapid than in industry, since this involves necessarily a task of finding the optimal combination of factors among which natural elements are dominant. An example is a series of failures of Chinese attempts to introduce high-yielding Japanese varieties of rice in the regions around and north of the Yangtze River since 1956.

The second is the economy of large-scale production which is particularly marked in the case of capital goods production. Although China is a big country and is in a favorable position in obtaining this economy, there are still not a few lines of production which cannot be economically operated due to the smallness of market. An example is high-quality steel sheet which constitutes a bottleneck in China and which China imported in 1958 as large as half million tons. According to the Japanese experts, the minimum size of a strip mill is around one million tons a year and China's market is far from capable of economically maintaining this size.³³

³² Masumi Sato, "The Level of Techniques in China", in Ishikawa (ed.), *Long-term Projection of Chinese Economy*, The Institute of Asian Economic Research (in Japanese, forthcoming).

³³ I am indebted in this observation to Mr. Watabe of the Japan Iron and Steel Federation and Mr. M. Sato of MITI.

TABLE 7. EFFICIENCY COMPARISON OF TEXTILE AND STEEL PRODUCTION IN CHINA, INDIA AND JAPAN (1956)

(Unit: US \$, converted by exchange rates)

	China	India	Japan
A. Textile Industry			
1. Wages, yearly basis (per unit of total employees)	266 ¹⁾	314	318
the ratio of the number of the female employees to the total	70%	8.1% ²⁾	71.0%
2. Value productivity of labor (per unit of total employees)	4,691 ³⁾	1,303	3,533
3. Ratio of wage cost to the total value of production (total employees basis)	6.00%	24.10%	9.01%
4. Price of product at factory			
a. cotton yarn per pound	(.532) ⁴⁾ (.748) ⁵⁾	.448	.576
b. bleached cotton fabrics (undyed) per yard	(.143) ⁴⁾ (.282) ⁵⁾	.167	.231 ⁶⁾
5. Physical productivity			
a. annual output of cotton yarn (bale) per productive worker (a year)	47.26		41.1 ⁷⁾
b. output of cotton yarn (pound) per hour by 1,000 spindles	58.79 (59.01) ⁸⁾		50.1
c. annual output of cotton fabrics (in 40 yd) per productive worker	904.15		1,136.2 ⁹⁾
d. output of cotton fabrics (yard) per hour by unit of power-looms	4.667 (4.677) ⁸⁾		3.669 ⁹⁾
B. Iron and Steel Industry			
1. Wages, yearly basis (per unit of total employees)	546	486	802
2. Value productivity of labor per unit of total employees	3,434 ¹⁰⁾	2,719	9,053
3. Ratio of wage cost to the total value of production total employees basis	9.44%	17.80%	8.85%
4. Price of product at factory			
a. pig iron (metric ton)	61.7 ¹¹⁾ (30.5) ¹²⁾	31.1	70.7
b. steel ingot (metric ton)		80.3	113.8
c. rails (metric ton)		111.5	119.6
5. Physical Productivity			
a. annual output of pig iron per worker in blast furnace department (metric ton)	625.7 ¹³⁾ (2,678.1)		1,400 ¹³⁾
b. utilization coefficient of effective capacity of blast furnace (metric ton/m ³)	1,305 ¹³⁾		0.868 ¹³⁾

Granted that these two elements approximate reality, it is quite probable that the rate of cost reduction differs among sectors and, in some cases dependent upon the γ coefficient, it may be larger in the capital goods sector than in agricultural sector, though less certain in case comparing with that of the consumers' goods sector. As a matter of fact, this seems to be what has occurred in the first Five Year Plan period as suggested by column 2 as added to Table 4, which shows that the rate of decrease in price is the larger for the group of commodities for which $P(d)/P(f) \cdot x$ is the larger. The differential rates of cost reduction will certainly affect the pattern of P_{ij} and, even when we ignore the limitational foreign demand conditions, it is likely to be the case that the policy of "reducing the import dependency ratio sooner" is efficient.

Though this is the most we can say with respect to the subject of this section, perhaps one word is pertinent as regards possible objections from the Heckscher-Ohlin Version of the above considerations. With respect to the uniformity of production functions of each commodity among the countries and the equal qualities of factors which are criticized as among unrealistic assumptions of this version, we have already touched upon in passing. Here, we have to refer to the notion of zero-social-value of labor as implied in this version when there is unemployed or underemployed labor in the economy. However, as Prof. Dobb considers,³⁴ this certainly lacks a dynamic vision, since if such labor with "zero-social-value" were used to the extent this version implies, the unsuccessful Chinese Case as considered above will certainly be repeated. Furthermore, with respect to various categories of skilled labor, the wage rates are better conceived as closely related to their respective productivities. That this is likely to be the case is suggested in Table 7, which shows the comparative wage rates of textile industry between Japan and China are fairly similar as are the composition and pro-

³⁴ Dobb, *op. cit.*, p. 32.

Source: In general, reference is made for China, Industrial Statistics Branch SSB, *Present and Past of Our Country's Iron and Steel, Electricity, Coal, Machine-Making, Textile and Paper-making Industries*, Statistics Publication Co., Peking, 1958; for India, CSO, Gov't of India, *Eleventh Census of Indian Manufactures 1956*, Delhi, 1959; and for Japan, Research and Statistics Division, MITI, Gov't of Japan, *Census of Manufactures 1956*, Tokyo 1958, and Nippon Boseki-kyokai; *Reference Book for Cotton Spinning Situation in the Latter Half of 1956*, Osaka, 1957.

Notes: (1) Since the figures for the total industry are not available, those for the state-owned and joint-public-and-private-owned enterprises are here taken. The former must be lower than the latter. Readers are cautioned for the fact that the figures in Lines 2 and 3 are derived by using the latter figures. (2) This is the figures for the directly employed workers only. (3) The total value of production for 1956, which is used as one of the basis for deriving this figure, is originally given in the 1952 fixed price term. This is converted into the 1956 current prices by using the wholesale price index of cotton textiles (0.972 as the price in 1952 taken as 1.0, from *Collected Shanghai Prices*. (4) This refers to the average cost at factory of cotton yarns of 20's and 32's. (5) This refers to the wholesale prices, taken from *Collected Prices Materials*. Cotton yarns are both of 20's. (6) Pure cotton narrow fabrics (undyed). (7) The figure is one converted to the 20's term. (8) For the factories under the direct control of the Ministry of Textiles. (9) The figures are given in terms of square yards. (10) Original figures of total value of production as given in 1952 prices are converted into the 1956 current prices by the same procedure as in note (2). Conversion coefficient is 0.634. (11) Ishikawa, Choice of Techniques in Mainland China, *The Developing Economies*, Sept.-Dec. 1962, p. 50. The figure indicates the controlled transfer price among the state enterprises. (12) Figure in parenthesis indicates the production cost of An Shan Iron and Steel Co. (13) Ishikawa, *Ibid.*, pp. 38, 41.

ductivity of labor; in the steel industry, the difference of the wage levels among Japan, China and India seems to be largely influenced by a distinct difference of labor productivities.⁸⁵

V. Concluding Remarks

The above examination tends to suggest that, under the combined context of a limitational foreign demand over exportable goods and a situation of recent technical progress favoring relatively rapid productivity increase in the producers' goods sector, the policy of "reducing the import dependency ratio sooner" is quite likely to be efficient. On the other hand, however, this may perhaps raise a new question: May the prospect of future foreign trade in this case be a declining one? Although this seems to be an important problem that is worthwhile discussing in an independent paper, a few comments may be relevant as concluding remarks.

Concerning this question, the writer considers it possible that Chinese foreign trade will decline in future, if the above policy continues. However, it should be noted that to the extent that the differential in the technological level between China and foreign advanced countries does not disappear, there should be a certain minimum level in any point of time below which the import dependency ratio cannot be reduced; and even though the rate of technological advance should be sufficiently large and the above differential being reducing, the total amount of foreign trade may expanding because of the existence of this critical minimum.⁸⁶ Therefore, the pattern of Soviet foreign trade after 1931 is not likely to be repeated, barring a worsening political and economic situation as occurred then.⁸⁷ In this regard, it is also important to note that exports in this case are not unlikely to be mainly in the form of capital goods rather than of the agricultural or consumers' goods.

⁸⁵ In this Table, it is further noticed how large is the impact of the natural resource endowment upon comparative cost: India's textiles are cheapest, despite low productivity, due to cheap cotton fibres; pig iron in India and China is benefited by the fact that iron ore and coal are mined in the country. Although this table is not suggestive on comparative capital cost, the factor-proportion theory seems to be no more than a very crude approximation of static comparative advantage.

⁸⁶ In a simple example, suppose the level of domestic and foreign techniques D_t and F_t can be measured in terms of the number of varieties of investment goods technically producible in the country, and the proportions of these varieties used in investment are uniform, the import of investment goods at any period of time can be divided into the following two parts, using the notations of *M. A.*;

$$M_{1t} = (1 - u_t)I_t$$

$$M_{2t} = u_t I_t - X_{1t}$$

$$\text{where } u_t = (D_0/F_0)e^{(d-f)t}$$

and f and d denotes the rates of increase of D_t and F_t over time. Here $(1 - u_t)$ is the minimum level below which the ratio of import dependency cannot be reduced and even with this minimum level reached, the amount of total trade is expanding if

$$(1 - u_t)vi - \frac{du_t}{dt} > 0$$

under the same assumption as *M.A. 2.*

⁸⁷ See note 21.

MATHEMATICAL APPENDIX

1. Fel'dman=Domar Model

In a most simple aspect, Fel'dman=Domar Model¹ can be expressed by a set of the following three equations:

$$(1.1) \quad \frac{dX_1}{dt} = \frac{\gamma}{V_1} X_1$$

$$(1.2) \quad \frac{dX_2}{dt} = \frac{1-\gamma}{V_2} X_2$$

$$(1.3) \quad Y = X_1 + X_2,$$

where X_1 and X_2 denote the net output of the two major sectors of the economy: the investment goods sector (hereafter designated by the suffix 1) and the consumers' goods sector (designated by the suffix 2); Y , the net national income; γ , a fraction of X_1 allocated to the investment sector (this is the planners' variable of the model); V , the marginal capital-output ratio. Among the assumptions of the model, there are those of a closed system without foreign trade; completely elastic supplies of labor with respect to any given level of wage rates;² permanent assets; and constancy of the values of γ and V once they are determined at the initial period.³

By solving the equations with respect to X_1 , X_2 and Y , which are the three endogenous variables of the model, one obtains:

$$(1.4) \quad X_1 = X_{10} e^{\frac{\gamma}{V_1} t}$$

$$(1.5) \quad X_2 = X_{20} + \left(\frac{1-\gamma}{\gamma} \right) \frac{V_1}{V_2} X_{10} (e^{\frac{\gamma}{V_1} t} - 1)$$

$$(1.6) \quad Y = Y_0 + \left[\left(\frac{1-\gamma}{\gamma} \right) \frac{V_1}{V_2} + 1 \right] X_{10} (e^{\frac{\gamma}{V_1} t} - 1)$$

(In the above equations as well as in the following, the suffix t is omitted where it is self-evident.) These solutions imply that the planners' variable γ has the sole responsibility for determining the growth of the system, when V_1 and V_2 are treated as parameters: the rate of growth will be higher in the longer period, the larger is the value of γ ; however, if a

¹ See note 16 in the text.

² This is a very important assumption, involving the two-fold implications: one, it assumes an economy with redundant labor reserve; second, the wage-rate and, with it, the consumption level of the workers can be reduced at will. The first implication seems to be quite realistic in so far as the model is intended for application in present day underdeveloped economies, and no modification will be required in the model for this reason. But, as regards the second, it is evidently unrealistic to consider that the range of freedom in freely changing the level of consumption is as wide as the model implies. If the assumption is changed to the opposite extreme, i. e., the wage rate is fixed and constant over time at a certain level, γ in the model is conditioned by

$$\gamma = \frac{1}{1 + \frac{\mu_1}{1-\mu_1} \frac{V_2}{V_1}}$$

where μ 's denotes the relative wages share in each sector. With regard to this and related discussions, see Ishikawa, "Capital Accumulation in Mainland China" *op. cit.*

³ For the rest of the assumptions as well as the discussion of the sector classification of the economy, refer to Domar, *op. cit.*

shorter period is taken, it is possible that the reverse is the case.

2. *Extended model comprising foreign trade*

In order to be closer to reality, foreign trade of the economy should be taken into account by removing the assumption of a closed system in the Fel'dman=Domar Model. First, a simple case is considered where (i) the level and structure of domestic and foreign prices are identical, (ii) exports consist of consumers' goods and imports of investment goods, (iii) foreign demand for the export goods and foreign supply of the import goods are completely elastic, and (iv) exports and imports balances.

As additional notations, I denotes net national investment; C , net national consumption; i , the ratio of I to Y ; M , the amount of imports and E , the amount of exports.

Fel'dman=Domar Model is then extended to:

$$(2.1) \quad \frac{dX_1}{dt} = \frac{\gamma}{V_1} I$$

$$(2.2) \quad \frac{dX_2}{dt} = \frac{1-\gamma}{V_2} I$$

$$(2.3) \quad Y = X_1 + X_2$$

$$(2.4) \quad Y = I + C$$

$$(2.5) \quad I = iY$$

$$(2.6) \quad M = I - X_1$$

$$(2.7) \quad E = X_2 - C$$

In this model, eq. (2.4) can be replaced by (2.4)', $M = E$, as is evident from substituting by Eq. (2.6) (2.7) and (2.3). In this model, the planners' variables are γ and i ; the parameters are V_1 , V_2 ; the endogenous variables are X_1 , X_2 , Y , I , C , M and E . With the number of equations altogether seven, the system will be solved when the magnitudes of γ and i are determined by the planners. Solving the system with respect to Y , I , X and M it is obtained that:

$$(2.8) \quad Y = Y_0 e^{\nu t} \quad \text{where} \quad \nu = \frac{\gamma}{V_1} + \frac{1-\gamma}{V_2}$$

$$(2.9) \quad I = I_0 e^{\nu t}$$

$$(2.10) \quad X_1 = X_{10} + \frac{\gamma}{\nu i V_1} I_0 (e^{\nu t} - 1)$$

$$(2.11) \quad M = M_0 + \left(1 - \frac{\gamma}{\nu i V_1}\right) I_0 (e^{\nu t} - 1)$$

It should be noted as one of the implications of this extended model that, when the economy is opened to the external world with elastic demand and supply conditions, no extra benefit (in terms of the increase in the long-term growth rate of the economy) is likely to be obtained by putting a higher value to γ . While, in the closed system, a higher value of γ results in a higher long-term growth rate of the system, it will rather decrease the growth rate in an usual situation where $V_1 > V_2$. It is true that the larger is the value of γ , the smaller will be the ratio of import dependency of investment goods (M/I) in any period of time. However, this course of development may not be an efficient choice in so far as the criterion of maximizing Y or C is concerned.

3. *Foreign demand for exportable goods restricted*

Next, the cases will be considered where, though foreign trade is taking place, the export possibility is limited by the restricting conditions of foreign demand. For this purpose, the

assumption (iii) of the previous paragraph is dropped, while the others are kept intact. As a substitute assumption, only two alternative cases will be taken up here: (i) as an extreme case, E is constant in the initial level: E_0 : or (ii) the rate of increase in E is exogenously fixed at a certain level.

In either case, an extra conditioning equation will be added to the system of eqs. (2.1)~(2.7). Therefore, of the two planners' variables: γ and i in that system, either one will lose freedom and will be converted to an endogenously determined variable; and it is easily seen that this one is i .⁴

In the following, the extra conditioning equation for each case is shown, together with the solutions of the system with respect to Y , X_1 , I and M .

Case (i)

Extra Equation: (3.1) $E = \bar{E}$

Solutions:

$$(3.2) \quad Y = Y_0 + \left[\left(\frac{1-\gamma}{\gamma} \right) \frac{V_1}{V_2} + 1 \right] (X_{10} + E_0)(e^{\frac{\gamma}{V_1}t} - 1)$$

$$(3.3) \quad I = (X_{10} + E_0)e^{\frac{\gamma}{V_1}t}$$

$$(3.4) \quad X_1 = X_{10} + (X_{10} + E_0)(e^{\frac{\gamma}{V_1}t} - 1)$$

$$(3.5) \quad M = M_0 = \bar{E}$$

Case (ii)

Extra Equation: (3.6) $\frac{1}{E} \frac{dE}{dt} = g$ where g is a constant.

Solutions:

$$(3.7) \quad Y = Y_0 + \left[\left(\frac{1-\gamma}{\gamma} \right) \frac{V_1}{V_2} + 1 \right] X_{10}(e^{\frac{\gamma}{V_1}t} - 1) + \frac{\frac{\gamma}{V_1} + \frac{1-\gamma}{V_2}}{\frac{\gamma}{V_1} - g} M_0(e^{\frac{\gamma}{V_1}t} - e^{gt})$$

$$(3.8) \quad I = X_{10}e^{\frac{\gamma}{V_1}t} + \frac{1}{\frac{\gamma}{V_1} - g} M_0 \left[\frac{\gamma}{V_1} e^{\frac{\gamma}{V_1}t} - g e^{gt} \right]$$

$$(3.9) \quad X_1 = X_{10}e^{\frac{\gamma}{V_1}t} + \frac{\frac{\gamma}{V_1}}{\frac{\gamma}{V_1} - g} M_0(e^{\frac{\gamma}{V_1}t} - e^{gt})$$

$$(3.10) \quad M = M_0 e^{gt}$$

These two cases imply that the crucial role of the planners' variable γ revives when the assumption of a particular demand condition abroad for the exportable goods is introduced; γ becomes again the sole responsible factor determining the growth rate of the system, though with a relatively minor modification by a constant rate of growth of export in case (ii); and no less important from the view-point of this paper, choosing a higher value of γ will not only increase the rate of growth of the system, but also decrease the ratio of import dependency in a quicker tempo than otherwise. The ratio of import dependency is here defined as M/I , and decreasing it as quickly as possible can be assumed to be one of the planners'

⁴ Since from eqs. (2.5) and (2.6),

$$i = \frac{X_1 + E}{X_1 + X_2}$$

In the period $t=0$, all the variables in the right side of the equation are given.

objectives, if it will not be inconsistent with the other objective to increase the overall rate of growth of the economy.

4. Possibility of declining export price introduced

Analysis in the previous paragraph as regards the case where foreign demand for exportable goods is restricted may be extended to a more general and more practical situation where, though the actual amount of export can be increased to any amount, it is subject to the counteracting tendency that the export price declines in response to it. In general, this is a case of variable terms of trade. And although this is nothing but another special example of the discussion in the previous Paragraph, it is treated separately, since it involves much different assumptions.

First, the assumption (i) of Paragraph 2 should be modified in so far as the price level of the exportable goods is variable in the external countries. With respect to the assumption (iii) there, this should be modified to the effect that the foreign demand for the exportable goods is inelastic, though the complete elasticity assumption of foreign supply of the importable goods kept unchanged for simplicity's sake. In vigorous terms it is assumed that

$$(4.1) \quad E_t = \bar{E} e^{(\epsilon\sigma + l)t} p_t^{1-\eta}$$

where ϵ denotes income elasticity of demand for the exportable goods; g , the rate of growth of per capital income; l , the rate of growth of population; and η , the price elasticity of demand for the exportable goods, all in the foreign countries. Lastly, the assumption (iv) of Paragraph 2 is changed to assume that exports and imports balance in terms of foreign prices. By assuming the price of importable goods as 1, both in this country and in the foreign countries, we can express this by

$$(4.2) \quad M_t = p_t E_t.$$

For formulating the case under these modified assumptions, we have to try a little bit more to develop eqs. (4.1) and (4.2). Since this paper focusses attention on foreign trade solely in relation to domestic economic development, p_t in the above equations must be explained in relation to the domestic factors. This can be done in the following way: the amount of exports in foreign prices, which can be derived from eq. (4.1) as

$$(4.3) \quad E_t p_t = \bar{E} e^{(\epsilon\sigma + l)t} p_t^{1-\eta},$$

must, in this system, be as large as the amount of imports the system requires for development. Hence

$$(4.4) \quad M_t = \bar{E} e^{(\epsilon\sigma + l)t} p_t^{1-\eta}$$

which can be changed to

$$p_t = \bar{E}^{-\frac{1}{1-\eta}} e^{-\frac{1}{1-\eta}(\epsilon\sigma + l)t} M_t^{\frac{1}{1-\eta}}$$

However, since $\bar{E}^{-\frac{1}{1-\eta}}$ can be converted to $p_0/M_0^{\frac{1}{1-\eta}}$ ⁵, this equation can be equivalent to

$$(4.5) \quad p_t = p_0 e^{-\frac{1}{1-\eta}(\epsilon\sigma + l)t} \left(\frac{M_t}{M_0} \right)^{\frac{1}{1-\eta}},$$

where $p_0 = \bar{E}^{-\frac{1}{1-\eta}} M_0^{\frac{1}{1-\eta}}$.

Now, the problem of this Paragraph can be formulated as a model, by modifying the

⁵ Since from eq. (4.4) we can derive

$$M_0 = \bar{E} p_0^{1-\eta},$$

and this can be converted to

$$p_0 = M_0^{\frac{1}{1-\eta}} \bar{E}^{-\frac{1}{1-\eta}}.$$

model in Paragraph 2 by eqs. (4.2) and (4.5). To reproduce them

$$(4.6) \quad \frac{dX_1}{dt} = \frac{\gamma}{V_1} I$$

$$(4.7) \quad \frac{dX_2}{dt} = \frac{1-\gamma}{V_2} I$$

$$(4.8) \quad Y = X_1 + X_2$$

$$(4.9) \quad I = iY$$

$$(4.10) \quad M = I - X_1$$

$$(4.11) \quad E = X_2 - C$$

$$(4.2) \quad E = \frac{1}{p} M$$

$$(4.5) \quad p = p_0 e^{\frac{-1}{1-\gamma} (\alpha\beta + b)t} \left(\frac{M}{M_0} \right)^{\frac{1}{1-\gamma}},$$

where $p_0 = E^{\frac{1}{1-\gamma}} M_0^{\frac{1}{1-\gamma}}$.

In this model, it should be noted that Y denotes domestic income, while it was used in Paragraph 2 for denoting national income; accordingly i should be interpreted as the saving ratio not to national income, but to domestic income. Furthermore, eq. (2.4) does not hold here, since it is derived from eqs. (4.8), (4.10), (4.11) and (4.2) that

$$(4.12) \quad Y = I + C + (E - M) \\ = I + C + M \left(\frac{1}{p} - 1 \right).$$

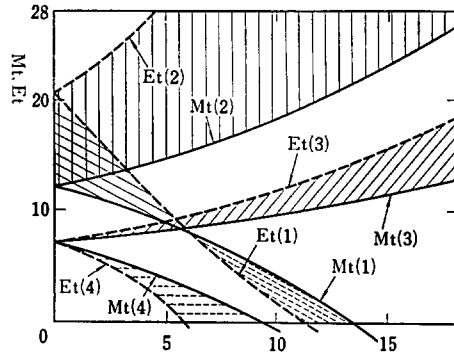
This $(E - M)$ or $M \left(\frac{1}{p} - 1 \right)$ can be defined as the "loss of domestic income due to the changes in the terms of trade".

The planners' variables of this model are γ and i , as were in Paragraph 2. The endogenous variables (Y, I, C, X_1, X_2, M, E and p) are eight in number as against the same number of equations. The system is accordingly soluble with any chosen values of i and γ , and the reader may find that the solutions with respect to Y, I, X_1 and M are just equivalent to those shown in eqs. (2.8), (2.9), (2.10) and (2.11), respectively, if the concept of Y in the latter is changed to the present one. It might seem, therefore, that the implications on the efficient choice of γ and i are also similar in both cases. But, focussing attention on national income, which is equivalent to $Y - (E - M)$ or $Y - M \left(\frac{1}{p} - 1 \right)$, it is known that this may not be the case. Since the analysis is complicated, we shall be content here in presenting a simple numerical illustration, showing the impact of the choice of i and γ upon $(E - M)$ or $\sum_{t=0}^n (E_t - M_t)$ for any period of time n depending upon the planners' time horizon.

App. Fig. 1, which was drawn for this purpose,⁶ indicate that (i) the higher the value chosen for i , the larger is the amount of $(E - M)$ in the immediate future, regardless of the choice of γ , but (ii) the higher value chosen for γ always accompanies with it in the longer run the smaller or the decreasing amount of $(E - M)$; and it will be easily observed that, in (i), a higher value of i has an implication that the rate of growth of the system is higher than otherwise, and that, in (ii) the higher value of γ implies a more rapidly de-

⁶ It should be emphasized that the value of η is here assumed as 2; if $\eta \geq 1$, the implication of this part will not come about.

APP. FIG. 1. MOVEMENT OF $(E-M)$
DEPENDING UPON THE CHOICE OF i AND r



Calculated from eqs. (2.11), (4.2) and (4.5), in case where $E=3$, $\eta=2$,
 $eg+i=0.01$, $Y_0=100$, $V_1=3$, $V_2=2.3$, $X_{10}=3$, and

- | | |
|------------------|------------------|
| Case 1: $i=0.15$ | Case 2: $i=0.15$ |
| $r=0.30$ | $r=0.10$ |
| Case 3: $i=0.10$ | Case 4: $i=0.10$ |
| $r=0.07$ | $r=0.30$ |

ing ratio of import dependency.⁷ In the typical four cases in App. Fig. 1, the best choice seems to be Case 1, since it will assure a higher growth rate of the system than Cases 3 and 4, and as compared to Case 2, $\sum_{t=0}^n (E_t - M_t)$ is small for any period of time except $t=0$. Though $\sum_{t=0}^n (E_t - M_t)$ is in this case larger than in Case 4, the difference will become relatively negligible if a sufficiently longer time-horizon is taken up.⁸

5. Relying upon External Aid—Indian Case

In the above cases of foreign demand for exportable goods restricted, the planners' objectives (*i. e.*, to maximise the level and the growth rate of the system as well as the tempo of decreasing the ratio of import dependency) are proved to be better served by choosing higher values of i and γ . Yet they are nevertheless conditioned by the initial level of X_{10} and (in case of Paragraphs 3) M_0 that may be very low, so that the level of national income at any period might be lower than otherwise and the level of import dependency might be higher than otherwise. (It is clear by seeing, for instance, that, for a given value of γ , the level of Y_t , X_{1t} is the lower, the smaller are the initial values of Y_0 , X_{10} .) As defined in the text, the Indian Case represents an extra effort to overcome this restricting condition by trying to receive a greater amount of external aid. For the purpose of formulation, we assume that the amount of external aid, designated as D , is a function of a receiving country's effort, *e. g.*, *via* diplomatic tactics or persuasion; that the degree of this effort is reflected in the ratio

⁷ It may be noted that the burden of $(E-M)$ at any time period is, in this model, to be born by the national consumption; *i. e.*, by reducing C . It follows that there is at any time a certain ceiling beyond which $(E-M)$ cannot expand. This will limit in actuality the range of freedom in choosing i .

⁸ Prof. A. K. Sen has analyzed a similar case of variable terms of trade in a different set of assumptions and on a more partial basis. Cf. Sen, *Choice of Techniques*, Basil Blackwell, Oxford, 1960, Ch. VI.

(designated as i') of net domestic investment (I) to national income.

In formulating this case into a model, we shall, for the sake of simplicity, rely on the assumption of Paragraph 3 (ii) as far as the restricting conditions of foreign demand for exportable goods are concerned. The model is as follows:

$$(5.1) \quad \frac{dX_1}{dt} = \frac{\gamma}{V_1} I$$

$$(5.2) \quad \frac{dX_2}{dt} = \frac{1-\gamma}{V_2} I$$

$$(5.3) \quad Y = X_1 + X_2$$

$$(5.4) \quad Y = I - D + C$$

$$(5.5) \quad I = i' Y$$

$$(5.6) \quad M = I - X_1$$

$$(5.7) \quad E = X_2 - C$$

$$(5.8) \quad \frac{1}{E} \cdot \frac{dE}{dt} = g.$$

That eq. (5.4) can be replaced by (5.4)' $M = D + E$ is easily seen from eqs. (5.3), (5.4), (5.5) and (5.7). Planners' variables are γ and i' . With the number of the endogenous variable eight ($Y, X_1, X_2, I, C, M, E, D$) as against eight equations, the system can be solved with any values of γ and i' . Solving the system with respect to Y, X_1, M and D , we obtain:

$$(5.9) \quad Y = Y_0 e^{\nu t}, \quad \text{where } \nu = \frac{\gamma}{V_1} + \frac{1-\gamma}{V_2}$$

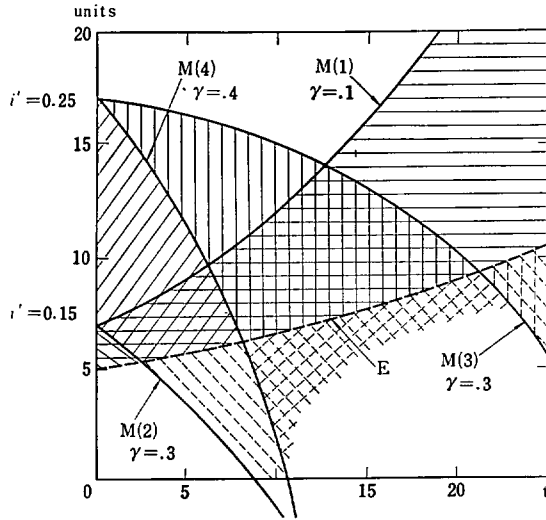
$$(5.10) \quad X_1 = X_{10} + \frac{\gamma}{\nu i' V_1} I_0 (e^{\nu t} - 1)$$

$$(5.11) \quad M = I_0' - X_{10} + \left(1 - \frac{\gamma}{\nu i' V_1}\right) I_0 (e^{\nu t} - 1)$$

$$(5.12) \quad D = D_0 + \left(1 - \frac{\gamma}{\nu i' V_1}\right) I_0 (e^{\nu t} - 1) - E_0 (e^{g t} - 1).$$

As is seen from these solutions, the determinants of the long-term growth-rate are similar to those in the case of paragraph 2. With respect to γ , a larger value of it does not necessarily lead a higher rate; rather it results, in the more usual case where $V_1 > V_2$, in a slower rate. However, in this case, a larger value of ν has always an effect of reducing the level of M in a quicker tempo or of increasing it in a slower tempo. In the former case, repayment of aid will become possible sooner. On the other hand, the role of i' in influencing the growth rate is obvious. At the same time, it affects directly the amount of aid and hence the level of import of capital goods. Thus, a larger i' will yield a higher level and a higher growth rate of the system, and at the same time higher values of D and M at any time-period. The problem, then, is what are the combined results of the choice of differing values of i' and γ ? For simplicity's sake, an illustrative numerical example is shown in App. Fig. 2, which indicates four typical paths of M and D depending upon the choices of i' and γ . Of these four paths, perhaps the most typical is the choice between those of $M(1)$ and $M(3)$; and it is evident that Indian Case represents the choice of $M(3)$ in preference to $M(1)$, since this is a typical case where a high value of i' yields a higher level and a higher growth rate of the economy, though by a larger amount of aid and hence a higher ratio of import dependency; but by choosing at the same time a high value of γ , the aid and, with it, the ratio of import dependency will decrease sooner without sacrificing much the rate of growth of the economy.

APP. FIG. 2. PATHS OF IMPORTS (M_t), EXPORTS (E_t) AND EXTERNAL AID (D_t , shaded area) DEPENDING UPON THE CHOICE OF i AND γ



Calculated from eqs. (5.11) and (5.8), where $Y_0=100$ units, $X_{10}=8$ units, $E_0=5$ units, $V_1=3$, $V_2=2.5$ and $g=0.03$; the selections of the values of i' and γ are shown in the chart for the four cases of M_t .

The Indian Case seems to be theoretically effective for the purpose, provided, however, that the external, some rich country is willing to respond favorably to the request from the country here concerned.

6. Choice of Techniques with Less Import Content—the Chinese Case

As one of the possible ways of analyzing the Chinese case which was described in the text, we assume first that the investment goods sector consists of two sub-sectors: one is designated as H -sector where investment called H -goods are produced with a high and fixed technique as represented by a fixed marginal capital-output ratio, V_H and the equipments used are exclusively H -goods; the other, designated as L -sector, produces investment goods called L -goods with low and variable techniques as represented by V_L with a variable value, and the equipments used are a kind of combined goods consisting of both H - and L -goods.⁹ We then assume that the proportion (m) of the amount of H -goods (X_H) to that of L -goods (X_L) in this combined equipments is fixed under a certain given technique, and varies in a fixed, positive proportion (b) to the varying values of V_L . It follows that the percentage (x) of total output of X_H in a given time period which should be diverted to L -sector depends upon the value of m , if the amount of X_L used as equipment in L -sector as well as total output of X_H are given. Another important assumption is that the imported goods in this system

⁹ It should be noted here that the separation of investment goods sector between the sub-sectors H and L is quite different from that between the sub-sector producing machineries used in consumers' goods sector, the sub-sector producing machineries to make machineries used in the consumers' goods sector, etc.

consist solely of H -goods. As an implication of these assumptions, it should be noted that the choice of a lower V_L is equivalent to choosing a technique with a lower import content, since on the one hand, a lower V_L yields an equivalently smaller m and hence an equivalently smaller x , while, on the other hand, a smaller xX_H has the same implication as equivalently economizing the imported H -goods. To be realistic, the marginal capital-output ratio (V_2) of the consumers' goods sector is assumed to vary in a fixed and positive proportion (a) to V_L .

Now a model for the Chinese Case can be formulated in the following way by expressing the conditions of foreign trade by (2.4)' and (3.1):

$$(6.1) \quad V_H \frac{dX_H}{dt} = (1-x)X_H + M$$

$$(6.2) \quad V_L \frac{dX_L}{dt} = \gamma X_L + xX_H$$

$$(6.3) \quad \frac{xX_H}{\gamma X_L} = m$$

$$(6.4) \quad V_2 \frac{dX_2}{dt} = (1-\gamma)X_L$$

$$(6.5) \quad V_2 = aV_L$$

$$(6.6) \quad m = bV_L$$

$$(6.7) \quad Y = I + C$$

$$(6.8) \quad I = X_H + X_L + M$$

$$(6.9) \quad C = X_2 - E$$

$$(6.10) \quad M = E$$

$$(6.11) \quad E = \bar{E}.$$

In this model, the planners' variables are γ and V_L , and as against the eleven equations, there corresponds the same number of endogenously determined variables (X_H , X_L , X_2 , Y , I , C , M , E , V_2 , m , x). The solutions of the system with regard to Y , X_H , X_L , and X_2 are shown as:¹⁰

$$(6.12) \quad Y = Y_0 + (X_{H_0} + M)(e^{\frac{1}{V_H}} - 1) - \frac{\gamma b V_L}{V_H \left(Z - \frac{1}{V_H} \right)} X_{L_0}$$

$$(e^{zt} - e^{\frac{1}{V_H}}) + \left[\frac{1-\gamma}{\gamma(1+bV_L)} \cdot \frac{V_L}{V_2} + 1 \right] X_{L_0} (e^{zt} - 1)$$

$$\text{where } Z = \frac{\gamma}{V_L} (1 + bV_L)$$

$$(6.13) \quad X_H = X_{H_0} + (X_{H_0} + M)(e^{\frac{1}{V_H}} - 1) - \frac{\gamma b V_L}{V_H \left(Z - \frac{1}{V_H} \right)} X_{L_0} (e^{zt} - e^{\frac{1}{V_H}})$$

$$(6.14) \quad X_L = X_{L_0} e^{zt}$$

$$(6.15) \quad X_2 = X_{2_0} + \left[\frac{1-\gamma}{\gamma(1+bV_L)} \right] \frac{1}{a} X_{L_0} (e^{zt} - 1).$$

With respect to eq. (6.13), perhaps one comment may be necessary. The second item of the right-hand side of the equation represents the magnitude of additional output of X_H in a given time period as compared to the initial period, if no part of it is diverted to L -sector in any time period. The third item represents the magnitude of X_H which were produced if a

¹⁰ The case where $Z = \frac{1}{V_H}$ is omitted for consideration in the following. However, the final conclusions are not affected by this.

diverted portion of X_H in each respective period of time had remained in H -sector. This item may be called the item of accumulated leakage.¹¹

From these solutions, the following observations could be made.

(1) Since $\frac{dZ}{dV_L} = -\frac{\gamma}{V_L^2} < 0$, the smaller V_L always results in the larger Z . It follows that the smaller V_L yields the consistently larger output of X_L ; it yields in the long-run the higher output of X_2 and the lower value of V_H , but in the short-run the reverse is the case. In case of $Z < \frac{1}{V_H}$, this observation is modified to a certain extent in the very long-run as far as X_H is concerned.

(2) When we come to consider the impact of differing values of V_L upon the magnitude of Y , it should be noticed that the impacts upon different sectors are counteracting each other to a certain extent. To be precise, we have to examine the derived value of $\partial Y/\partial V_L$ from eq. (6.12). Since it is larger, equal or smaller than zero, depending upon

$$1 + \frac{1-\gamma}{\gamma(1+bV_L)} - \frac{\gamma b V_L}{V_H \left(Z - \frac{1}{V_H} \right)} \cong 0$$

and by replacing each respective variables and parameters by some practically conceivable values it is known that the usual value of $\partial Y/\partial V_L$ is smaller than zero, and the usual case seems to be that the smaller V_L yields the larger Y . However, it is also found that the benefit of enlarging Y by choosing a smaller V_L will gradually be lost as time goes on.

(3) By a similar examination with respect to the combined total of X_H , X_L and M , we come to know that the smaller V_L will make the value of M/I smaller, with a similar reservation. However, the value of M/X_H is definitely larger in the long run, when the choice is made on the smaller V_L .

¹¹ The reason why this is so can be explained in this way. First, the leakage in any given time period n is shown by $\gamma b V_L X_{Lo} e^{\gamma n}$; second at the time period of t , this would have resulted in H -goods of the amount of $\gamma b V_L X_{Lo} e^{\gamma n} e^{\frac{1}{V_H}(t-n)}$, if it were kept in H -sector. Therefore, the accumulated leakage is:

$$\gamma b V_L X_{Lo} \int_0^t e^{\gamma n + \frac{1}{V_H}(t-n)} dn$$

and the solution is just equivalent to the third item. For the interpretation of this item, I am indebted to a useful suggestion by Prof. S. Fujino.