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ASSORTED
NON SIKH 3

11/12/90

Gita (Vassar) (914) 691-7169 (H)
437-7399 (O)

[redacted]

Gita Sen: Gender, Population & Development: The Case of Kerala

* While Kerala has a per capita income which is 1/9 of that of upper middle income countries, and 2/3 of that of the rest of India, it does better than either on almost every indicator of basic health & education

1. Debate in 1970's about fertility was concerned with identifying factors which were central in leading to declines in fertility
   - Two distinct paths emerge in countries which have experienced significant declines in fertility since 1965 (although some like S. Korea have both)
     a) High GDP growth, rapid urbanization,
     b) Low GDP growth, low per capita income, relatively low urbanization, but high government expenditures on basic health & education. Kerala & Sri Lanka are in this group (social development path).

(low is high govt spending ? locally provided)

2. In both groups, gender role change is a crucial factor. But in second group, creating a history, status for women is much more important.

Orla Ben : 11/12/90

Although GNP per capita is ¼ of middle income countries, the total fertility rate is lower (60%) ⅔, the infant mortality rate is ½, maternal mortality rate is the same, and life expectancy is the same.

B. Walker

3. Causes of Kerala's distinctiveness
- coastal strip between sea & mountains: lowlands, midlands, & highlands
- Population density is > 600 persons/km, almost as high as Bangladesh
- Eco. is largely rural & agrarian. Service sector has been growing rapidly.
- Agriculture has been commercial for a long time. Even prior to 15th century, trade in spices. later tea & rubber plantations took over highlands
- One of the most rigid caste structure in India, prior to 19th century. But gender relations were much more flexible than other parts of India. The caste just below top, i.e. just below the Brahmins (the Nairs) were matrilineal & matrilocal. Inheritance was only through women so girl-children were prized.

The dominant role of the Nairs, & their relatively large size (20% of population) probably account for Kerala's distinctive attitude toward women.

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- British rule was indirect, since this was a Princely state. Thus some internal issues, such as attitudes toward social development, were not subject to direct control by the Raj.

- During the 19th century there were large social & economic changes which conditioned the present situation. Then, more were more proximate factors.
  - Expansion of commerce. Coconut production was the basis of rope based on coconut fiber, and this expanded very rapidly. The caste of "Toddy-Tappers" were the ones who traditionally dealt with coconuts, and they were near the bottom of the caste system. The expansion of coconut trade enriched this caste, while the caste system preserved their monopoly. The pressure that built up exploded in the 20th century when this caste spearheaded the movement for social change
  - The Christian church in India is one of the oldest in the world (56 AD from Thomas the Apostle). It did not break with the caste system, since it was not a Western missionary import. The

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Anglicans concentrated on the bottom of the social order, & concentrated on literacy & schools. The Catholic church responded to this threat by extending competition to health care. & the native rulers cooperated with this.

* Others states followed a similar pattern of state expenditures but [illegible] because of the different positions of women (girls were not allowed to go to school)

— Land reform: as early as 1878, wastelands & govt owned lands were distributed to tenants & others. The lower castes (the coconut producers who had capital but no land), & the Syrian Christians who had focussed on trade & now turned to tea & rubber) benefitted from this.

— Proximate factors: education was already well-established, both at higher level & popular level. The Raj substituted English-based education for this. But the language of administration did not become English, so local language education continued to flourish. Similarly, traditional health structure was not obliterated, but rather incorporated into the general structure.

The historical autonomy of women among the Nairs, & the examples thus set for rising social groups, meant that girls had almost the same access to education as boys.

Guha Sen 11/12/90

women ~~there~~ become involved in the health & educational structure, not just at the bottom like nurses, but also at the top as doctors, surgeons, even a Chief Medical Office in the state of Travancore by 1930's. ~~Spreading~~ health care was an important priority. Girls were encouraged to focus on science, hygiene, etc, & to take back their knowledge to the family to ~~practices~~ change ~~their~~ practices. Although the general rules were the same as in Madras Presidency, the implementation was head & shoulders above ~~them~~.

By the ~~end~~ of the 19th century, ~~there~~ was a major movement to open up government jobs to lower castes & lower groups. The Nadars, who were locked out, spearheaded a major social movement (funded by their new wealth) to open their own schools, ~~temples~~, presses, health facilities, etc. Other lower castes tried to follow suit. By the present period, caste has become an entirely ~~different~~ secondary factor. The caste system was broken down. This religious reform movement democratized society, ~~although~~ ~~it~~ ~~was~~ and spread health care & literacy. Mortality

Gita Sen

rates fell early on, but birth rates did not fall till the 1960's. Voluntary sterilization became very popular, after two children.

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THE POLITICAL ECONOMY OF GREECE

An Empirical Analysis of Marxian Economics

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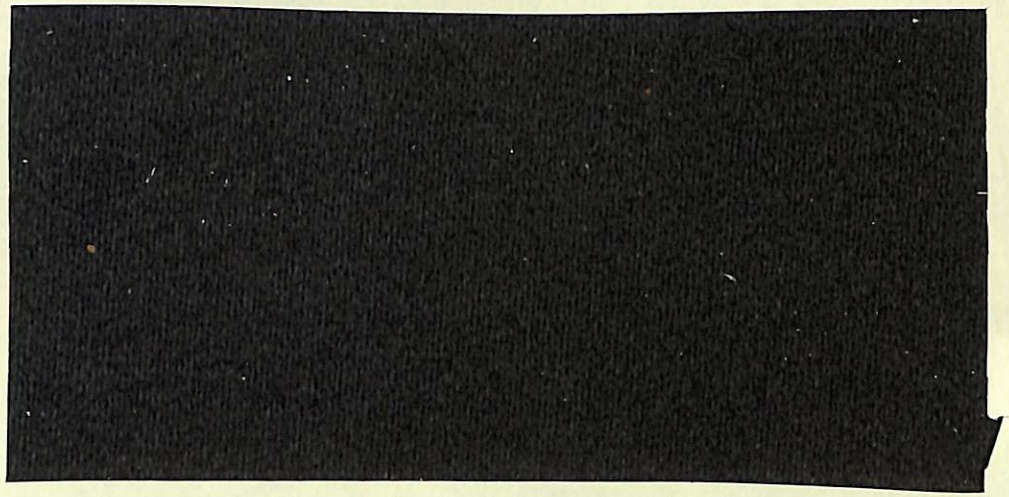

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An Empirical Analysis of Marxian Economics

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The main purpose of this paper is to empirically calculate the Marxian categories of the Greek economy over a twenty-year period (1958–1977). The empirical estimates of both the basic Marxian variables and the fundamental relationships are calculated. Finally, the Marxian results are summarized and contrasted with relevant conventional measures. The results in this paper show a falling rate of profit along with a simultaneous rise of the organic composition of capital and the rate of surplus-value as these relate to the Greek economy and for the period under consideration.

1. Introduction

Marxian economic theory as an analytical foundation can be tested within the context of a number of empirical categories (variables). These categories reflect the fundamental differences between the Marxian and conventional approaches. In recent years, there has been a sustained interest in the empirical verification of Marx, as seen by the contributions of Shaikh, Wolff, Moseley, Sharpe, and others. The common characteristic of these writings is the systematic transformation of the conventional categories found in the National Accounts and input–output tables into the corresponding Marxian variables. This paper follows this line of thought in that it attempts through a transformation procedure to estimate these categories for the Greek economy.

Studies on the economy of Greece have, for the most part, concentrated on specific aspects or analyses of particular problems of the economy. The rare exceptions of macroeconomic analysis [Negreponti-Delivanis (1981); Samaras

*A different version of this paper was presented at the conference on 'International Perspectives on Accumulation and Profitability' at New York University, September 16–18, 1988. I am indebted to Anwar Shaikh for his comments, guidance and support. I have also benefited from comments by Fred Moseley, Willi Semmler, E.A. Tonak and the anonymous referees of this journal.

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(1982)] are also limited in their treatment of determining the structure of the economy even within the context of orthodox economic measures. The absence of such studies is attributed mainly to two reasons: first, the difficulty of estimating the extent of the 'underground' economy which contributes to significantly underestimating the national income and product magnitudes, and second, the deficiencies and incompatibilities of relevant statistics for some time series. Most of the data used here, were obtained from the official sources of National Accounts and input–output tables neither of which are as detailed as the data of countries such as the U.S.

All calculations are expressed in money forms of value and are obtained from the transformation of a standard Leontief input–output system into a Marxian alternate that specifically reflects the Marxian distinction between production and circulation activities of capital. The empirical investigation contained here is limited to the 1958–1977 period since the detailed input–output data required for the transformation are available for this period only.

The remainder of the paper is divided into three sections. Section 2 provides an overview of the Marxian theoretical foundations and the corresponding measures derived from them. In section 3, the alternate framework is developed from the standard input–output scheme and the empirical calculations are carried out. Finally, section 4 provides a detailed comparison of conventional measures with the Marxian results of section 3.

2. Theoretical foundations and Marxian categories

A number of Marxian scholars interested in the empirical verification of Marx's variables accept the orthodox accounting constructs and identify variables in them, viz., wages, profits, capital–output and wage–profit ratios, with those corresponding to Marxian analysis [Glyn and Sutcliffe (1972); Rowthorn (1976)]. Thus, both the orthodox categories and those of the Marxian tradition become derivatives from the same underlying accounting procedures. Yet, every student of Marx agrees that there are fundamental differences in the theoretical structure of the two analyses; hence, the unqualified use of conventional accounting concepts is questionable [Shaikh (1978)]. In what follows an attempt is made to empirically determine the Marxian categories for the economy of Greece following the approach developed by Shaikh and recently applied in a study of the U.S. economy [Tonak (1984)].

The empirical estimates of the key variables in the Marxian system are presented for the 1958–1977 period. These variables are listed below and classified according to the Marxian notions of 'value' and 'product'.[1]

[1]All Marxian variables are in *italics* while the corresponding orthodox variables are not.

value:
- total value (TV)
- gross value added (GVA)
- circulating constant capital used up (m)
- fixed constant capital (c')
- variable capital (v)
- constant capital ($c'+m=c$)
- gross surplus-value (s_G)
- rate of surplus-value (s/v)
- organic composition of capital (c/v)

product:
- total product (TP)
- gross final product (GFP)
- intermediate use product (u)
- worker's consumption (necessary product) (C_w or n)
- gross surplus product (σ_G)

The theoretical differences between the Marxian and mainstream analyses require a process of transformation of the tools used within the framework of standard analysis (input–output and National Accounts systems) into a framework of Marxist analysis. The procedure for such transformation is quite complex, especially if it is to maintain accuracy in the 'mapping between Marxist and I–O categories' [Shaikh (1985, p. 5)]. It should be noted, however, that the frequency and degree of detail in input–output and National Accounts tables vary from country to country and for this reason, it becomes necessary to modify a procedure intended for general applicability to suit a particular case. Such is the case with the data available for the Greek economy.

The orthodox input–output framework is well-known [Leontief (1986)].[2] The basic differences of the revised input–output scheme concentrate on the partition of economic activities in accordance with the Marxian criterion of productive and unproductive activities and the removal of fictitious elements included in the finance and rental activities necessarily present in the orthodox schemes to insure the required balance of double-entry accounting principle. The partition of activities also necessitates adjustments in the inter-industry purchases and sales, gross value added, consumption and gross final demand blocks of the input–output system and each of these in their turn are further adjusted internally, as a result of applying the same criterion of productive and unproductive activities and labor. The conventional elements of the typical input–output model, including the accounting relationships

[2]The standard Leontief input–output configuration contains five components: (1) inter-industry flows, (2) value added flows, (3) final demand flows, (4) a labor vector, and (5) a capital vector. In the procedure used in here, only the first three are operational.

Year 1960 — Panel a

STEP 1. Production

		PRODUCT							
		Production (u =u)	Workers Nec. Consumption (n = CW)	Non-Workers Consumption Cπ	Investment I	Imports and Exports ΣX	Government Expenses G	Gross Final Product GFP =GFD	Total Product TP =GP
VALUE	PRODUCTION (m = m)	91942.2	50304.0	52507.0	28307.0	-8231.0	20502.0	143389.0	235331.2
	WAGES (v = W)	50304.0							
	PROFITS ($S_G = G_\pi$)	93084.0							
	GROSS VALUE ADDED (GVA =GVA)	143388.0							
	TOTAL VALUE (TV = TV)	235330.2							

KEY:
- ---- TOTAL PRODUCT = *TP*
- ——— TOTAL VALUE = *TV*
- *GFP* (Includes m_T)
- *GVA* (Includes m_T)
- m_T (In *GFP* and *GVA*)

Fig. 1. Marxian versus I/O standard measures step-by-step graphical procedure (constant 1970 prices in million drachmas).

Panel b

STEP 2. Production and Trade

		PRODUCT							
		Production (u =n	Trade uT=mT	Productive Workers Nec. Consumption n =CW$_p$	Non-Workers Consumption Cπ	Investment I	Imports and Exports ΣX	Government Expenses G	Gross Final Product GFP	Total Product TP
VALUE	PRODUCTION TRADE	86586.2	5356.0	48328.0	54483.0	28307.0	(-8231.0)	20502.0	148745.0	235331.2
	WAGES	48328.0								
	PROFITS	100416.0								
	GROSS VALUE ADDED GVA	148744.0								
	TOTAL VALUE *TV*	235330.2								

KEY: [See Panel a]

Fig. 1 (*continued*)

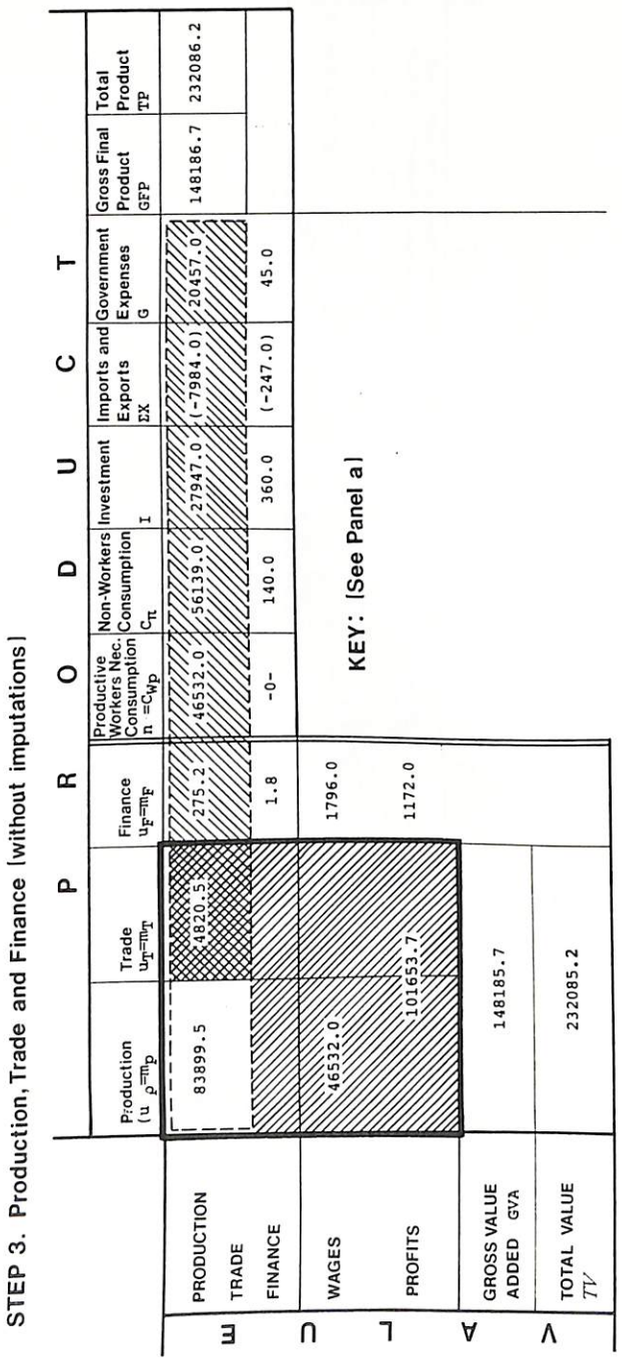

Fig. 1 (*continued*)

recast in the Marxian categories and relationships, are preserved in the modified format of the model. Thus, the vertical sum of inter-industry inputs, plus variable capital, plus surplus output, equals gross output. Also the horizontal relationship of the inter-industry outputs, plus personal consumption, plus surplus product equals gross product. Subtracting the inter-industry transactions from each of these two relationships results in the equality between value added (vertical relation), and final use (horizontal relation).

The partition of the standard input–output framework into its productive and unproductive segments along with the necessary adjustments to remove the fictitious elements, yields the Marxian framework within which the alternate categories are calculated. The procedure for the transformation of the orthodox scheme into the Marxian configuration, as it is applied for the partitioning of the Greek economy specifically, allowing for the calculation of the corresponding Marxian categories, is presented in a step-by-step transformation graphically in fig. 1.

Once the transformation of the standard input–output accounting system has been performed, the calculation of the Marxian variables can be easily carried out. Thus, the values of (m), (v), (s_G) and ultimately the revised (GVA) are computed and balanced with (u), (n), (σ_G) and the revised (GFP) respectively. The balance of the sub-totals necessarily render the grand totals of (TV) and (TP) equal.

The categories of $\underline{c}$, $\underline{v}$ and $\underline{s}$ are required to construct three fundamental quantitative relationships of Marxian analysis. The *organic composition of capital* (OCC$=c/v$), the *rate of surplus-value* (RSV$=s/v=\sigma/n$). and the *rate of profit* ($r=s/c+v=$RSV$/(1+$OCC$)$). These relationships form the core of the Marxian analysis; they are not and cannot be considered identical to the orthodox relationships of capital–output ratio, profit–wage ratio and the rate of profit as these are determined within the conventional methodology [Shaikh (1978)]. The issue of productive and unproductive labor distinction is most significant in the concretization and computation of *variable capital* in the pure Marxian sense. Defining productive labor has been subjected to various methodological approaches.[3] Within the Marxian tradition the theoretical foundations are firm; productive labor must produce and reproduce surplus-value, unproductive labor produces no surplus-value but, in fact, decreases it. Although there are many labor activities that may be necessary, they nevertheless are unproductive. Certainly activities of searching for buyers, keeping the books, accounts and correspondence 'are not incurred in producing the use value of commodities, but in realising their value. They are pure costs of calculation' [Marx, *Capital* (vol. III, p. 289)]. In

[3]To be sure the literature on the distinction of productive and unproductive labor abounds. See for example the writings of Coontz (1965), Gough (1972), O'Connor (1974), Driver (1980) and others.

addition even though the State's activities include productive activities, there is a large number of them that are unproductive despite their necessity in the complex system of advanced societies.[4] The distribution of labor employment into productive and unproductive uses has far-reaching implications in the working of a complex economy, in that an uneven distribution at the expense of productive activities can upset the process of expanded reproduction and accumulation, the most central feature of capitalism as a system of production [Shaikh (1980)]. The significance of how labor is distinguished and classified is paramount in setting a 'blue-print' for the correspondence of Marxist categories with official data. Although official statistics tend to be similar among national economies, adjustments are usually required to reflect unique features of a particular economy. In the case of Greece, the distribution of labor and the basis for such distribution are discussed below. In general, wages for labor expended on unproductive activities (circulation activities) within the sphere of production are not part of variable capital but part of surplus-value. *Variable capital* then is equal to wages of workers in productive activities ($v = \mathrm{Wp}$).

Surplus-value constitutes the remainder of gross value added after the exclusion of variable capital ($s_G = GVA - v$). Even though Marx distinguishes surplus-value in *absolute* and *relative* terms, the level of abstraction employed here considers surplus-value in its aggregate form and not its subdivisions.

Finally, *constant capital* is the aggregate of fixed and circulating capital. The circulating fraction is determined simply from the inter-industry flows (m), while the fixed part of constant capital (c') presents a difficulty in its calculation, especially for Greece, since no data exist on the origin of the capital stock. The input–output tables include in the final demand block the money-form of gross investment and the change of stocks, but in order to accurately determine c', it is necessary to analyze the relevant data given in the National Accounts.

3. The structure of the Greek economy

The input–output tables of the Greek economy are available for the 1958–1977 period in both current and constant 1970 prices. The tables consist of 35 business sectors, 6 final demand categories and 3 value added categories. The rental of dwellings sector has no labor content in the value added block. The final demand block consists of 2 consumption categories (private and public), 2 investment categories (fixed and change in stocks) and the two categories of foreign trade (exports and imports), while the value added block contains information on wages and salaries, indirect taxes net of

[4]The role of the State is another issue of much controversy especially among Marxian and Neo-Ricardian writers.

subsidies and other value added. We distinguish sectors as productive or unproductive as follows:

productive:
agriculture,
mining and quarrying,
manufacturing,
utilities (electricity, gas, water),
construction,
transportation and storage,
communications,
miscellaneous services,

unproductive:
wholesale and retail trade,
banking, insurance, real estate,
rental of dwellings,
public administration, defense (public services).

The tables in the National Accounts include the health and educational services sectors, irrespective of whether these are privately provided or under the auspices of the State in the miscellaneous services sector. In contrast, the input–output tables distinguish these sectors as private and public. These, then, when provided privately are included in the input–output sector listed as *other services*. On the other hand, when these activities are under the tutelage of the State, then they are correspondingly included in the sector listed as *public services*. In terms of the Marxian distinction of whether these are productive or unproductive sectors, the determination can be based on the criterion of surplus-value creation. Then, and in accord with Marx, the private enterprises employing labor for the creation of surplus-value are productive; those of the State are assumed not to create surplus-value and are considered unproductive. Under this criterion, the *other services* sector is listed in the productive activities category and the *public services* sector in the unproductive category, respectively. The distinction in the case of the Greek economy, however, is not as simple as it appears. A careful analysis of the entire State sector will show that some activities can be considered 'industrial' and therefore may be in the production sphere and/or in the circulation sphere. In addition we need to decide how to treat the general State activities for the maintenance and reproduction of the social order: police, judicial, defense, public administration, etc., which, although necessary, are not productive. It is necessary therefore to obtain detailed data on the State activities[5] which are not included in the standard input–output

[5]The procedure and the data required for such an analysis of the State have been carefully outlined in Shaikh (1978, 1985). In addition an empirical study on the State was recently completed for the U.S. economy [Tonak (1984)].

models. Information is usually ascertained from the National Accounts as part of the State revenues and expenditures. In this study, however, because of insufficient data we have assumed that the public services sector is productive. This assumption, given the crudity and level of aggregation of the data is unlikely to cause significantly misleading estimates.

The approximation of the actual values is obtained from the transformation of the standard input–output configuration into the Marxian input–output framework. In fig. 1, the procedure applied in each step transforms the values of the orthodox categories into the Marxian correspondents for the sample year 1960. The Marxian variables (m), (v), (s_G) take new numerical values at each step of the procedure (shown in panels a, b, and c of fig. 1) with the ultimate values determined at the last and summary step. Once the last step (step 3 in this case) is completed, the values of the Marxian variables are determined. The calculated values for (v) are further adjusted by extracting the salaries of corporate officers and those of other workers involved in the commercial activities of the productive sectors, i.e., salespersons, traders, etc., which are considered unproductive, even though they are performed within the sphere of production. The difficulty, however, in calculating these types of data is enormous and only a very rough approximation can be made. Data in the Survey of Labour Force for 1983, computes the executive and senior administrative personnel for 1961, 1971 and 1983 and gives the sectoral distribution of personnel for 1983. In 1983 the senior executives were primarily concentrated in the manufacturing (approx. 26%), construction (11%), banking and insurance (11%) and other services sectors (52%). Assuming the distribution was the same in 1961 and 1971 the number of individuals for each sector was computed for these years.[6] The 1971 estimates were subsequently contrasted with estimates in a study of distribution of income in Greece for 1973 (Athanasiou). Income class estimates for salaried employees in the manufacturing and services sectors were compared based on the following assumptions: (i) corporate officers occupy the highest classes of income, and (ii) salespersons, traders, etc., are evenly distributed across all classes of income. On the basis of these assumptions, I estimated the 1973 salaries of senior level executives, excluding those in the trade, banking and insurance sectors, to be 5,731.3 million drachmas, while the estimate for salespersons, traders, etc., in the productive sectors amounted to 710.1 million drachmas, both measured in 1973 prices. Deducting these figures from total wages for productive (Wp) activities for 1973 (130,908 million drachmas) yields $Wp' = 124{,}466.6$ million drachmas.

If it is assumed that the ratio of Wp'/Wp $(=0.9507)$ remained constant

[6]This assumption would seem to contradict the official data showing an increase of 270% in the number of individuals for the category of executive and administrative personnel, but what we are assuming here is first, that the large increase took place after 1974 and second, that the sectoral percent distribution remain stable during the largest part of the 1958–1977 period. Thus, the estimates of the Marxian categories are more conservative.

over the entire period 1958–1977, in current and constant 1970 prices, all values of the Marxian categories calculated under the first approximation procedure can be adjusted to reflect the further distinction of productive and unproductive labor *within* the productive sectors.

Constant capital, as we have mentioned earlier, is comprised of fixed and circulating capital. Circulating constant capital is determined from the revised input–output scheme whose values are equal to m. Fixed constant capital (c'), however, presents an unusually difficult problem, especially for the Greek economy, since information about its productive and unproductive nature is required. Only capital invested in the means of production can be considered; capital invested in the means of circulation cannot [Moseley (n.d., pp. 8–10)]. Empirical studies estimating constant capital within the Marxian framework have been attempted, primarily for the U.S. economy, but with very different results and indeed opposite conclusions [Moseley (n.d.); Wolff (1979)]. In this study, I follow for the most part the methodological procedure used previously by Moseley, but with some modifications because of insufficient data for the economy of Greece. Following Moseley and adjusting for these inadequacies I calculate the fixed constant capital as follows: Fixed Constant Capital = Fixed Constant Bus. Capital(Kbus) = Total Capital Stock (K) − Capital Residential Stock (Kres) − Capital Stock for Government unproductive activities (Kgov).

As was mentioned earlier, some government activities, e.g., public administration, defense, etc., are not considered surplus producing and therefore fixed capital invested in them is subtracted. On the other hand, fixed constant business capital, as shown in the relationship above, is assumed to be all productive capital, i.e., no provision to adjust for unproductive business capital invested in office, computing and accounting machines is made since such data simply do not exist.

All three relationships show stable trends for the economy of Greece. The organic composition of capital is increasing for the entire 1958–1977 period, although the rate for 1977 is lower than the corresponding rates of 1975 and 1976, most likely due to the provisional nature of the data in the original input–output table for that year. Similarly, the rate of surplus-value follows the same increasing trend but the values show the presence of some instability. Finally, the rate of profit shows a declining trend, a 'tendency to fall', for the entire 1958–1977 period. All these trends can be seen clearly in the illustrations of figs. 2 and 3.[7]

It is important to note that the transformation of the orthodox values into the corresponding Marxian categories requires that two other adjustments be considered and taken into account.[8] Both adjustments involve imputed estimates for rents and finance charges. However, such adjustments to the

[7]Data and detailed calculations on which results are based are available on request.
[8]These adjustments are considered in detail in Shaikh (1978, 1985).

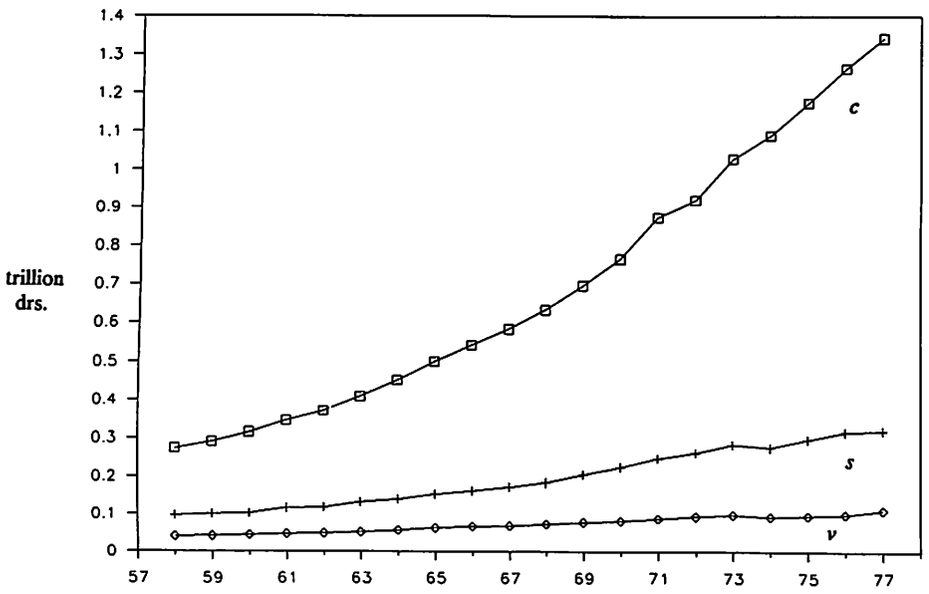

Fig. 2. Marxian categories.

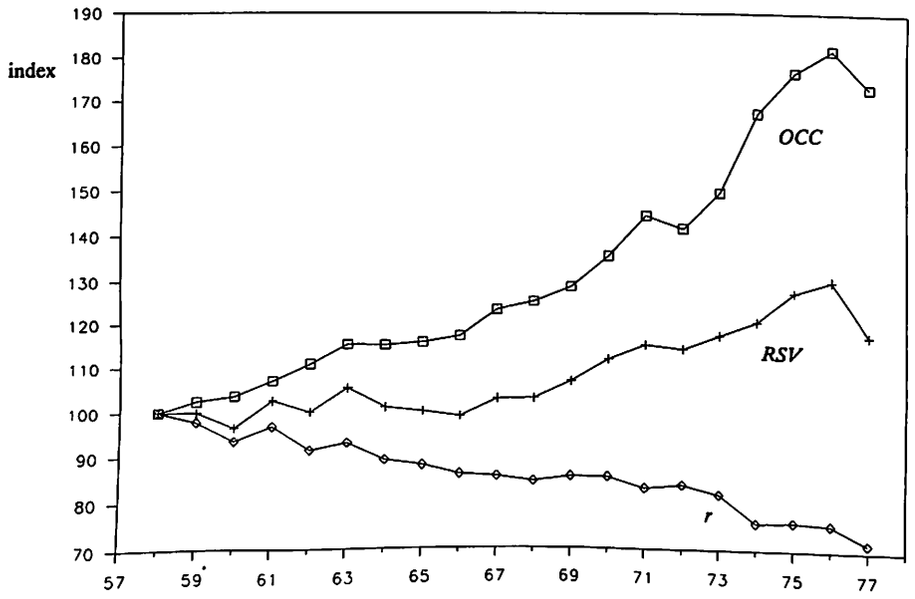

Fig. 3. Marxian relationships.

revised input–output table are not possible in this empirical investigation since data do not exist. Neither the standard input–output tables nor the National Accounts for Greece provide this information and the estimates for rental transactions available for a single year (1973) are extremely crude and very unreliable. However, the exclusion of these two adjustments does not, we believe, materially affect our estimates.

The trends shown in figs. 2 and 3 might be attributed to the economy operating at varying levels of capacity utilization during the same period; hence, raising the possibility of underconsumption [Sweezy (1966, pp. 162–186)]. In principle, a decreasing rate of capacity utilization (U) can account for a falling rate of profit and a rising organic composition, since both are dependent on U.[9] Data relating to capacity utilization measures for the economy of Greece are either unreliable or deficient [Negreponti-Delivanis (1981)]; it is nevertheless possible to construct a crude measure of U using the conventional method of the *Wharton Index of Capacity Utilization* [Klein and Summers (1966)].

The Wharton measure of capacity can be determined by a simple procedure of deductive calculations based on the maximum output attained for peak years over a certain period. Output at peak years is taken as capacity output which is assumed to grow linearly along a straight-line path between successive peaks. For the years after the last peak, capacity is assumed to follow the same growth path observed before that peak and in such years where the actual values exceed the trend, the actual values become the peaks. Hence, the rate of utilization does not exceed 100, and it is 100 at every observed peak. In determining a capacity measure for an economy as a whole, industries are aggregated using value added weights. Capacity output can be read from the capacity output frontier, while the utilization rate (U) is equal to the ratio of actual output to capacity output [Perry (1973, pp. 708–710); Hertzberg et al. (1974, p. 55)].

The actual output for the Greek economy, measured in terms of GDP at constant 1970 prices, is shown in fig. 4. Notice that although the real GDP curve is fairly smooth, we can still identify years 1958, 1961, 1965, 1969, 1973 and 1976 as peak years within the twenty-year period, 1958–1977. Capacity output estimates can be read off the capacity output frontier shown in fig. 4. The adjusted rates r_a and OCCa are contrasted with the actual rates r and OCC in fig. 5. Notice that the adjusted rates follow similar trends, viz., a falling rate of profit with a simultaneous rise of the organic composition of capital.

There are obvious drawbacks in applying the Wharton methodology for calculating capacity utilization, namely, its treatment of each peak output as

[9]Since $r_a = r/U$, where r_a is the adjusted rate of profit and $OCCa = OCC \times U$, where OCCa is the adjusted OCC.

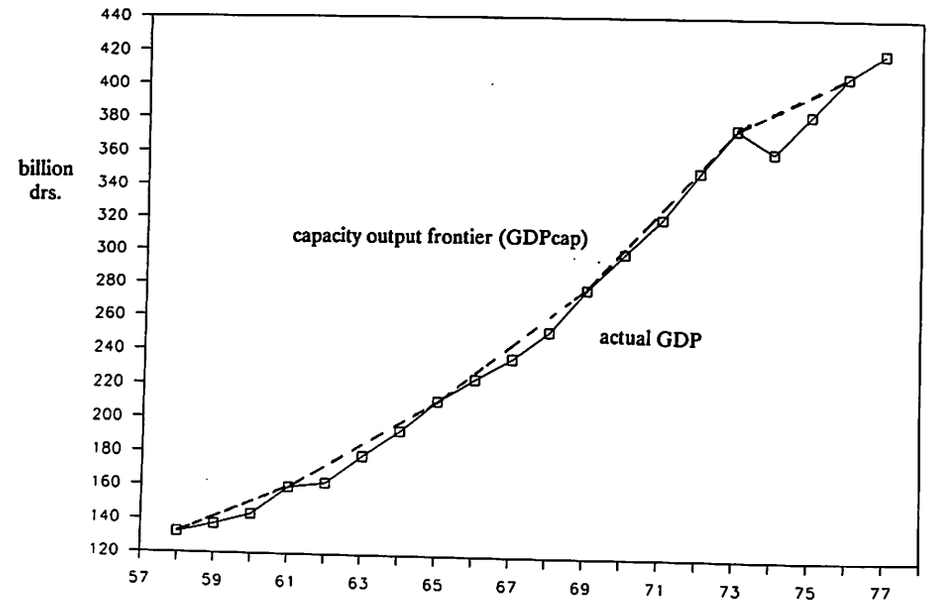

Fig. 4. Actual and capacity measures of GDP.

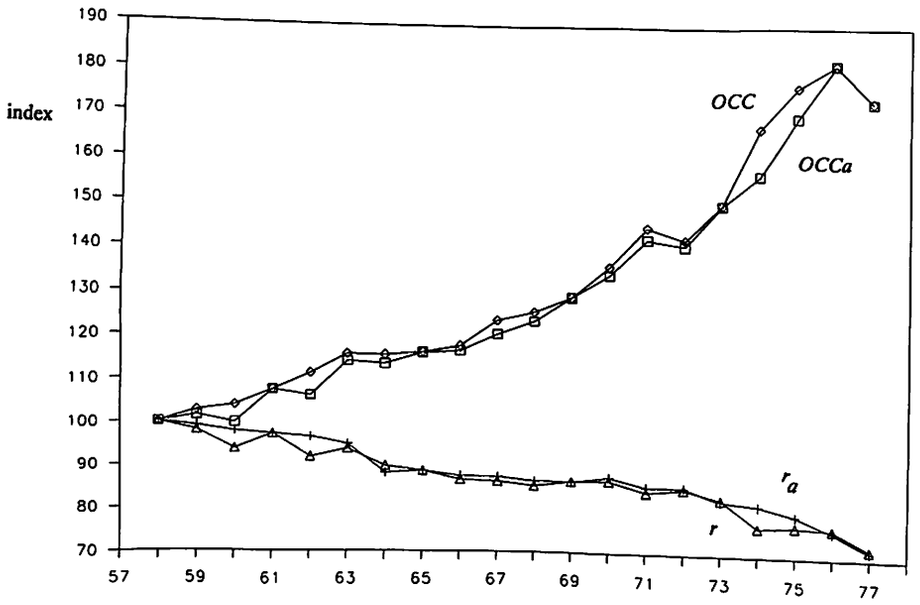

Fig. 5. Marxian measures: actual versus capacity adjusted.

revised input–output table are not possible in this empirical investigation since data do not exist. Neither the standard input–output tables nor the National Accounts for Greece provide this information and the estimates for rental transactions available for a single year (1973) are extremely crude and very unreliable. However, the exclusion of these two adjustments does not, we believe, materially affect our estimates.

The trends shown in figs. 2 and 3 might be attributed to the economy operating at varying levels of capacity utilization during the same period; hence, raising the possibility of underconsumption [Sweezy (1966, pp. 162–186)]. In principle, a decreasing rate of capacity utilization (U) can account for a falling rate of profit and a rising organic composition, since both are dependent on U.[9] Data relating to capacity utilization measures for the economy of Greece are either unreliable or deficient [Negreponti-Delivanis (1981)]; it is nevertheless possible to construct a crude measure of U using the conventional method of the *Wharton Index of Capacity Utilization* [Klein and Summers (1966)].

The Wharton measure of capacity can be determined by a simple procedure of deductive calculations based on the maximum output attained for peak years over a certain period. Output at peak years is taken as capacity output which is assumed to grow linearly along a straight-line path between successive peaks. For the years after the last peak, capacity is assumed to follow the same growth path observed before that peak and in such years where the actual values exceed the trend, the actual values become the peaks. Hence, the rate of utilization does not exceed 100, and it is 100 at every observed peak. In determining a capacity measure for an economy as a whole, industries are aggregated using value added weights. Capacity output can be read from the capacity output frontier, while the utilization rate (U) is equal to the ratio of actual output to capacity output [Perry (1973, pp. 708–710); Hertzberg et al. (1974, p. 55)].

The actual output for the Greek economy, measured in terms of GDP at constant 1970 prices, is shown in fig. 4. Notice that although the real GDP curve is fairly smooth, we can still identify years 1958, 1961, 1965, 1969, 1973 and 1976 as peak years within the twenty-year period, 1958–1977. Capacity output estimates can be read off the capacity output frontier shown in fig. 4. The adjusted rates r_a and OCCa are contrasted with the actual rates r and OCC in fig. 5. Notice that the adjusted rates follow similar trends, viz., a falling rate of profit with a simultaneous rise of the organic composition of capital.

There are obvious drawbacks in applying the Wharton methodology for calculating capacity utilization, namely, its treatment of each peak output as

[9]Since $r_a = r/U$, where r_a is the adjusted rate of profit and $OCCa = OCC \times U$, where OCCa is the adjusted OCC.

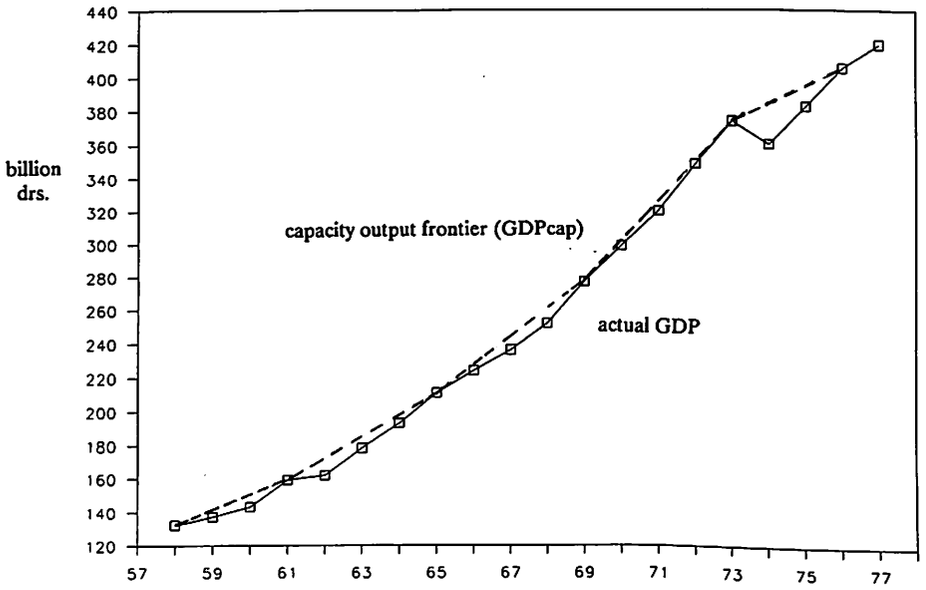

Fig. 4. Actual and capacity measures of GDP.

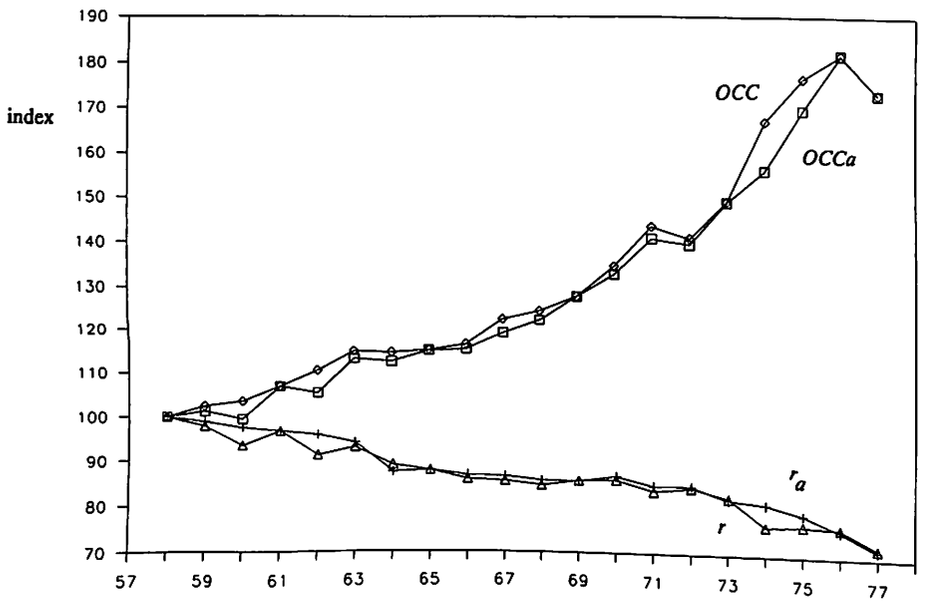

Fig. 5. Marxian measures: actual versus capacity adjusted.

a point of full capacity. However, crude as these measures may be, they nevertheless show that for the case of Greece no incidence of Sweezy's undercomposition can be inferred.

4. Summary and conclusions

In this paper, the attempt to estimate the Marxian measures of the Greek economy for the period 1958–1977 has shown that the trends of the Marxian categories of economic variables over the twenty-year period (1958–1977) deserve serious consideration. For the empirical evidence shows that there is a tendency for the rate of profit to fall while at the same time both the rate of surplus-value and the organic composition of capital tend to rise. The money value of the mass of profit or surplus-value over the twenty-year period under examination increased by approximately 233% , while the rate of profit decreased by about 28%. At the same time, the value of constant capital increased approximately 390%, while that of variable capital increased 181%, all measured in constant 1970 prices. The results differ substantially from those estimated in accordance with the orthodox tradition. As was indicated earlier the basic Marxian categories can be compared with the orthodox ones. In what follows, such a comparison is taken up.

We begin our comparative analysis with the Marxian category of the rate of surplus-value and that of the profit/wage ratio of the orthodox tradition. In orthodox terms, the Marxian category of the rate of surplus-value is equivalent to the ratio of 'gross profit on sales' ($\pi^* = s/v$) over the 'wages and salaries of the production workers' (Wp), while the profit–wage ratio usually refers to either 'enterprise profit' net of indirect taxes (π) over the total wage bill ($W = Wp + W_u$) or pre-tax 'enterprise profit' (p) over the total wage bill. The estimated values of the rate of surplus-value (s/v) and the values of the profit/wage ratios (π/W or p/W) are tabulated in table 1. These are also graphically depicted in fig. 6, in which it can be observed that all three ratios exhibit upward trends. Over the twenty-year period (1958–1977), the rate of surplus-value rises from 244% in 1958 to 317% in 1976, while correspondingly, the net profit–wage ratio rises from 166 to 185% and the pre-tax profit/wage ratio from 193 to 222%. In 1977 all ratios drop considerably and I believe this can be attributed to the provisional nature of the year's statistical data. More important, however, these results suggest that for the Greek economy the 'profit-squeeze' hypothesis calculated in either form, π/W or p/W, would not be easy to validate, even on orthodox grounds.

The second comparison involves the assumed correspondence between the organic composition of capital (c/v) and the capital–output ratio (K/Q).[10]

[10]The assumed trend correspondence between the organic composition of capital and the capital–output ratio has been suggested by Glyn and Sutcliffe (1972) who associated a constant organic composition of capital with the stability of the capital–output ratio.

Table 1

Conventional measures versus Marxian results – Greek economy 1958–1977.

Year	π/w	p/w	s/v	K/Q	c/v	$c/v+s$
1958	1.66	1.93	2.44	2.53	6.91	2.01
1959	1.67	1.93	2.44	2.64	7.08	2.06
1960	1.57	1.85	2.35	2.78	7.16	2.14
1961	1.68	1.97	2.50	2.72	7.39	2.11
1962	1.59	1.90	2.43	2.94	7.65	2.23
1963	1.68	2.00	2.57	2.90	7.96	2.23
1964	1.60	1.93	2.46	2.95	7.95	2.30
1965	1.57	1.90	2.44	2.96	7.99	2.32
1966	1.53	1.88	2.41	3.06	8.10	2.37
1967	1.57	1.94	2.51	3.17	8.51	2.42
1968	1.53	1.92	2.52	3.28	8.64	2.46
1969	1.57	1.98	2.61	3.30	8.87	2.46
1970	1.64	2.06	2.74	3.32	9.35	2.50
1971	1.65	2.05	2.82	3.36	9.96	2.61
1972	1.68	2.07	2.79	3.39	9.77	2.58
1973	1.72	2.10	2.87	3.43	10.34	2.67
1974	1.78	2.10	2.95	3.72	11.58	2.93
1975	1.83	2.21	3.11	3.76	12.21	2.97
1976	1.85	2.22	3.17	3.77	12.57	3.01
1977	1.77	2.14	2.88	3.89	11.99	3.09

The estimated values of the organic composition of capital and those of the capital–output ratio calculated on the basis of conventional measures, both unadjusted for capacity utilization are shown in table 1. In addition, table 1 includes the ratio of $[c/(v+s)]$ which has been identified in some writings as the proper measure for the organic composition of capital.[11] As can be seen clearly from fig. 7, all three ratios show rising trends, with the Marxian organic composition (OCC, c/v) in a more pronounced way than the other two. Over the twenty-year period, the organic composition rose from 691% in 1958 to 1257% in 1976, while the capital–output ratio rose from 244 to 335% and the $[c/(v+s)]$ from 201 to 301% with the 1977 values showing a drop again as a result of the provisional nature of the raw data. Even though there appears to be a relative trend correspondence between the capital–output ratio and the $[c/(v+s)]$ ratio, no evidence of stability in the former or constancy in the latter is observed to prove the assumed correspondence of the two trends as the Glyn and Sutcliffe thesis would argue. On the contrary, the assumed correspondence between stock categories of the Marxian and orthodox analyses would run to similar problems of inconsistency along the same lines of the flow categories. 'In particular, the category of the *stock* of capital plays a very important role in Marx's theory of accumulation, in which

[11]Glyn and Sutcliffe identify the organic compoisition of capital as $c/v+s$. On the other hand the alternate form of $(c/c+v)$ has been used by Sweezy.

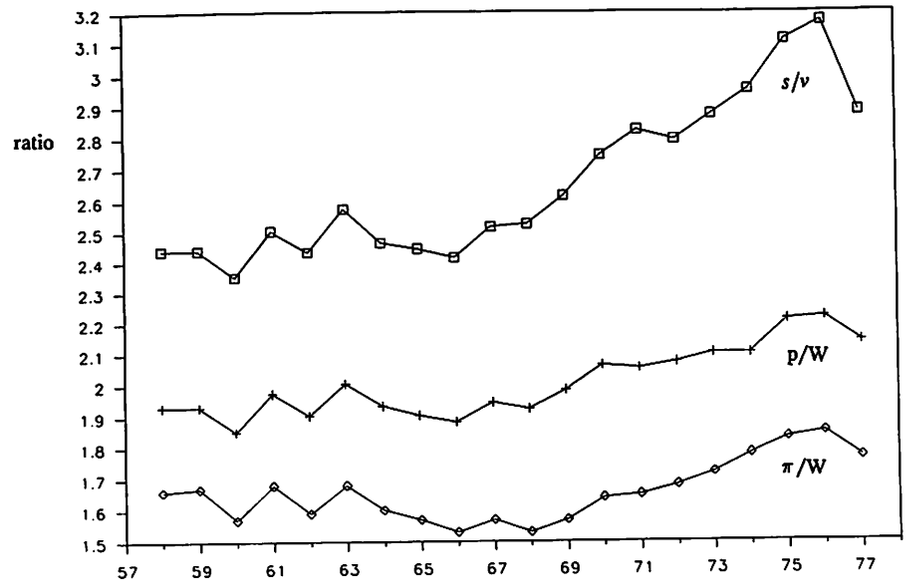

Fig. 6. Profit–wage ratios versus rate of surplus-value.

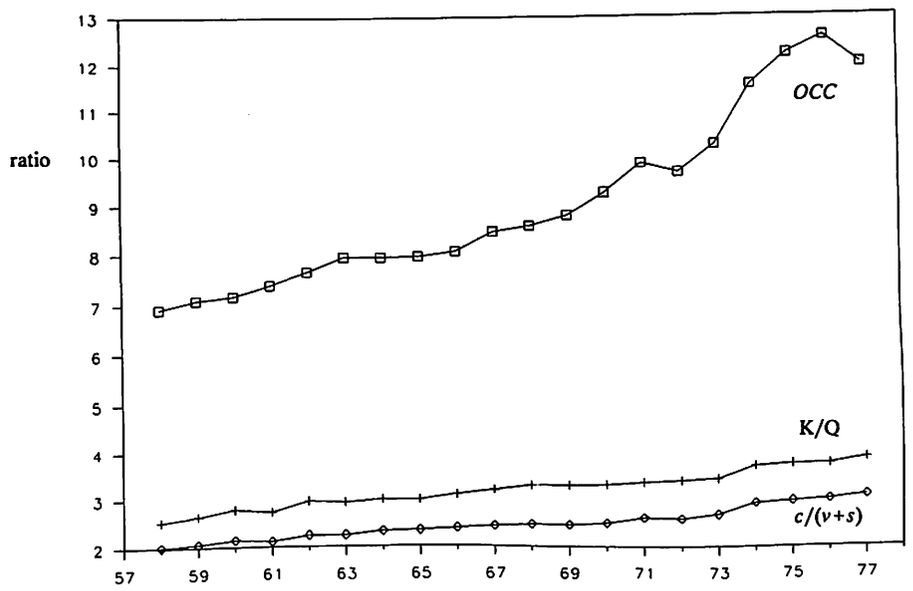

Fig. 7. Capital–output ratio versus organic composition of capital.

. . . a rising rate of exploitation coupled with a rising organic composition manifests itself as a falling rate of profit' [Shaikh (1978, p. 45) emphasis in original]. This is certainly consistent, at least for the economy of Greece, as the empirical results depicted graphically in figs. 3 and 5, testify. There, we see that over a twenty-year period, the rate of surplus-value is rising along with a simultaneous rise in the organic composition of capital which manifests itself in a falling rate of profit, the latter falling by almost 30%.

A third comparison can be made to determine productivity measures of labor employed in 'productive' activities as opposed to the orthodox measure of productivity of the labor force in general. Since reliable data on the Greek labor force is only available for Census years, we restrict our estimates on productivities to 1961 and 1971, both Census years. Defining the ratio $q = TP/L_p$ and $y = GDP/N$, we obtain

Year	q	y	q/y
1961	82.72	43.80	1.89
1971	198.28	98.98	2.00

This shows rising trends of both ratios. Further, there appears to be an increase in the productivity of labor in productive activities (q) in relation to the labor productivity of the entire economy (y) as seen by the increase in the ratio of (q/y) from 1961 to 1971. Even though these measures can be contested as limited in scope, the view that low labor productivity as a reason for the lack of 'investing animal spirits' by Greek industrialists can nevertheless be questioned.

The above comparisons show quite clearly that the differences in theory between the orthodox and Marxian traditions are also reflected in practice. This is not surprising since 'the beginning is different, the method is different, the categories are different, the very purpose is different' [Shaikh (1978, p. 1)].

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Good survey of Stigler & other commentators on Ricardo's "93%" theory

Seminar: Ricardo, Sraffa, Marx
Prof. Shaikh

A

DID RICARDO HAVE A LABOR THEORY OF VALUE?

David R. Grossman

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This paper will start by looking at what Ricardo had to say about value in the third edition of his Principles of Political Economy. Then George Stigler's interpretation of Ricardo's theory of value will be looked at, followed by other commentators who expanded upon Stigler's interpretation. Then, in the fourth section, the views of some opponents of the Stigler interpretation will be presented. Finally, Marx's critique of Ricardo will be presented.

In section I, chapter I (On Value) of his Principles of Political Economy, Ricardo states the following:

> The value of a commodity, or the quantity of any other commodity for which it will exchange, depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour.[1]

In other words, the exchange value, or relative price of a commodity is determined by the relative quantity of labor embodied in it. Thus, by value Ricardo means exchange value, or relative price, and he is therefore putting forward a labor theory of relative price. It can be seen in the above quotation that Ricardo is concerned with trying to find a theory of value that would not be affected by changes in money wages.

Ricardo then qualifies his labor theory in two ways. First, he states that the labor theory does not apply to those goods which have their relative values determined solely by scarcity. This is not a problem because scarce commodities only form a very small part of the mass of commodities daily exchanged in the market.[2] Second, he points out that the labor theory applies only to those goods produced and sold in a competitve economy. This rules out any sort of monopoly pricing.

With these two qualifications, Ricardo's embodied labor theory of relative price as presented in section I can be represented as follows:

$$\frac{V_{x1}}{V_{x2}} \cong \frac{L_{x1}}{L_{x2}}, \quad [3]$$

where the V's represent the value of goods X_1 and X_2, and the

L's represent the embodied labor imputs per unit of output. This can also be written as $\frac{L_{x1}}{L_{x2}} \simeq \frac{P_{x1}}{P_{x2}}$ where the P's stand for the prices of goods X_1 and X_2. Ricardo's aim is spelled out in an article by L.E.Johnson:

> It must be stressed, however, that Ricardo was not interested in explaining this static price ratio - the neoclassical problem - but only in showing that changes in P_{x1}/P_{x2} would conform rather closely, though not identically to changes in L_{x1}/L_{x2}.[4]

In section II, Ricardo gets rid of the problem of labor of different qualities being differently rewarded and concludes that "this is no cause of variation in the relative value of commodities." In the words of Schumpeter:

> First of all he moved two difficulties out of his way, that of the difference in quality of labour by pointing out that the different kinds of labour soon crystallize into a firm relation of values, so that they can all be as it were reduced to one type of 'normal labour.' Similarly he dealt with the fact of the uneconomical use of labour which does not determine its exchange value, by stressing the 'necessary' or, 'customary' quantity of labour (Marx's socially necessary labour).[5]

Therefore, an hour of superior labor(more skilled, etc.) is expressed as a multiple of a normal labor hour. By doing this Ricardo was able to talk about a general wage rate rather than a series of rates. A stable relative wage pattern was to be expected and therefore, the question of how the scale of differential wages gets determined became irrelevant.

With the continued assumption that labor is the only input, the equation of relative price determination can be expan-

ded to the following:

$$\frac{P_{x1}}{P_{x2}} = \frac{L_{x1} \cdot W_{Lx1}}{L_{x2} \cdot W_{Lx2}}.$$

This says that the price of the product is equal to the average labor requirement times the standard money rate of reward. The W's stand for the money wage rate of the labor inputs involved in the production of goods X_1 and X_2. In order for the embodied labor to determine precisely the relative price ratio, then W_{LX1} must equal W_{LX2}. Competitive labor markets and a stable distribution of skills over time ensure this result.

In section III, Ricardo looks at the problem of capital as an input. Capital, in the form of implements, tools and buildings, which is presently employed in production and which assists labor is considered to be past embodied labor. Therefore,

> The exchangeable value of the commodities produced would be in proportion to the labor bestowed on their production; not on their immediate production only, but on all those implements or machines required to give effect to the particular labor to which they were applied.[6]

Ricardo calls the implements, tools and buildings, fixed capital, and calls the wages laid out on labor as the circulating capital.

The equation for the labor theory of relative price can be written as follows:

$$\frac{P_{x1}}{P_{x2}} = \frac{L_{x1} \cdot W_{Lx1} + C_{x1}}{L_{x2} \cdot W_{Lx2} + C_{x2}},$$

where the C's represent the amount of fixed capital in money sunk in the production of goods X_1 and X_2. The price

ratio will be exactly equal to the value ratio (embodied labor ratio) if $W_{LX1} = W_{LX2}$ and $L_{X1}/L_{X2} = C_{X1}/C_{X2}$ (or, $C_{X1}/L_{X1} = C_{X2}/L_{X2}$). That is, the labor theory of relative price holds rigorously if the wage rate per unit of embodied labor is the same for both goods and if the capital-labor ratios are identical (Ricardo assumes that the fixed capitals are of equal durability).

In the same section, Ricardo discusses the effect of changes in wages on the relative values of commodities. Changes in wages would, he says, affect profits but not the determination of relative price:

> The proportion which might be paid for wages, is of the utmost importance in the question of profits; for it must at once be seen, that profits would be high or low, exactly in proportion as wages were low or high; but it could not in the least affect the relative value of fish and game, as wages would be high or low at the same time in both occupations.[7]

This passage appears in the context of Ricardo's rejection of Smith's theory. Smith had said that the labor theory of relative price holds only in the "early and rude state of society" but that once accumulation of stock and the appropriation of land begins, relative price is determined by adding up the three income shares. Ricardo's rejection of the adding-up theory is stated clearly in a footnote:

> Yet he (Smith) limits its (labor theory of value) application to 'that early and rude state of society, which precedes both the accumulation of stock and the appropriation of land;' as if, when profits and

> rents were to be paid, they would have some influence on the relative value of commodities, independent of the mere quantity of labour that was necessary to their production.[8]

In other words, the payment of profit (and rent) does not affect the relative value of a commodity since it is only the labor embodied which regulates the relative value. Any increase in the wage share only reduces the profit share leaving the relative value the same since there has been no change in embodied labor. This forms the premise for Ricardo's primary concern: distribution of the national product among the main classes of society.

So, the labor theory of relative price also holds under capitalism and

> Consequently, sections I-III represent Ricardo's statement of the labor theory of relative price in its most uncompromising form. Given his assumptions (stability of relative wages and uniform capial-labor ratios), the value ratio based on the labor embodied in a commodity can be said to precisely determine the relative prices of commodities, assuming that demand is given and that costs are constant.[9]

Then, in sections IV and V, Ricardo introduces complications which arise from the introduction of fixed capital and the return which must be paid on it.

The general rate of profit (which comes about through the migration of capitals among industries, seeking the best return) jumps into the analysis at this point and Ricardo uses it in his famous first illustration which can be shown in tabular

form:

		Corn Farmer	Cloth or Cotton Mnftr.
First Year	Wages	£ 5,000	£ 5,000
	Profit on Wages (10%)	500	500
	Price ("Value") of Product	£ 5,500	£ 5,500
Second Year	Wages	£ 5,000	£ 5,000
	Profit On Wages (10%)	500	500
	Profit On Fixed Capital (10%)	___	550 (10% of £5500)
	Price ("Value") of Product	£ 5,500	£ 6,050
After Wages Rise	Wages	£ 5,050	£ 5,050
	Profit on Wages (9%)	450	450
	Profit On Fixed Capital (9%)	___	495
	Price ("Value") of Product	£ 5,500	£ 5,995

In the first year, the corn farmer lays out 5,000 l. on wages for his workmen in order to produce corn. A cloth manufacturer and a cotton goods manufacturer each lay out 5,000 l. on wages for their workmen, who, over the course of the year, construct a machine. The value of the corn at the end of the year is 5,5001. assuming a profit rate of 10 percent. The same is true of the cloth or cotton goods. Ricardo assumes there is only circulating capital advanced (wages) and takes the general rate of profit on that amount. In the second year, the corn farmer

repeats the same process. However, each manufacturer now advances 5,000 l. in wages to workmen who now work with the assistance of a machine whose value is 5,500 l. (Ricardo is here assuming that workmen, in whatever sector, are paid 50 l.per year each, so that the farmer and the manufacturer each employ 100 workmen and therefore the same quantity of labor). It is assumed that the machine does not depreciate. The value of the cloth is not 5,500 l. but 6,050 l. because a profit of 10 percent on the invested machinery must be added on.

Ricardo then assumes that wages rise such that profits fall to 9 percent. This occurs because the value of corn remains constant due to the implicit assumption that the value of gold (the money commodity) remains constant and is produced by unassisted labor for one year as is corn. Since the rate of profit must equalize in all sectors, the 9 percent rate also applies to the manufacturer. But, while the value of corn stays constant, the value of cloth drops due to the fact that only 9 percent of 5,500 l. is now added on. It drops from 6,0501. to 5,9951. Therefore, a one percentage point drop in the profit rate caused by a wage increase, causes about a one percent "alteration" in the relative value of the goods. Therefore, Ricardo concludes that relative values will alter when wages change (and profits) if the proportions of fixed-to-circulating capitals differ. But, Ricardo does not view this as a great cause of the variation in relative values of commodities i.e. it is comparatively slight in its effects as compared

to changes in relative labor quantities. In section V, Ricardo adds two other cases in addition to capital proportions which can alter relative values independently of the quantity of labor: different durabilities of capital, and different times in bringing goods to market. Thus, it seems that all of Ricardo's modifications to his labor theory reduce to complications caused by time, or the production period.

So, a new equation can be written representing the inclusion of a general rate of profit: $\frac{P_{x1}}{P_{x2}} = \frac{L_{x1} \cdot W_{Lx1} + C_{x1} \cdot R_{c1}}{L_{x2} \cdot W_{Lx2} + C_{x2} \cdot R_{c2}}$.

Then the relation $P_{X1}/P_{X2} = L_{X1}/L_{X2}$ holds in a precise way if and only if $W_{Lx1} = W_{Lx2}$, $R_{c1} = R_{c2}$, and $C_{x1}/C_{x2} = L_{x1}/L_{x2}$ (or, $C_{x1}/L_{x1} = C_{x2}/L_{x2}$). $W_{Lx1} = W_{Lx2}$ and $R_{c1} = R_{c2}$ hold because Ricardo assumes that long-run competitive pressures bring these conditions about. The imprecision in Ricardo's labor theory is caused by the differing capital-labor ratios.

Stigler On Ricardo

George Stigler, in his famous article "Ricardo and the 93 Per Cent Labor Theory of Value"[10] castigates those commentators who believe that Ricardo clung to a pure labor theory of value even though the labor theory required some modifications. Stigler believes that Ricardo put forward an analytical cost of production theory which differed from Smith's theory "only in the exclusion of rent from costs." To show this, he quotes the following from Ricardo:

> This difference in the degree of durability of fixed capital, and this variety in the proportions in which the two sorts of capital (fixed and circulating) may be combined, introduce another cause besides the greater or less quantity of labour necessary to produce commodities, for the variations in their relative values - this cause is the rise or fall in the value of labour.[11]

In addition, he quotes Ricardo's statement in Notes On Malthus in which Ricardo equates value with cost of production and "by cost of production I invariably mean wages and profits."

Stigler then mentions Ricardo's belief that changes in the relative values of commodities by fluctuations in wages and profits were very small in comparison with those brought about by fluctuations in the quantity of labor (with a one percentage point drop in the rate of profit, the cotton or cloth in Ricardo's example vary in relative value only one percent). According to Ricardo:

> The greatest effects which could be produced on the relative prices of these goods from a rise of wages, could not exceed 6 or 7 percent; for profits could not, probably, under any circumstances, admit of a greater general and permanent depression than to that amount.[12] (Ricardo means here a decrease in the rate of profit from 10 percent to 3 percent).

This passage is the reason for Stigler's interpretation of a 93 percent labor theory of value.

Stigler then refers to the following statement by Ricardo:

> In estimating, then, the causes of the variations

> in the value of commodities, although it would be wrong wholly to omit the consideration of the effect produced by a rise or fall of labour, it would be equally incorrect to attach much importance to it; and consequently, in the subsequent part of this work, though Ishall occasionally refer to this cause of variation, I shall consider all the great variations which take place in the relative value of commodities to be produced by the greater or less quantity of labour which may be required from time to time to produce them.[13]

Stigler concludes that there is no basis for the belief that Ricardo had an analytical labor theory of value, "for quantities of labor are not the only determinants of relative values." Such a theory, according to Stigler, "would have to reduce all obstacles to production to expenditures of labor or assert the irrelevance or non-existence of non-labor obstacles."[14] But, according to Stigler, Ricardo held an empirical labor theory of value since the quantities of labor needed in production are the dominant (quantitatively) determinants of relative values. This is an empirical proposition and can not be interpreted as an analytical theory (which requires a precise determination of relative values by labor embodied).

Stigler also finds fault with Ricardo's analytical labor theory (i.e.,his labor theory of value given in sections I-III) :

> His theory was wrong in reducing all capital to previously expended labor plus interest; except in some irrelevant day of Genesis all capital has been made by the cooperation of earlier capital and labor and land.[15]

It is obvious that by interpreting Ricardo's theory as a cost of production theory or as an empirical labor theory of value, where the quantity of labor is only of quantitative importance and not analytical importance in determining relative price, Stigler is placing Ricardo as one of the crude forerunners of the neoclassical factor theory of price. However, Stigler's vantage point being that of modern supply and demand price theory, does not allow him to see where Ricardo's intentions lay. It was Marx who saw the direction in which Ricardo was heading but was unable to pursue because of certain confusions.

Other Commentators

In an article entitled "Ricardo's 93 Per Cent Labor Theory of Value: A Final Comment,"[16] George Wilson and James Pate put forward the view, that although Stigler is correct in calling Ricardo's theory an empirical labor theory of value, he is not correct in characterizing it as a 93 percent labor-embodied theory. According to Wilson and Pate, Stigler overlooks the examples Ricardo gave in editions one and two of his Principles which indicate something other than a 93 percent labor theory, in the sense that Ricardo allows non-labor inputs to be more important in the determination of relative prices. In other words, they are trying to out-Stigler Stigler.

In the example to which Wilson and Pate refer, Ricardo looks at two goods being produced, one using only fixed capital

in its production,[17] and the other using only labor. The competitive value (or price) of any commodity is represented by the following equation in Ricardo's first and second editions:

$$P = V + (C+V)i + \frac{Ci}{(1+i)^n - 1}$$

where V is variable capital equal to the wage bill, C is fixed capital (essentially machinery), and i is the rate of profit. The last term is the annuity required to replace capital equal in value to C that has durability of n time periods.[18] So, here, unlike in his example in edition three, he is taking into account depreciation, and therefore the durability of capital.

Ricardo supposes that an engine that will last 100 years and has a value of 20,000 l., without any labor whatever, could produce a certain quantity of commodities annually and that profits are at 10 percent. The whole value (price) of the goods produced would be annually 2,000 l. 2s.11d. This is so because 2,000 l. represents the profit on 20,000 l. at 10 percent and the 2s.11d. represents an annuity for 100 years at 10 percent, which, at the end of this period, will replace a capital of 20,000 l. At the same time, 20,000 l. is employed in supporting productive labor, and which is annually consumed and reproduced, in the production of a different good. With a 10 percent rate of profit, the commodities produced must sell for 22,000 l.

Ricardo then supposes labor (i.e., wages) to rise so that 20,952 l. is required now to pay the wage bill (about a 5 percent increase in wages). Profits will fall to 5 percent since

the commodities will continue to sell for 22,000 l. and to produce 20,952 l. would be required, leaving 1,048 l. as profit on a capital of 20,952 l.[19]

However, no wages are paid by the owner of the machine which lasts 100years and when the rate of profit falls to 5 percent (a general rate of profit is assumed), the price of his goods must fall to 1,0071.13s.18d., i.e., 1,0001. to pay his profits (5 percent of 20,0001.), and 71.13s.8d. to accumulate for 100years at 5 percent to replace the capital of 20,000 l. If the rate of profit fell to 4 percent, his goods would sell for 8161.3s.2d.; and when the rate of profit fell to 3 percent, for 6321.16s.7d. Thus, a drop in the rate of profit from 10 percent to 3 percent due to an increase in wages of under 7 percent, would result in a price fall of 68 percent, for any commodity produced wholly by a machine lasting 100 years.

No change would be effected on the price of the commodity produced wholly by labor. The change in relative prices in this example is independent of any change in the relative quantities of labor.

Ricardo then sums up with the following:

> ... therefore when profits fell from 10 to 3 per cent.the goods, which were produced with equal capitals, would fall
>
> 68 percent. if the machine would last 100Years
> 28 per cent. if the machine would last 10years
> 13 per cent. if it would last 3years
> and little more than 6 percent. if it would last only 1year.[20]

It can be seen that the last figure Ricardo gives is the same as the one obtained in his example of the third edition, the only difference being that, in the third edition, he assumes that the fixed capital has a production period of one year before it can be used to assist labor, but is then a perpetual asset (never depreciates). In the present example, Ricardo does not look at production time for the fixed capital, but only the durability of the machine (it depreciates fully in one year).

Thus it appears that in the first and second editions, Ricardo analytically held an "87 percent"labor theory of value, a "72 percent" labor theory, a "32 percent" labor theory, etc., as well as a 93 percent labor theory of value. In the words of P.D.Groenewegen:

> The quantitative nature of the description depends on the assumptions regarding the durability of the fixed capital and the extent of the variations in the rate of profit which are selected. It can, therefore, be concluded that in this rather meaningless quantitative sense, Ricardo provided stronger analytical arguments against the labor theory of value in the first and second edition of his Principles, than he did in the third edition.[21]

Wilson and Pate also look at Ricardo's example of the third edition dealing with the production period of fixed capital, and after putting it in mathematical form conclude that a 93 percent labor theory of value emerges (again) only because of the particular figures that Ricardo used namely a drop from a 10 percent profit rate to 3 percent, and a production period

ratio of 2 to 1 between the manufactured good and corn. If other numbers are plugged in, for example, a drop in profit rate from 25 percent to 3 percent, or from 20 percent to 3 percent and a period of production ratio between the manufactured good and corn of K/L where K>2, the variation in relative price not due to changes in labor quantities is much larger.

So, according to Wilson and Pate, and also Groenewegen, Stigler was right in characterizing Ricardo's theory as an analytical cost of production theory, but technically wrong in calling it a 93 percent labor theory of value. Stigler did not go far enough in looking at non-labor factors!

The only way to rescue the 93 percent labor theory, according to Wilson and Pate, would be to see if Ricardo's figures for production period and profit rate changes were realistic at that time in England. On the basis of the data they uncovered (they concede that the data are not totally reliable) they conclude that

> the foregoing evidence, although scattered and fragmentary, clearly offers no support for the belief that Ricardo's illustrations or even the main general features of his value theory derived much from the facts that were presumably available to him.[22]

So much for Wilson and Pate.

The conclusion that Groenewegen comes to is that even though Ricardo recognized the difficulties involved in a labor theory of value, he regarded it as a useful approximation in the analysis of certain economic problems. In fact, the main

problem with which Ricardo was concerned, the distribution of the national product among the three classes of society over time, required an analytical labor theory of value for its solution. In other words, it had to be assumed that capital-labor ratios, durabilities of capital and time to market, were uniform in all industries such that an increase in money wages (with real wages constant) caused by the diminishing returns in agriculture (corn made up most of the real wage and no technical progress assumed), would not cause any change in relative values. Since relative values would remain unchanged(in terms of some invariable standard) the value of the national product in labor embodied terms could be ascertained. Then it could be shown that, in labor embodied terms, wages and rent grew as a proportion of the national product, while profits as a proportion (and ultimately in absolute terms) fell. Pasinetti has shown mathematically that the assumption of uniform capital-labor ratios, etc., is a necessary condition in order to reach Ricardo's conclusions on distribution.[23] Therefore, since the assumption is a restrictive one, Ricardo's conclusions flowing from an analysis implying such a condition, are to be considered a special case.

Groenewegen refers to Sraffa's analysis in the Introduction To Ricardo's Works which sees Ricardo's solution to the distribution problem as using value as an extension of his earlier corn model argument in his Essays On Profits:

> In the 'corn economy' the rate of profit could be simply expressed as the ratio of 'neat produce' to wages fund, both expressed in physical quantities of corn. In a more general model, a similar simplicity could be obtained if both inputs and outputs could be expressed in terms of a single physical measure, which appeared in one form or another among the inputs and the outputs. Ricardo found this desired quality in quantities of labor time, to which, under certain assumptions, both inputs and outputs could be reduced. The rate of profit, as Ricardo argued in an important passage in the Principles, then depends on the 'proportion of the annual labour of a country...devoted to the support of the labourers.' In this manner, Ricardo was able to generalize his 'corn model' of distribution in the Principles by using the simplifying assumption of equal production periods in all sectors of industry which reliance on the labor theory required.[24]

So, Ricardo's general model of distribution is really just a blown up version of his corn model because of his assumption of equal production periods in all industries. Thus, Ricardo ignored the analytical difficulties he ran into in his labor theory of value in order to show the independence of value and distribution.

Ricardo also (in effect) denies the general validity of his distribution results, according to Groenewegen, when he introduces his chapter "On Machinery" in the third edition. Here Ricardo recognized technical progress in the form of substitution of machinery for human labor. By doing so, Ricardo acknowledged that the production periods for an industry which substituted machinery would change and be different from the assumed uniform period. Therefore, the results flowing from the use of a "100 percent" labor theory of value would no lon-

ger apply. Therefore, Groenewegen concludes, the analytical difficulties that Ricardo had with the labor theory of value and the relegation of Ricardo's distribution model to a special case uphold the general validity of Stigler's interpretation of Ricardo's theory of value.

Opponents Of The Stigler Interpretaion

Opponents of the Stigler view maintain that Ricardo did not have a cost of production theory of value, nor did Ricardo intend to put one forward. According to Dobb, Ricardo (in his first edition) regarded the modifications made to the labor embodied theory when wages rise, as a reinforcement of his argument against Adam Smith's cost of production theory (adding-up theory), and announced it triumphantly.[25] Smith had claimed that when wages rose, the prices of all commodities went up because price was determined by adding up the three cost components, wages, profits, and rents. Ricardo showed that not only did a rise of wages fail to raise the prices of commodities, but it actually caused the prices of some commodities to fall due to the secondary effect of unequal proportions of capital. In fact, in the first edition, all goods produced with fixed capital fell in price because the numeraire commodity or invariable standard (money), in terms of which commodity prices were measured, was produced by unassisted labor for one year.

Ricardo modified this in the third edition by defining

the standard as being produced with a fixed-to-circulating capital ratio that represented the social average ratio. Therefore, when wages rose, the prices of those goods produced with a ratio higher than the raio of the standard [26] would fall when measured by the standard, and the prices of those goods with a ratio lower than the standard ratio [27] would rise. However the price level on average would remain unchanged. In Smith's view all prices rise and therefore so does the price level. Ricardo's attack on Smith remained intact. As Meek puts it:

> In opposition to Smith, Ricardo maintained that 'it is not because of this division into profits and wages,-it is not because capital accumulates, that exchangeable value varies, but it is in all stages of society, owing only to 2 causes: one the more or less quantity of labour required, the other the greater or less durability of capital:- that the former is never superceded by the latter, but is only modified by it.' Thus accumulation, in so far as it occasioned 'different proportions of fixed and circulating capital to be employed in different trades' and gave 'different degrees of durability to such fixed capital' certainly introduced 'a considerable modification to the rule, which is of universal application in the early stages of society.' But it introduced no more than a modification to that rule. Adam Smith's view that the labour theory applied only to primitive times, and that it had to be replaced by some sort of 'cost of production' theory when capital accumulated, was decisively rejected.[28]

Thus Dobb and Meek show that Ricardo did not think that he was putting forward a cost of production theory.[29]

Caravale and Tosato view Ricardo's efforts to define an invariable measure of value as an attempt to overcome tha logical difficulties and to restore general validity to the rule

that exchange values are determined solely by relative quantities of labor:

> The role envisaged by Ricardo for the perfect standard of value was, in other words, that of establishing in general the same staightforward connection between diminishing returns and the rate of profit- to the exclusion of the 'confusing' effects of movements in relative prices due to changes in distribution consequent upon technological changes occuring in agriculture - that the labour theory of value made possible, in its limited sphere of validity.[30]

Ricardo chose gold to be the invariable measure of value in the sense that it was assumed that the quantity of labor required to produce gold would not vary. Therefore, if the price of any good rose in terms of gold, then this rise in price indicated the increase in the quantity of labor required to produce the good which was being measured. However, since gold is produced under a certain ratio of fixed-to-circulating capital which can be different from the ratio of the measured good, then as money wages rise as a result of diminishing returns in agriculture and the profit rate falls,[31] relative prices will not be proportional to relative embodied labor as measured by the standard.

Ricardo concludes:

> ...suppose...the same quantity of labour to be always required to obtain the same quantity of gold, still gold would not be a perfect measure of value, by which we could accurately ascertain the variations in all other things, because it would not be produced with precisely the same combinations of fixed and circulating capital as all other things, nor with fixed capital of the same durability; nor would it require precisely the same length of time, before it could be brought to market. It would be a perfect measure of value for all things produced under the same circumst-

ances precisely as itself, but for no others.[32]

Ricardo's problem is summed up by Sraffa:

> Even though nothing has occurred to change the magnitude of the aggregate, there may be apparent changes due solely to change in measurement, owing to the fact that measurement is in terms of value and relative values have been altered as a result of a change in the division between wages and profits. This is particularly evident in the extreme case where the aggregate is composed of the same commodities in the same quantities, and yet its magnitude will appear to have changed as measured in value.
>
> Thus the problem of value which interested Ricardo was how to find a measure of value which would be invariant to changes in the division of the product; for, if a rise or fall of wages by itself brought about a change in the magnitude of the social product, it would be hard to determine accurately the effect on profits.[33]

So, Ricardo's search for the invariable measure of value was unsuccessful. He therefore could not restore in the general case the relation between technology (in agriculture) and the rate of profit which exists, when the labor theory of value holds (i.e. uniform ratios in all industries). Ricardo failed because of the "logical impossibility of defining a commodity such that relative prices, when measured in terms of it, are not affected by the changes in distribution ensuring from the working of diminishing returns."[34]

In Meek's view, Ricardo always had in the back of his mind the idea that the role which human labor played in the process of value-creation was something "unique and fundamental." He quotes a passage from Ricardo's final paper on value to show

that it became more and more apparent that Ricardo identified value with embodied labor:

> I may be asked what I mean by the word value, and by what criterion I would judge whether a commodity had or had not changed its value. I answer, I know no other criterion of a thing being dear or cheap but by the sacrifices of labour made to obtain it. Every thing is originally purchased by labour - nothing that has value can be produced without it ...That the greater or less quantity of labour worked up in commodities can be the only cause of their alteration in value is completely made out as soon as we are agreed that all commodities are the produce of labour and would have no value but for the labour expended upon them.[35]

Thus, according to Meek, Ricardo was moving in the right direction and was justified in thinking that embodied labor ratios ought to be the sole regulators of exchange ratios:

> and if they proved upon examination not to be so, then this was a 'contradiction' which had somehow to be solved. And if the 'contradiction' turned out to be very difficult to solve, this was not to be taken as an indication of the inadequacy of the basic doctrine, but rather as an indication of 'the inadequacy of him who has attempted to explain it.'[36]

Comments

It has been shown that Ricardo did not intend to put forward a money cost of production theory of price. This is evident in his attack on Smith's theory and his emphasis on the primacy of the quantity of labor in the determination of relative price(and made even clearer in his move toward identifying

labor as the substance of value). However, due to the difficulties he encountered, and his inability, analytically, to extricate himself from these difficulties, his theory became vulnerable and open to a Stigler type interpretation. It was up to Marx to point the way forward.

Marx's Critique Of Ricardo

Marx fully lays out his critique of Ricardo's theory of value in chapter X, part II of Theories of Surplus Value. Ricardo, according to Marx, is only concerned with the magnitude of value in the sense that the magnitudes of the values of commodities are proportionate to the quantities of labor which are required for their production;

> He begins with the determination of the magnitude of the value of the commodity by labour time and then examines whether the other economic relations and categories contradict this determination of value or to what extent they modify it.[37]

This method is historically justified, but scientifically inadequate, according to Marx. The problem with this method is that it begins at an abstract level, but instead of continuing at this level, Ricardo brings in categories (such as the genral rate of profit) which are at a less abstract level and confounds them.[38]

The reason why Ricardo runs into trouble in sections IV and V of his Principles, according to Marx, is his presuppos-

ition of a general rate of profit for different capital investments of equal magnitude, or for different spheres of production in which equal sized capitals are used. The following passages from Marx illustrate the problem:

> Instead of postulating this general rate of profit, Ricardo should rather have examined in how far its existence is in fact consistent with the determination of value by labour-time, and he would have found that instead of being consistent with it, prima facie, it contradicts it, and that its existence would therefore have to be explained through a number of intermediary stages, a procedure which is very different from merely including it under the law of value. He would then have gained an altogether different insight into the nature of profit and would not have identified it directly with surplus-value.[39]

In other words, Ricardo mixed together a concept associated with the sphere of competitive capitals (general rate of profit) and determination of value by labor-time, a relation of the production sphere. He arbitrarily throws into the analysis a general rate of profit whose formation must be explained. He therefore identifies profit at the general rate with surplus value, i.e., the "value" of the commodity (associated with labor-time) is equal to the sum of the variable capital (wages) and the profit at the general rate.

> Having made this presupposition Ricardo then asks himself how will the rise or fall of wages affect the "relative values," when fixed and circulating capital are employed in different proportions? Or rather, he imagines that this is how he handles the question. In fact he deals with it quite differently, namely, as follows: He asks himself what effect the rise or fall of wages will have on

> the respective profits on capitals with different periods of turnover and containing different proportions of the various forms of capital. And here of course he finds that depending on the amount of fixed capital etc., a rise or fall of wages must have a very different effect on capitals, according to whether they contain a greater or lesser proportion of variable capital, i.e., capital which is laid out directly in wages. Thus, in order to equalise again the profits in the different spheres of production, in other words, to re-establish the general rate of profit, the prices of the commodities - as distinct from their values- must be regulated in a different way. Therefore, he further concludes, these differences affect the "relative values" when wages rise or fall. He should have said on the contrary: Although these differences have nothing to do with the values as such, they do, through their varying effects on profits in the different spheres, give rise to average prices or, as we shall call them cost-prices which are different from the values themselves and are not directly determined by the values of the commodities but by the capial advanced for their production plus the average profit. Hence he should have said: These average cost-prices are different from the values of the commodities. Instead, he concludes that they are identical and with this erroneous premise he goes on to the consideration of rent.[40]

Since capitals have different compositions, a rise or fall in wages will affect the respective profits on capitals differently such that a general rate of profit no longer exists. In order to re-establish the general rate, relative values must change, while labor-times (Ricardo says quantities of labor) remain unchanged. Ricardo did not see that the different compositions themselves give rise to cost-prices which differ from labor values, in the formation of the general rate of profit. The reason he could not see this is due to the fact that Ricardo did not directly identify the surplus value with unpaid

labor (the "surplus value" for Ricardo was the profit at the general rate). Therefore, Ricardo's "value," with which he starts, is really the cost-price, and thus Ricardo's "value" is identical with cost-price.

Marx continues:

> He has already assumed this difference(i.e., the difference between the cost-prices and the value of commodities; my note), in postulating a general rate of profit, thus presupposing that despite the varying ratios of the organic component parts of capitals, these yield a profit proportional to their size, whereas the surplus-value they yield is determined absolutely by the quantity of unpaid labour-time they absorb, and with a given wage this is entirely dependent on the volume of that part of capital which is laid out in wages, and not on the absolute size of the capital.
>
> What he does in fact examine is this: Supposing that cost-prices differ from the values of commodities - and the assumption of a general rate of profit presupposes this difference - how in turn are these cost-prices themselves reciprocally modified, proportionately modified by the rise or fall of wages, taking also into account the varying proportions of the organic component parts of capital? If Ricardo had gone into this more deeply, he would have found that - owing to the diversity in the organic composition of capital which first manifests itself in the immediate production process as the difference between variable and constant capital and is later enlarged by differences arising from the circulation process - the mere existence of a general rate of profit necessitates cost-prices that differ from values. He would have found that, even if wages are assumed to remain constant, the difference exists and therefore is quite independent of the rise or fall in wages, thus he would have arrived at a new definition.[41]

These passages point out the fundamental flaw in Ricardo's labor theory of relative value: He identified cost-price with labor value and thus a change in wages caused a deviation of

relative values from labor values due to the different compositions of capital. In reality, all he was saying was that a change in wages brought about new cost-prices (where the original cost-prices already deviated from labor values). It is the formation of the general rate of profit which causes cost-prices to deviate from labor values; but the law of value as the manifestation of labor-time under capitalism is not violated.

Marx then goes over Ricardo's third edition example in detail. How Marx solved Ricardo's problem can be shown by using tables taken from an article by Jesse Schwartz.[42] First the preliminaries. In the first year of Ricardo's example, both the manufacturer and the farmer employ only variable capital in the amount of £5,000. The total value of the machine as well as the corn is £5,500 at the end of the year. Ricardo does not consider raw materials or depreciation of machines here so that the augmentation of the value of the corn and machine of £500 is due only to living labor. Ricardo assumes that this augmentation is profit at the general rate of 10 percent as determined in the farm sector. In Marx's view, Ricardo had in effect stipulated that the rate of surplus-value, or S/V, was 500/5,000 or 10 percent. Because Ricardo neglects constant capital (raw materials and machine), he identifies the rate of profit with the rate of surplus-value. The following table shows Marx's correction of Ricardo's example for the second year:

	Manufacturer	Farmer
Capitals	5500C+5000V	5000V
Surplus Value(S)	500	500
Rate of Profit	4.75%	10.00%
Value of Commodities (C + V + S)	5500	5500
Cost (Capital outlay, C + V)	5000	5000

Both the farmer and manufacturer lay out 5,0001. in wages as in the first year, but the manufacturer, in addition, employs the newly built machine whose value is 5,5001. With a rate of surplus-value of 10 percent (Ricardo's "rate of profit"), each produces a mass of surplus-value of 5001. Ricardo assumes that the machine does not depreciate. While Marx thinks this is totally unrealistic, he grants Ricardo this premise and concludes that the value of the cotton goods and the cloth is 5,5001. (Ricardo, at this point, added 10 percent of the 5,500, the value of the machine, onto the value of the cloth and called this total the "value" of cloth). The cost of producing the cloth is the 5,0001. laid out in wages (the same is true of corn) since materials and depreciation do not enter. The rate of profit in the farm sector is 10 percent, where the rate of profit is defined by Marx as the surplus-value divided by the total capital, or S/C + V. The manufacturer's rate of profit, however, is 4.75 percent. The capitals in both sectors must yield the same rate of return. This happens only when prices are different from their values. The results of this process

can be shown in a second table:

	Manufacturer	Farmer	Total
Capitals	5500C + 5000V	5000V	5500C+10,000V
Surplus Value	500	500	1000
Value of Commodities	5500	5500	11000
Cost(Capital Outlay)	5000	5000	10000
Price Of Commodities (Price of Production, or Cost-Price in Theories of Surplus Value)	5677	5323	11000
Rate of Profit	6.45%	6.45%	
Deviation of Price From Value	+ 177	- 177	

The value rate of profit is given by total surplus-value divided by total capital and the rates of profit in the two sectors are equalized at this rate (which happens to be 6.45 percent) via the transfer of surplus-value brought about through deviations of prices from their values. Thus, Marx showed that prices deviate from values, and a general rate of profit is formed, without disturbing the theory of value (i.e., that labor alone creates value and thus "determines" it). This occurs through the redistribution of a given mass of surplus-value.

Although Marx criticizes Ricardo's confusion of the laws of surplus-value with the laws of profits, he states that Ricardo's neglect of constant capital, and his consideration of profit (surplus-value) only in relation to the variable capital comes close to recognizing "that somehow variable capital, the component of capital that exchanges with living labor, is

solely productive of surplus-value, the stuff of profits."[43] Unfortunately, Ricardo's confusions did not allow the breakthrough.

Conclusion

The answer to the quesion posed in the title of the paper is, no, Ricardo did not have a labor theory of value. Ricardo did not put forward a theory which viewed labor as the sole creator of value, even though he may have moved political economy closer to realizing this. He could not do this because he did not recognize labor-time as the substance of value under capitalist relations of production. Ricardo's confusion of cost-price (price of production) with value, and his jumping in with a general rate of profit, as Marx showed, precluded the possibility of Ricardo fully grasping this analytically.

However, one can characterize Ricardo's theory as a labor theory of price of production ("cost-price" in Theories of Surplus-Value). Ricardo's emphasis on labor as the dominant determinant of price of production seems to rule out any intention on his part to put forward a money cost of production theory a la Smith (as Stigler claimed). In fact, Ricardo took Smith's cost of production theory to task and showed that rent was eliminated from price considerations, while distribution between wages and profits only modified the labor determination of "value". The quantity of labor bestowed was the important thing,

not the adding up of income categories to arrive at price. However, as said before, Ricardo's confused analysis in which his modifications seemed to contradict his previous labor theory,

left the door open to Stigler (and others) whose motive is to put forward the neo-classical factor theory of price and distribution based on supply and demand.[44] Stigler, et.al., conveniently ignore Marx's critique of Ricardo, and Marx's integration of value, price of production and market price.[45] For Marx, commodities do not exchange at their values, but this does not contradict the theory of value, where abstract labor-time is the substance of the modified values called prices.[46]

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Notes

[1] David Ricardo, The Works and Correspondence of David Ricardo, Vol.I (Cambridge: Cambridge University Press, 1981), p. 11.

[2] Ibid., p. 12.

[3] This notation is taken from L.E. Johnson, "Ricardo's Labor Theory of the Dterminant of Value," Atlantic Economic Journal (March 1984), pp. 50-59.

[4] Ibid., p. 52.

[5] Joseph A. Schumpeter, Economic Doctrice and Method (New York: Oxford University Press, 1967), p. 116.

[6] Ricardo, op. cit., p. 24.

[7] Ibid., p. 27.

[8] Ibid., p. 23.

[9] Johnson, op. cit., p. 55.

[10] George Stigler, "Ricardo and the 93 Per Cent Labor Theory of Value," Essays in the History of Economics (Chicago: University of Chicago Press, 1965), pp. 326-342.

[11] Ibid., p.331. Quoted from Works, VolI., p. 30.

[12] Ibid., p.332. Quoted from Works, Vol I., p. 36.

[13] Ricardo, op. cit., pp. 36-37.

[14] Stigler, op. cit. p.333.

[15] Ibid.

[16] George W.Wilson and James L.Pate, "Ricardo's 93 Per Cent Labor Theory of Value: A First Comment," Jouranl of

Political Economy, January/February, 1968. An article which puts forward the same view as Wilson and Pate's and which will also be looked at is by P.D.Groenewegen, "Three Notes on Ricardo's Theory of Value and Distribution," Australian Economic Papers, June 1972.

17 Ricardo himself says that this is impossible, but that it does not affect the principle involved.

18 The general formula for an annuity can be written:

$$PMT = FV\left[\frac{i}{(1+i)^n - 1}\right]$$

where PMT = Payment per period n

FV = Future value

It shows that a given payment per period for n periods at interest rate i, yields the future value FV. In Ricardo's example, a 20,0001. machine is used so that the annuity component of price is the amount that has to be recouped in each period and invested at interest rate i in order to yield 20,0001. in n periods.

19 The assumption that is implicit here is that the money commodity being used as numeraire (gold, for example) requires only labor for its production and has the same period of production.

20 Ricardo, op. cit., p. 60.

21 Groenewegen, op. cit., p.56.

22 The opposite conclusion is reached by Haim Barkai, "The Empirical Assumptions of Ricardo's 93 Per Cent.Labor Theory of Value," Economica (November 1967), pp. 422-23.

[23] Luigi L.Pasinetti, "A Mathematical Formulation of the Ricardian System," Review of Economic Studies, 1960.

[24] Groenewegen, op. cit., pp. 58-59.

[25] Maurice Dobb, Theories of Value and Distribution Since Adam Smith (Cambridge: Cambridge University Press, 1977), p. 81.

[26] Or with more durable fixed capital or with slower tu over of circulating capital.

[27] Or with less durable fixed capital or faster turnover of circulating capital.

[28] Ronald L.Meek, Studies in the Labour Theory of Value (London: Lawrence and Wishart, 1973), p. 105.

[29] This is also evident in Ricardo's exclusion of rent in the determination of relative price. It is evident, furthermore, in Ricardo's correspondence as pointed out by Sraffa in his Introduction to Ricardo's Works.

[30] Giovanni A.Caravale and Domenico A.Tosato, Ricardo and the Theory of Value, Distribution and Growth (London: Routledge and Kegan Paul, 1980), p. 55.

[31] Ricardo, in effect, assumes that gold, which is produced with the social average ratio, is produced by unassisted labor in one year and thus its rate of profit determines the general rate. Those goods produced by unassisted labor in time periods less than one year (even only one day) form the group of goods that would rise in price (measured by gold) when wages rise. Since earlier it was seen that Ricardo also considered

corn as a good produced by unassisted labor for one year, Ricardo's model in the Principles is an extension of his earlier corn model as presented in his Essay on Profit. A key assumption in all of this is that corn (produced with diminishing returns) makes up most of the real wage so that the money wage must rise with diminishing returns (and the increased quantity of labor required) in order to keep the real wage (determined exogenously) constant.

[32] Ricardo, op. cit., pp. 44-45.

[33] Sraffa, Introduction to Works, p. XLViii.

[34] Caravale and Tosato, op. cit., p. 58.

[35] Ricardo, Works, Vol. IV, p. 397. quoted in Meek op. cit., p. 116.

[36] Meek, op. cit., p. 118.

[37] Karl Marx, Theories of Surplus-Value, Part II (Moscow: Progress Publishers, 1968), p. 164.

[38] But the key advance of Ricardo over Smith is when:

> Ricardo steps in and calls to science: Halt! The basis, the starting point for the physiology of the bourgeois system - for the understanding of its internal organic coherence and life process - is the determination of value by labour-time. Ibid., p. 166.

[39] Ibid., p. 174.

[40] Ibid., p. 174-175.

[41] Ibid., pp. 175-76.

[42] Jesse G.Schwartz, "There is Nothing Simple about a Commodity," The Subtle Anatomy of Capitalism (Santa Monica:

Goodyear Publishing Company, 1977), pp. 486-87.

[43] Ibid., p. 491.

[44] In Ricardo's time, people, such as Samuel Bailey, played on weaknesses in Ricardo's analysis in order to put forward supply and demand theories of price.

[45] Marx's integration is not wholly satisfactory. In fact, he presents no actual mechanism that would show how these three are related.

[46] This section has not gone into all of the details of Marx's critique of Ricardo's theory of value, only some of the major aspects.

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Growth of Capital Stock, 1880-1929 — 4/24/86

[Historical Statistics of US, Colonial Times to 1970; Series F-450, 455, p. 256]

	Non-Farm, Non-Resident Structures, 1929-$ (F 450)	Producers Durables, 1929-$ (F 455)	Total Structures & Equip	Avg. Annual Growth Rates: Structures	Equip	Total
1850	3.0	.4	3.4	—	—	—
1880	13.2	4.7	17.9 (31 yrs)			.138
1890	23.2	11.7	34.9 (11)			.086
1900	32.9	19.9	52.8 (11)			.047
						(.047)
1900	25.7	13.5	39.2			
1912	40.7	24.6	65.3 (13)			.051
1922	48.1	31.8	79.9 (11)			.020
1929	61.0	39.1	100.1 (8)			.032
1933	59.6	33.9	93.5			
1939	54.3	34.7	89.0			
1945	49.7	42.6	92.3			

Forecasting Investment Spending: The Performance of Statistical Models

by Richard W. Kopcke*

Forecasters and analysts devote much attention to business spending on new plants, offices, and equipment. Not only is this investment spending an important source of demand for current industrial products, but it also provides for future economic growth by renewing and expanding the nation's capital stoek.

As shown in Chart 1, business expenditure for plant and equipment — business fixed investment (BFI)—has averaged approximately 10 percent of U.S. gross national product (GNP) since World War II. Even though capital spending does not account for an especially large share of total demand for goods and services in the economy, Charts 1 and 2 reveal that it is a relatively volatile component of GNP. Some attribute the generally strong economic performance during the 1960s partly to the rapid rise of capital spending relative to GNP during this decade. Changes in business fixed investment have also contributed significantly to cyclical swings in final sales. For example, during the slump in production from late 1973 to early 1975 the drop in real business fixed investment spending was approximately one-half the total decline in real final sales.

Simple comparisons such as these understate the influence of business investment behavior on economic activity. Swings in the demand for capital goods induce changes in wage and salary income and profits in industries supplying capital goods. In turn, these income swings lead to changes in other components of GNP such as consumption spending and inventory accumulation. Thus, volatility in business fixed investment can generate "multiplier" effects which tend to unsettle the smooth growth of GNP, and BFI can have a much greater influence on the economy than the level of investment spending itself might indicate.

This link between the strength of investment spending and the growth of GNP currently commands the attention of economists and policymakers alike. Though investment spending has remained high relative to GNP, Chart 3 reveals that the growth of the business capital stock has declined since the late 1960s. The annual growth of the capital stock formerly exceeded the growth of employment by as much as 2 percentage points during the late 1960s, but today the expansion of capital barely matches that of employment. Perhaps ironically, business has been less willing to add to its capital stock during the years of most rapid labor force growth.

Of even more concern to some, however, is the rate of increase of BFI during the remainder of the 1980s. Since 1975 economic growth has been supported mostly by consumer spending. Some forecasters fear that consumers are no longer willing or able to support adequate growth. Others also believe that it may not be desirable to continue to rely on consumer demand in any case. In order to achieve long-run goals for adequate expansion of employment opportunity and of living standards perhaps business's demand for investment goods should compensate for any loss of momentum in consumption spending. Perhaps BFI should grow considerably faster than GNP in coming years. Even

*Vice President and Economist, Federal Reserve Bank of Boston. The author is grateful to Gary Loveman and Mark Dockser for their research assistance.

1. All linear models with lagged variables of many periods (see notes p. 21)
2. All models predict turning points one or more periods too late (25-26)

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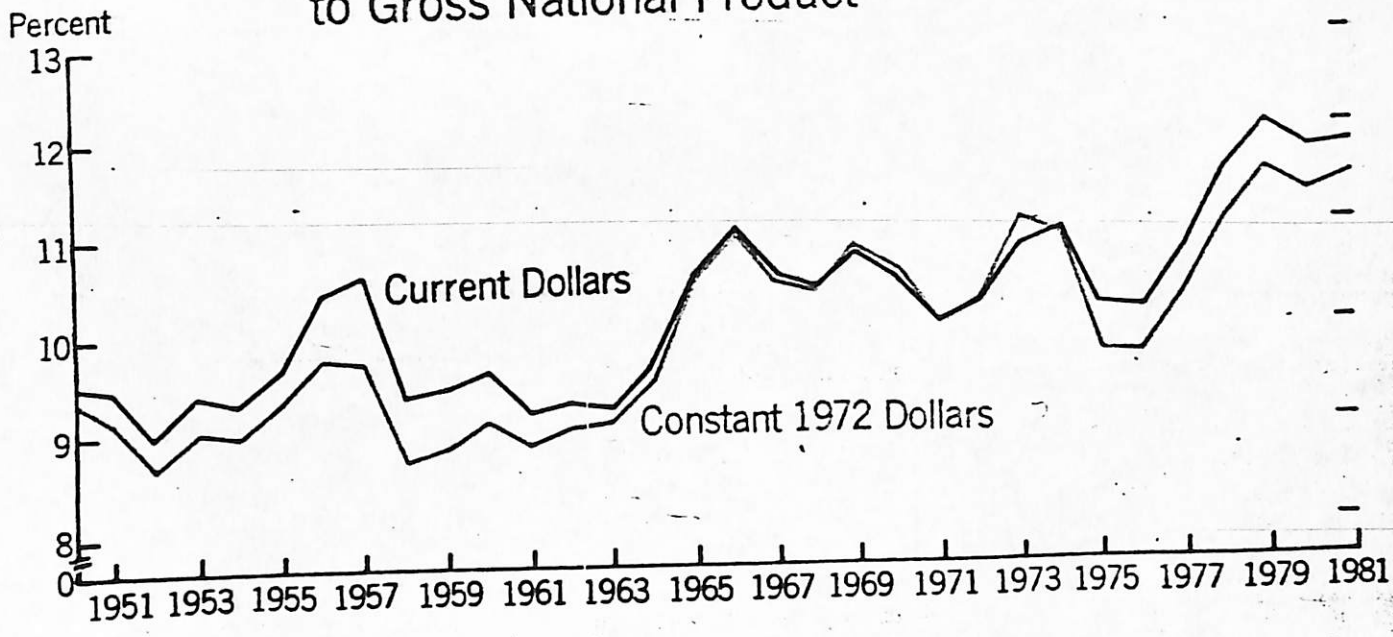
Chart 1

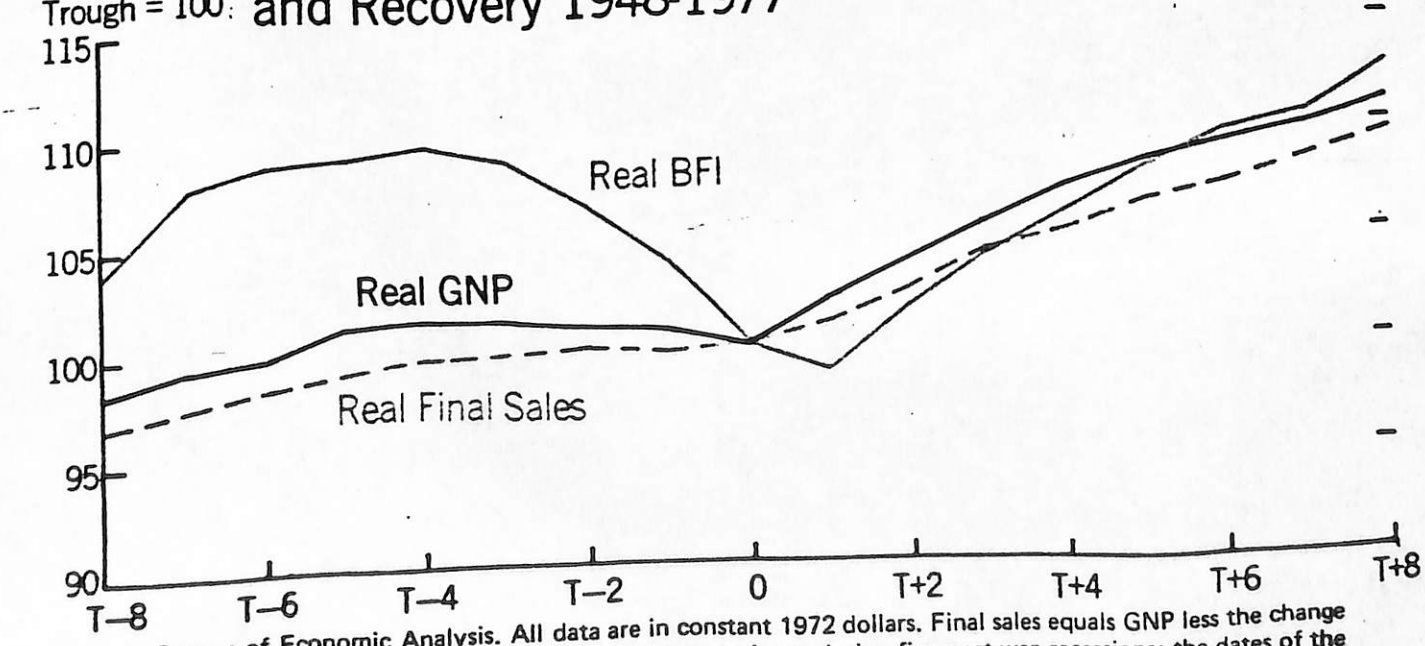
The Ratio of Business Fixed Investment to Gross National Product



Source: Bureau of Economic Analysis.

Chart 2

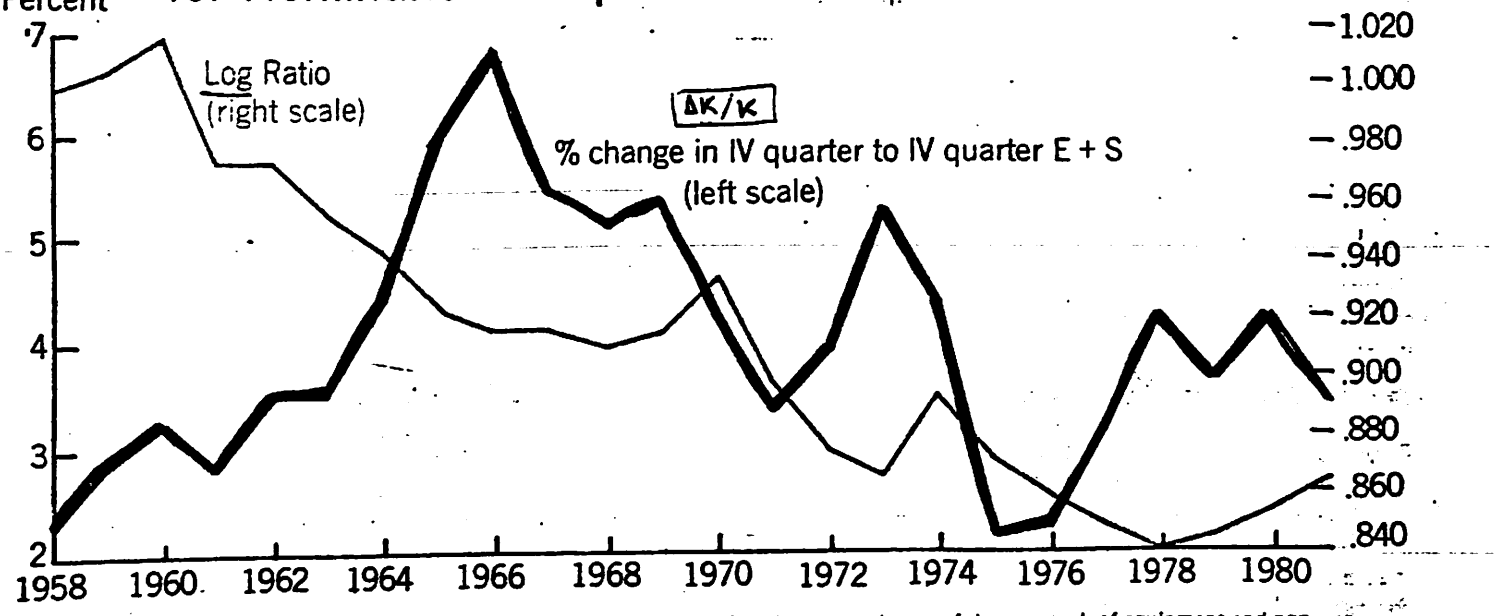
The Behavior of Business Fixed Investment, Gross National Product, and Final Sales During Recession and Recovery 1948-1977



Source: Bureau of Economic Analysis. All data are in constant 1972 dollars. Final sales equals GNP less the change in business inventories. Each index is an average of the experience during five post-war recessions; the dates of the troughs are: 1949: IV, 1954: II, 1958: II, 1961: I, 1970: IV, 1975: I.

Chart 3

The Growth of the Capital Stock for Nonfinancial Corporations



Note: The annual growth of the capital stock is the fourth quarter to fourth quarter change of the net stock of equipment and nonresidential structures in 1972 dollars for nonfinancial corporations (Bureau of Economic Analysis). The labor-capital index is the logarithm of average hours worked for nonfinancial corporations (Bureau of Labor Statistics) divided by the product of the average capital stock multiplied by the capacity utilization rate (Board of Governors of the Federal Reserve System). The labor-capital index is then adjusted so that 1958 equals unity.

though investment spending may have been high relative to GNP during the 1970s, the current rate of expansion of the capital stock cannot support adequate economic growth.[1]

Despite investment's prominent role in continuing policy debates in Washington, no consensus has been reached about what course of action, if any, is warranted to bolster the demand for plant and equipment. Because the determinants of investment spending are the subject of considerable debate, there is no general accord about why capital spending is supposedly so sluggish or how policy may enhance the demand for capital.

This article examines the forecast performance of five statistical models of investment theory, each representing a different theory of business demand for plant and equipment. All these models tended to underpredict BFI since 1977. If there was any mystery surrounding capital formation in the late 1970s, it was the surprising strength of BFI, especially the demand for producers' durable equipment.

The model that performed best "explains" current investment spending simply by extrapolating past investment spending. Apparently the pattern of capital spending after 1977 has deviated little from its average behavior before 1977 even though the pattern of business sales, profits, cash flow, and the cost of capital has changed markedly in the late 1970s. The relatively strong growth of BFI from 1978 to 1981, therefore, was explained most accurately by the simple extrapolative model, which exploited the pre 1977 pattern of BFI, rather than the alternative models, which relied on trends in other variables to forecast BFI.

The performance of this extrapolative model was not impressive enough to discredit the alternative models, however. One weakness of this simple model is most apparent when we ask why BFI was so strong in the face of relatively adverse business conditions. The simple model tells no story that "explains" the pace of investment spending. Can we expect investment spend-

[1] In 1976 and 1977, the Council of Economic Advisers in their *Economic Report to the President* suggested that BFI should be as high as 12 percent of GNP to achieve adequate growth of employment and living standards. Chart 1 shows that BFI has risen to 11 percent recently, but much of the increase in the BFI-GNP ratio is due to the negligible growth of GNP since 1979. Since 1977, the Council has continued to express concerns about inadequate investment spending and attempts have been made to increase BFI by relaxing regulations and tax burdens on capital.

ing to remain strong in the 1980s? If investment spending were supported by faith in an imminent recovery, recent capital budgets might not have been as closely tied to current business conditions as they had been in the past. Continuing weak sales growth could undermine this faith, restoring the traditional ties between BFI and concurrent business conditions.

Though the extrapolative model performed best overall, the alternative models predicted changes in investment spending quite accurately for certain years. Each model had its season, but unfortunately the models alone cannot tell us which of them will perform best during the next few years. Consequently, professional forecasters may consider a variety of models of investment spending as well as surveys of investment plans or capital budgets when preparing projections of BFI. The two most popular surveys of business investment plans may have been especially helpful for forecasters in 1980 and 1981 because, unlike the models, they modestly *overpredicted* the increase in capital spending.

Returning to a popular issue, we used the models studied in this article to forecast the strength of capital formation for the remainder of this decade. Even with fairly optimistic assumptions—4.5 percent real GNP growth in 1983 levelling off to 3.5 percent thereafter and inflation declining to 4.5 percent in 1990—BFI will grow slightly less rapidly than real GNP, averaging only about 3.5 percent per year. There is little difference among the models: total investment spending as a percent of GNP will decline a little during the 1980s. Though this article shows that such long-term forecasts can err by a substantial margin, the conclusion is very plausible. Investment as a percent of GNP varies most when the growth of GNP is itself highly variable—partly because swings in BFI tend to cause swings in GNP growth—so a forecast of steady economic growth at the sustainable rate of 3.5 percent suggests a similarly steady and sustainable rate of capital formation. According to the statistical models, as long as we believe that GNP growth should be neither very high nor very low, a fundamental change in the distribution of income is probably required to change the share of national production that is devoted to the construction of offices or factories and to the manufacture of producers' durable equipment.

I. Theories of Investment Demand

This article examines the performance of five "conventional" models of investment spending. Though these models cannot represent all existing investment equations, they do represent the more common approaches taken by economists. Most popular investment equations are either a straightforward modification of one of these five or a blend of two or more of these basic models. Because the approaches examined here represent polar models, they provide a convenient analysis of the major issues in the continuing debate about the determinants of investment spending.

The General Accelerator Model

The accelerator model proposes that firms' demands for investment goods depend on changes in the demand for business products. A firm's stock of capital varies directly with its level of output so changing demands for finished products must induce the firm to alter its productive capacity.

The accelerator model provides one of the oldest explanations of investment behavior, and this elementary statement of the acceleration principle has been strongly challenged over the years. Accordingly, the theory has gradually evolved into more general statements. The distinguishing trait of the general accelerator model is that investment functionally depends upon lagged values of some measure of output as well as a lagged value of capital stock, or productive capacity. In this pure form, prices, wages, taxes, interest rates, etc. have no major independent, systematic influences on capital spending. The particular mathematical form of this model used here is the first entry in Table I.

The model is attractive in its simplicity. Lagged output terms represent the belief that investment responds to changes in final demands only gradually because an increase in the demand for productive capacity must pass through stages of planning, contracting, and ordering before intentions become expenditures. These lags differ among investment projects so an increase in output will engender investment expenditures during many ensuing periods.

The sequence of lagged output terms serves one other essential purpose as well. Because capital resources are long-lived, investment plans must depend upon assessments of future demand as well as current output. Because investors are assumed to extrapolate future output expectations from past sales patterns,[2] the lag terms also represent the output projections which are essential for capital planning. Even though the present levels of demand for final products must directly influence investment decisions, they are also a tangible

[2] Despite its apparent simplicity, this technique of forecasting future sales by a weighted average of past sales is gaining some sophisticated support from some practitioners of time series modeling. The time series model discussed below uses this technique to forecast investment itself.

ing to remain strong in the 1980s? If investment spending were supported by faith in an imminent recovery, recent capital budgets might not have been as closely tied to current business conditions as they had been in the past. Continuing weak sales growth could undermine this faith, restoring the traditional ties between BFI and concurrent business conditions.

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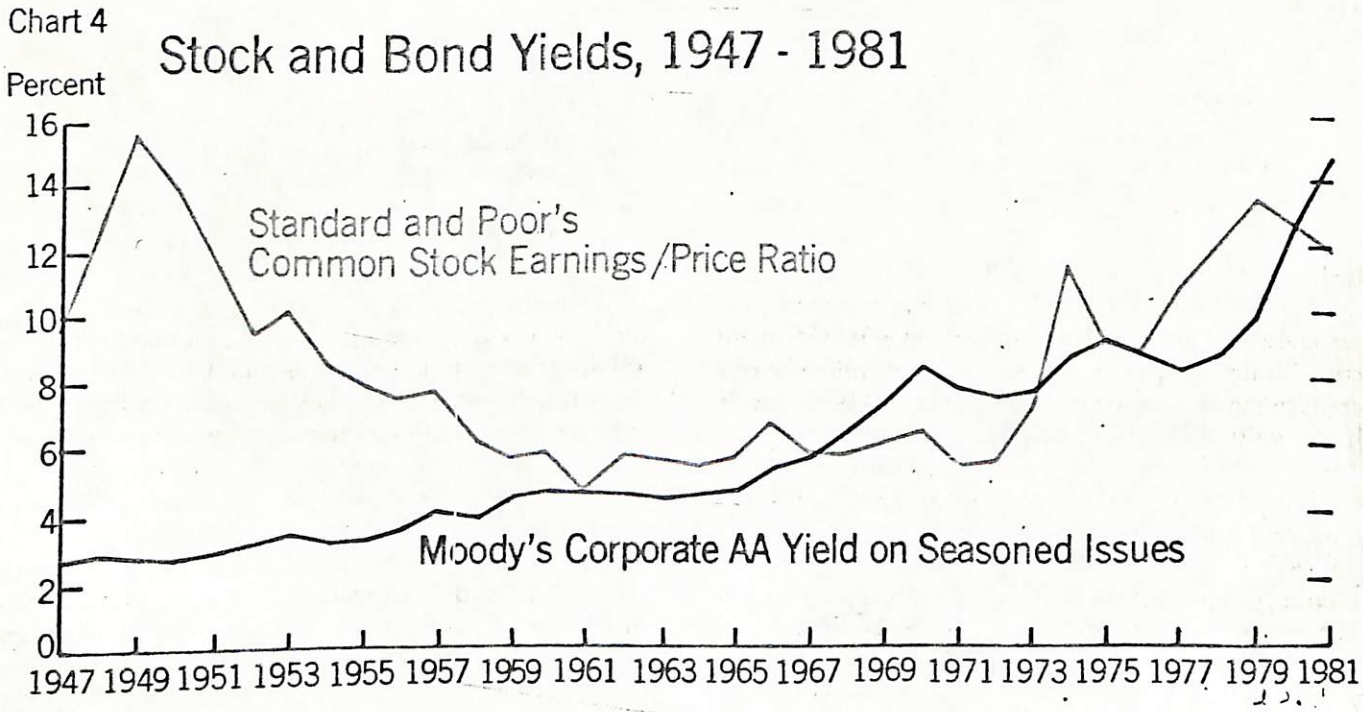
Chart 4



ket valuation of corporate assets rises relative to their replacement value—the prospective returns to capital improve with respect to the user cost of capital—the demand for plant and equipment rises relative to cash flow.

Firms generally obtain investment financing from three sources: internal funds, issuing debt, or floating equity. Because internal funds could be lent to other borrowers at market yields, the cost of these funds is roughly equal to market rates of interest. As firms begin to borrow, however, they assume risks which can cause the true cost of funds to rise above quoted interest rates. The larger the size of debt service payment to which a firm is committed, the more exposed the firm becomes should earnings decline unexpectedly. If a firm must refinance a portion of its debt during a period when credit market funds are in short supply, financial embarassment or bankruptcy may result. These risks cause the true cost of borrowing to rise well above market rates of interest with increased reliance on bank or bond financing.

Equity does not legally obligate a corporation to pay stated interest charges, but firms usually sell equity only after they have made extensive use of debt financing. In general, an investment project should be undertaken only if its after-tax yield does not threaten to reduce the previously anticipated growth path of earnings per share for the corporation. Otherwise, the stockholders sacrifice dividend growth and suffer attendant capital losses. For a larger, profitable firm the yield on an investment (before deducting interest charges) financed entirely by debt must be no less than one-half the interest rate; because the corporate income tax has averaged about 50 percent, the after-tax "cost" of debt is about one-half the stated rate of interest. To maintain the prospective growth path of earnings per share from equity financing, a firm ordinarily pursues investment projects with yields at least as great as the firm's ratio of earnings per share to its stock price. Projects with especially attractive growth opportunities may be undertaken even if their initial returns are less than after-tax debt yields or earnings-price ratios.

If bond yields were generally twice as high as earnings-price ratios, equity would be a competitive source of funds for corporations; however, as shown in Chart 4 interest rates have seldom exceeded stock yields. Even

when interest rates have been relatively high, they have never been twice as high as earnings-price ratios for any significant period of time. Consequently, external equity financing represents the most costly source of funds, used mainly when the capacity for debt leveraging is exhausted—when the "true cost" of borrowing is well above market rates of interest.

According to this cash flow description of the demand for investment, a firm will first commit its retained earnings to financing its capital budget before seeking external debt or equity funding. The size of the capital budget therefore depends on: the firm's available cash flow, the capacity of the firm to obtain credit cheaply, and the prospective returns on new investments. The greater the margin between the return on investment and the "cost" of external financing, the more generous will be the capital budget. By combining retained earnings and the ratio of the market value of corporate assets to their replacement value, the cash flow model shown in Table 1 may not only capture the interaction between the cost of funds and the return to capital, but it also may embrace some of the more subtle influences of business risk and general investor uncertainties.

While the accelerator and neoclassical models devote much attention to the level of output and the existing capital stock as principal determinants of investment demand, the cash flow model places more emphasis on the financing of capital spending. The generalized cash flow model examined here is designed to capture some of the intricate interrelationships among interest rates, cash flow, business risks, and the prospective returns to capital, as well as other determinants of investment spending.

II. Estimation of the Investment Equations

The coefficients in each of the five investment equations are estimated from quarterly data spanning the 24 years from 1954 to 1977. A detailed description of the data and the equations is provided in the appendix. The five equations in Table 1 are estimated for the two major components of real BFI: producers' durable equipment and expenditures on nonresidential structures, both measured in 1972 dollars.

The usual amount of experimentation preceded the choice of the equations reported in this article. Preliminary tests indicated that neither the fits nor the forecasts of the equations benefited by introducing the capacity utilization rate into the statistical models.[7] In the last model, cash flow conceivably could include dividend payments or depreciation profits, the so-called holding gains on inventory, but the equation performs best when cash flow equals retained earnings less depreciation profits.[8] Neither the theory behind each equation nor the general mathematical expressions

[7] We introduced the capacity utilization rate (UCAP) by multiplying output by UCAP: a 1 percent increase in sales that occurs when UCAP is 70 percent encourages less investment spending than when UCAP is 90 percent. Other specifications could overturn our results.

[8] Depreciation profits are inventory holding gains. For example, an item is booked into inventory at $1 and later sold for $1.50. The firm's accounting may report a profit of $0.50 on the transaction even though the firm replaces the item in inventory for $1.50. First-in-first-out inventory accounting is one source of inventory profits when prices are rising.

Table 2
Selected Statistics for the Investment Models for the Estimation Period, 1954:I–1977:IV

Model	% Root Mean Squared Error	Percent of Absolute Errors Exceeding $1 Billion	Percent of Absolute Errors Exceeding $2 Billion	Autocorrelation Coefficient	Number of Lags
			Nonresidential Structures		
(1) Accelerator	.82	19.8	2.1	.995	6
(2) Neoclassical	.78	16.7	3.1	.925	12
(3) Time Series	.89	28.1	2.1	N.A.	3
(4) q Model	.78	16.7	1.0	1.000	8
(5) Generalized Cash Flow	.74	15.6	1.0	.975	10
			Equipment		
(1) Accelerator	1.22	42.7	10.4	.997	6
(2) Neoclassical	1.11	37.5	8.3	.839	13
(3) Time Series	1.73	41.7	18.8	N.A.	2
(4) q Model	1.58	42.7	17.7	.994	8
(5) Generalized Cash Flow	1.58	51.0	15.6	1.000	9

Accelerator $I\!R_t = a + b_0 Q + b_1 Q_{-1} + b_2 Q_{-2} + \cdots + b_5 Q_{-5} + c\,KR_{t-1}$ (31)

Neoclassical $I\!R_t =$

Time Series $g_{KR_t} = a + b_1 g_{KR_{t-1}} + b_2 g_{KR_{t-2}} + b_3 g_{KR_{t-3}}$

Q Model

Cash Flow $g_{KR_t} = a + \sum_{i=0}^{9} b_i\, q_{t-1-i}\, \frac{CFR_{t-1-i}}{KR_{t-i}}$, q = Tobin's Q = $\frac{\text{Equity + Debt}}{\text{Net Assets}}$, CFR = real Cash Flow

shown in Table 1 dictate a specific lag for the statistical equations. Accordingly, all lag coefficients were constrained by a third-degree polynomial, and the length of the lags was adjusted so that all coefficients were positive and would eventually converge to zero.

Table 2 describes the performance of each equation during the sample period. The error performance of all equations is very good. Even though the differences among equations are so small that they are practically negligible, this is no guarantee that all equations will forecast equally well. The coefficients of the equations are chosen so that the errors will be as small as possible. Thus, the attractive statistics in Table 2 may simply mean that all equations can be made to track the data equally well. The equations could be refitted to other sample periods and checked for stability. Instead, this article examines the forecast accuracy of the equations since 1977.

For all equations, errors made in any given quarter are positively correlated with the previous quarter's error. In other words, the equation will tend to overpredict investment in a quarter if it had overpredicted in the previous quarter. The column headed, "autocorrelation coefficient" provides a measure of the dependence between adjacent errors. When the degree of autocorrelation is high (approaching 1.0) as it generally is in Table 2, there is cause for concern. A high value of the autocorrelation coefficient suggests that the model may have omitted some determinants of investment spending. As a result nearby errors will tend to be related because they share common elements. High values in column 4 also suggest that the equation tracks investment well because it benefits from taking into account the previous quarter's error. If this is the case, the equation's ability to forecast investment too far into the future may be impaired because the model will no longer be able to correct for its errors quarter by quarter. Therefore, in an informal sense models with high autocorrelation coefficients may be less attractive than those with lower coefficients.

The following sections discuss the empirical strengths and weaknesses of each model both for the sample interval and for forecasting investment spending from 1978 to 1981.

III. Forecast Performance of the Investment Models

Table 2 describes the relative performance of each equation during the period of estimation from 1954:I to 1977:IV. Tables 3 and 4 describe the relative performance of each equation during the forecast period from 1978:I to 1981:IV. The statistics in these three tables may be considered a test of competing models of investment spending, but rather than seeking the "number one" theory, we should consider the merits of each model, appreciating that each may provide insights into this unique historical interval.

There are two sets of forecasts for each model. The first, summarized in Table 3, is a set of static forecasts: each quarterly forecast of investment spending is calculated with full knowledge of the previous quarter's actual investment outlays and the attendant forecast error. This experiment provides little understanding of how well a forecaster would have fared by using the model to forecast BFI for the late 1970s from the vantage point

Table 3
Selected Statistics for Static Forecasts of the Investment Models, 1978:I–1981:IV

Model	% Mean Error	% Mean Absolute Error	% Root Mean Squared Error	Percent of Absolute Errors Exceeding $1 Billion	Percent of Absolute Errors Exceeding $2 Billion
			Nonresidential Structures		
(1) Accelerator	.57	1.0	1.1	50	0
(2) Neoclassical	1.00	1.4	1.6	56	25
(3) Time Series	.52	1.1	1.3	56	19
(4) q Model	.53	1.2	1.5	44	19
(5) Generalized Cash Flow	.78	1.2	1.5	50	19
			Equipment		
(1) Accelerator	.97	1.9	2.3	81	44
(2) Neoclassical	.82	1.8	2.1	75	44
(3) Time Series	4.70	5.6	6.3	94	88
(4) q Model	−.16	2.4	3.2	69	56
(5) Generalized Cash Flow	.33	2.3	2.9	81	56

Table 4
Selected Statistics for Dynamic Forecasts of the Investment Models, 1978:I–1981:IV

Model	Mean Error	Mean Absolute Error	Root Mean Squared Error	Percent of Absolute Errors Exceeding $4 Billion	Percent of Absolute Errors Exceeding $8 Billion
			Nonresidential Structures		
(1) Accelerator	3.7	3.7	4.4	44	6
(2) Neoclassical	9.1	9.1	10.0	88	63
(3) Time Series	2.0	2.2	2.7	19	0
(4) q Model	7.0	7.0	7.4	88	38
(5) Generalized Cash Flow	7.6	7.6	8.2	88	50
			Equipment		
(1) Accelerator	6.8	6.9	8.3	63	31
(2) Neoclassical	6.8	6.9	8.1	75	38
(3) Time Series	2.5	3.5	4.4	38	13
(4) q Model	7.8	7.8	9.6	63	50
(5) Generalized Cash Flow	8.4	8.4	9.0	94	50

of the fourth quarter of 1977; nevertheless, the static forecast's error performance can be compared to the model's error performance during the period of estimation, 1954-1977. In other words, the static prediction crudely gauges whether the equation is able to track the data during the forecast interval as well as it does during the estimation interval. Table 3 presents the static forecast error statistics for each model so that they might be compared to the statistics reported in Table 2.

A cursory inspection of Tables 2 and 3 indicates that the performances of the investment models are worse during the forecast period than during the period of estimation. Some deterioration is to be expected, but the reported statistics can be discomforting. For example, a comparison of the root mean squared errors presented in Table 2 with the root mean squared errors shown in the third table reveals that the dispersion of errors has virtually doubled in the forecast interval. Technically this increase in root mean squared errors is so large that we may be entitled to conclude that no equation is stable:[9] either the description of investment spending is much more complicated than any of these models suggest or the link between measured investment spending and the determinants of investment demand changed during the 1970s.[10]

The universally positive mean errors shown in the first column mean that all models systematically underpredict investment spending,[11] especially the equipment equations. According to these mean errors, if there is any mystery surrounding recent investment spending, it is the surprising strength of BFI, especially the spending on producers' durable equipment.

The error statistics summarized in Table 3 suggest that the five investment models examined in this article share one trait with all existing equations for investment spending: none represents the one true stable model. As policy analysts and forecasters are well aware, no single approach has ever convincingly displaced the others. As a result, a wide variety of investment models continue to coexist.[12]

The second set of forecasts for the models are dynamic forecasts, and their errors are described in Table 4. Using this second approach, quarterly forecasts of investment do not benefit by knowing investment in the previous period or by knowing previous forecast errors.

[9] A proper test of static forecast errors compares the set of these errors with a tolerance range defined by their variances and covariances. See H. Theil, *Principles of Econometrics* (John Wiley & Sons, Inc. 1971), Chapter 3.

[10] One possible change is the innovation in the management and analysis of information offered by modern microelectronics. This technological change may have fostered equipment spending. Also changes in depreciation accounting may have influenced the way businesses report capital expenditures. In the early 1970s, for example, businesses began depreciating some assets separately from one another. They may be more inclined to report separately spending on some office and factory equipment that was formerly lumped in with structures expenditures. See P. Corcoran and L. Sahling, "Business Tax Policy in the United States: 1955-1980," Federal Reserve Bank of New York, Research Paper No. 8102, September 1981.

[11] This type of bias in forecasts is not unusual. Because we have used estimated coefficients in each model, the forecasts tend to err. Provided the explanatory variables change smoothly from year to year, the errors in our experiment will tend to be positively correlated. If because of the estimated coefficients the model tends to underestimate in one year, it will tend to underestimate in all years.

[12] There is really no way to compare the "validity" of models. Each model relies on a unique form of "exogenous" information, and appending ad hoc equations for these explanatory variables to an investment model changes its statistical properties. We can always test the specification error in one investment model by assuming that another is the "true" one, but such relative tests cannot unconditionally isolate the "true" model.

Unlike the static forecasts, the dynamic forecast cannot keep from straying far from the trend of actual BFI by constantly checking its previous errors and incorporating corrections for them in subsequent forecasts. Dynamic forecast errors therefore cannot be compared easily to static forecast errors. The performance of the dynamic forecast suggests how well a model might estimate investment spending several years into the future.

Table 4 describes the dynamic error performance of each model from 1978:I to 1981:IV. Unlike the static forecasts, the dynamic projections for some equations are subject to substantial error. In fact, the mean errors for some equations in Table 4 are as high as 10 percent of investment spending. This means that forecasts of the rate of growth of investment demand would have been off the mark by several hundred percent for these models. Whereas the differences between equations were modest in Tables 2 and 3, the error statistics of Table 4 reveal that performances of investment models need not be similar for purposes of long-range forecasting.

Charts 5 and 6 complement the tables of error statistics. Chart 5 graphs the projections for nonresidential structures demand. The upper panel displays the static forecasts for selected equations, and the lower panel charts the dynamic forecasts. Similarly, Chart 6 presents the projections for selected equipment demand equations.

The Performance of the Time Series Model

Although the time series model performed poorly in the static forecasting experiment, its dynamic forecasts for both equipment and structures were the best of the five models by a considerable margin. This finding is rather surprising because time series models generally produce superior static forecasts and their dynamic forecasts are more prone to error.

As shown in Table 3, the static errors of the time series model were so small for forecasts of structures expenditures that this model ranked second best. Yet, its static forecast errors for equipment spending were unacceptably large in comparison to every other model. As shown in Table 4, however, the dynamic error statistics for the time series model are smaller than those for every other model both for structures and for equipment spending. This performance is even more impressive considering that the time series model could not benefit by using future sales, interest rates, and other variables appearing in the other equations to influence its dynamic forecast.

The Performance of the General Accelerator Model

In the static forecast experiment, the accelerator model generally outperformed the competition, and this model's dynamic forecasts were second only to those of the time series model. Over all, the accelerator model appears to produce relatively accurate forecasts most consistently. According to Table 2 from 1954 to 1977 the accelerator model generally forecasts changes in each component of investment spending within $1 billion. Yet, as shown in Table 3, the static projections do well to err by less than $1 billion. Not only have the sizes of the errors increased from 1978:I to 1981:IV, but the estimates tend to underpredict investment spending fairly consistently; that is, the errors do not vary between positive and negative values, they tend to be uniformly positive. The data provided in the charts and Table 3 show that the performance of the equipment equation is weaker than that of the structures function.

As shown in Table 4 and Charts 5 and 6; the accelerator model's persistent tendency to underpredict spending, when not corrected, has led to substantial dynamic forecast errors. By the end of 1981, the accelerator model underpredicts BFI by $24 billion, an error of more than 14 percent of actual spending. About two-thirds of this overall error is due to the model's underprediction of equipment spending.

In some respects the performance of the accelerator model should give cheer to its proponents. The summary of forecast errors in Tables 3 and 4 show that the accelerator model's static forecasts of structures expenditures were best and that this model's dynamic forecasts of structures spending were second only to the time series model. The accelerator's equipment equation was essentially tied with the neoclassical equipment equation for producing the best static forecast and the second-best dynamic forecast.

The Performance of the q Model

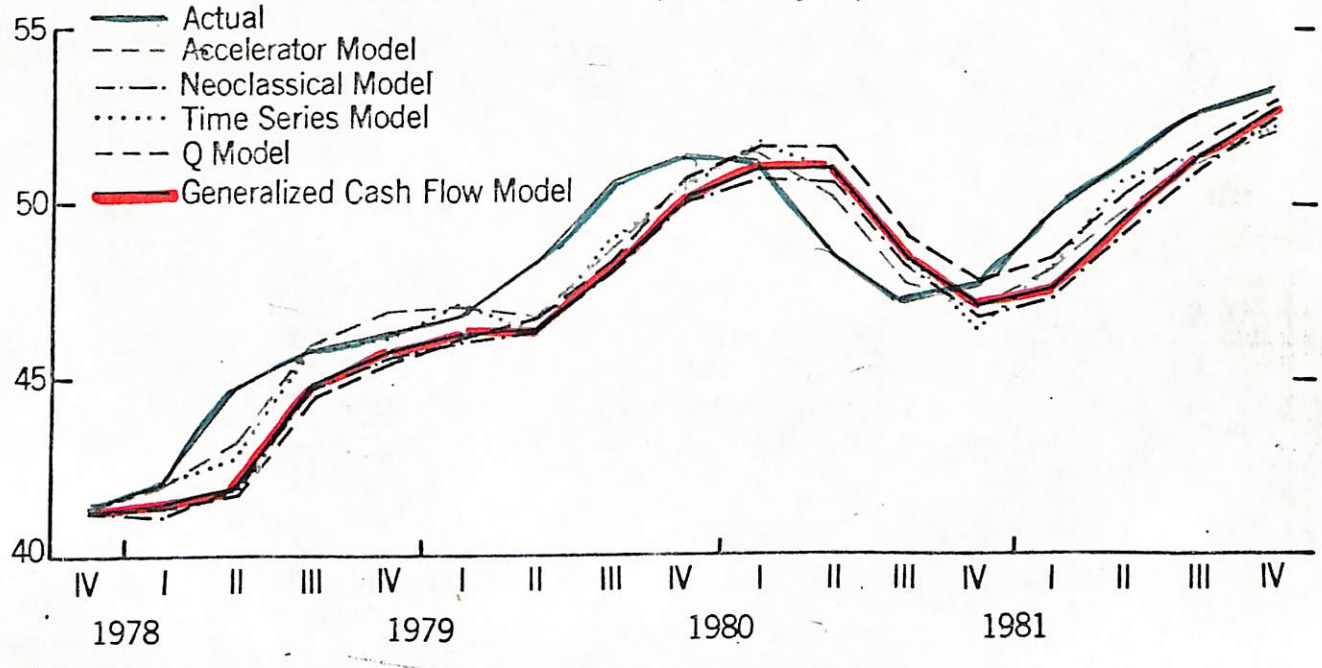
Though the q model's forecasts generally are not as accurate as those of the time series and accelerator models, the q model's static forecasts closely track BFI, and by 1981 its dynamic forecast error for total investment spending is only one-third that of the accelerator model.

From the error summaries shown in Table 3, the static forecasts for the q model miss the mark by $1 billion or more less frequently than any other model. However, the relatively large root mean squared error

Chart 5

Nonresidential Structures: Static Forecast Performance

Billions of 1972 Dollars, Seasonally Adjusted Annual Rates



Nonresidential Structures: Dynamic Forecast Performance

Billions of 1972 Dollars, Seasonally Adjusted Annual Rates

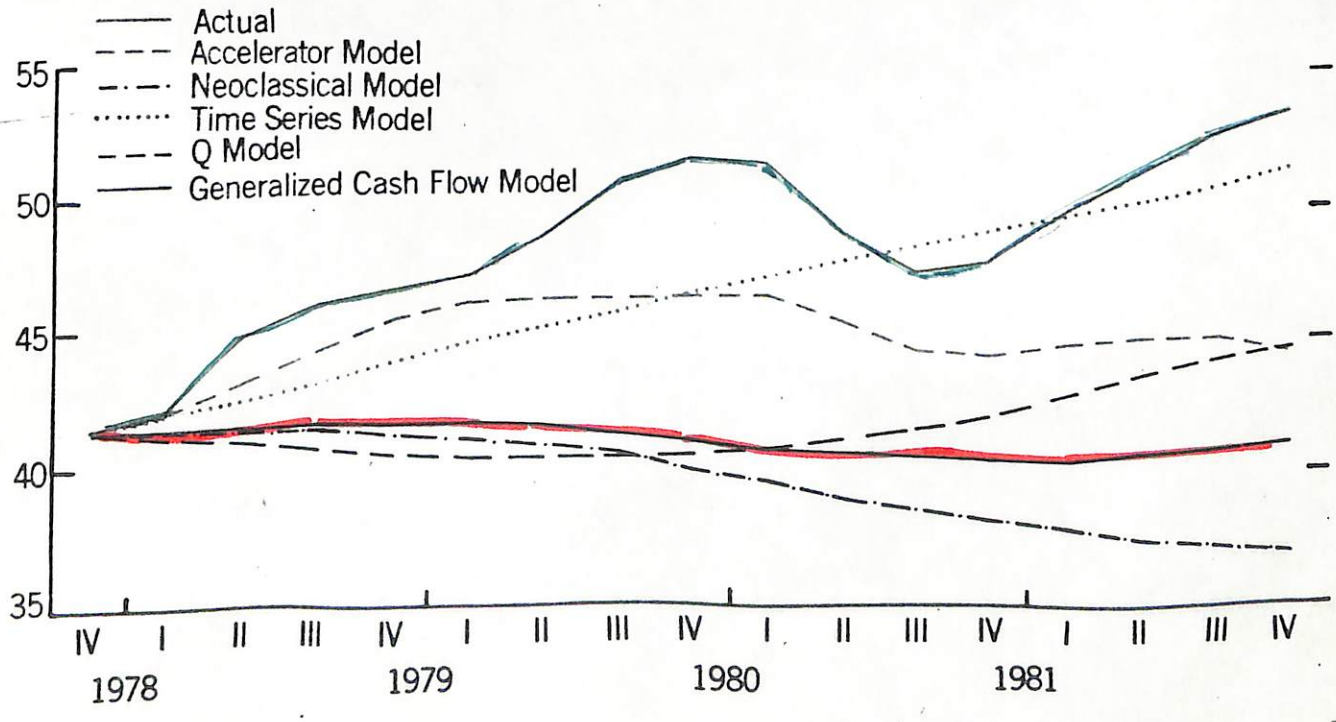
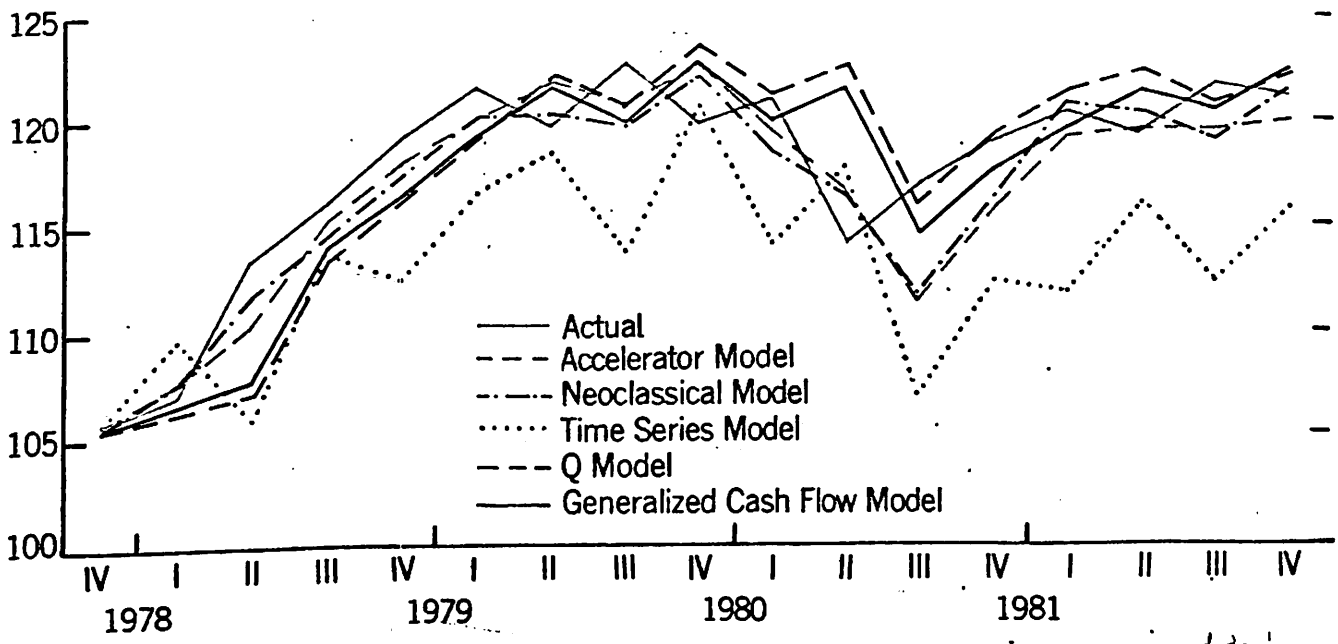


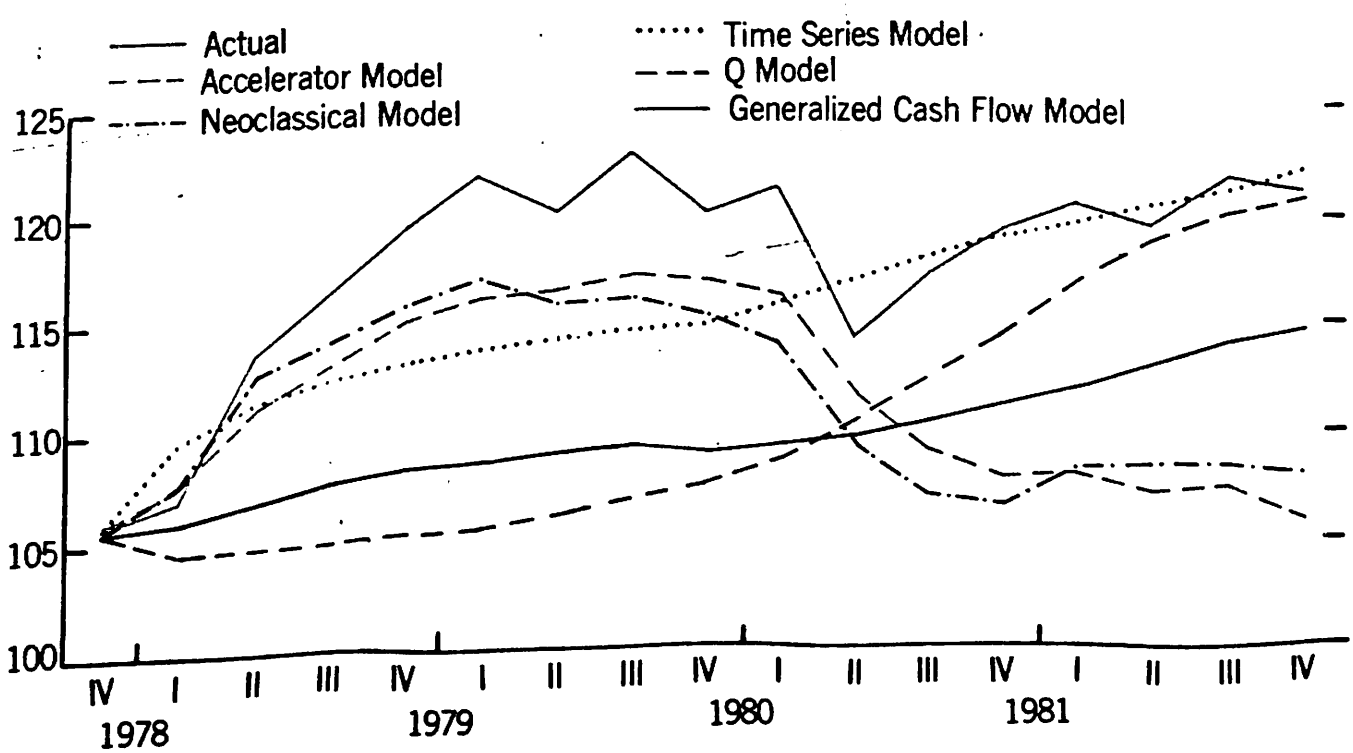
Chart 6 Producers' Durable Equipment: Static Forecast Performance

Billions of 1972 Dollars, Seasonally Adjusted Annual Rates



Producers' Durable Equipment: Dynamic Forecast Performance

Billions of 1972 Dollars, Seasonally Adjusted Annual Rates



for this model's forecasts implies that its few large forecast errors tended to exceed the larger errors of the other models. When the q model missed the mark, it did so by a wide margin.

The dynamic forecast errors of the structures and equipment equations follow the same general pattern. From early 1978 to the end of 1979, the q model strayed well off track by underpredicting investment spending. Then, in 1980 and 1981, the dynamic forecasts of equipment spending quickly recovered to make rather accurate predictions by the end of 1981, but the dynamic forecast errors of structures spending improved only slightly during this period. In contrast, the dynamic forecasts of the accelerator model predicted BFI relatively accurately until the middle of 1980, after that its errors increased steadily as it underpredicted BFI.

Therefore, even though it is tempting to denegrate the q model for its poor showing in Tables 3 and 4, at times this model may describe the motives for investment demand better than the accelerator model. Though sales have failed to grow during the early 1980s, the demand price for capital was not so low as to predict the investment slump that the accelerator model forecasted.

The Performance of the Generalized Cash Flow Model

The overall forecasting performance of the cash flow model ranks it with the q model. Both the structures and equipment equations for the cash flow model tend to underpredict investment spending by a relatively substantial margin from 1978 to 1981.

Though the statistics in Table 3 show no vast differences among the investment models, a relatively large proportion of the cash flow model's static errors exceeded $2 billion. Like the q model, the cash flow model's dynamic forecast for equipment spending strayed well below actual spending from 1978 to 1979, but unlike the q model, the cash flow model's forecasts failed to recover in the 1980s. Furthermore, the cash flow model's dynamic forecast error for structures expenditures generally increased from 1978 to 1981. Apparently, recent investment spending was stronger than predicted by BFI's "traditional" tie to business cash flow.

The Performance of the Neoclassical Model

Of all the models, the neoclassical model underestimated BFI by the widest margin from 1978 to 1981. The neoclassical model's equation for equipment spending tied that of the accelerator model as second best, but the neoclassical model, more than any other, badly underestimated structures expenditures.

By the end of 1981 BFI exceeded the neoclassical model's dynamic forecast by $30 billion, an 18 percent error. Although the accelerator model also substantially underestimated BFI in 1981:IV, its dynamic forecasts did not begin to stray badly until the last half of 1980. The neoclassical structures equation produced substantial dynamic errors in the middle of 1979, and unlike the time series or q models, the neoclassical structures equation did not recover in 1980 or 1981.[13]

Summary

All models tended to underpredict BFI. Apparently the pattern of investment spending after 1977 deviated little from its average behavior before 1977 even though the pattern of sales, cash flow, and the cost of capital changed markedly in the late 1970s. After 1977 sales often would rise and fall, sometimes sharply, from quarter to quarter and overall growth was negligible; the purchasing power of business cash flow reflected the uneven and sluggish sales performance and the user cost of capital steadily rose. The relative strength of investment spending from 1978 to 1981, therefore, was "explained" more accurately by the time series model, which exploited the previous pattern of BFI, than by the alternative models, which relied on trends in other variables to forecast BFI.

The performance of the time series model was not impressive enough to discredit the alternative models. In fact one of the drawbacks of the time series model is apparent when we ask why investment spending was so strong despite adverse business conditions. Can we expect BFI to remain relatively strong in the mid-1980s? Though the model forecasts investment well in this experiment it provides no "explanation" of BFI. Indeed, if investment spending were supported by faith in an imminent recovery, capital budgets might not be as closely tied to sales, cash flows, or financing costs as they had in the past. A loss of faith in recovery and subsequent sustained growth due to continually weak sales and cash flows may restore the ties between BFI and concurrent business conditions.[14]

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[13] Our specification of the cost of capital may be responsible for some of this error. Estimates of the cost of capital vary, and ours rose substantially—especially for structures—in the late 1970s. Yet an alternative dynamic forecast, which assumed that the cost of capital did not change after 1977:IV, produced errors 75 percent as great as those reported here.

[14] In a previous study, we found that the dynamic forecasts of the time series model performed relatively poorly. See my, "The Behavior of Investment Spending during the Recession and Recovery, 1973-1976," *New England Economic Review*, November/December 1977, pp. 5-41.

A comparison of Charts 5 and 6 also shows that the models other than the time series model predicted changes in equipment or structures expenditures for certain years very accurately. This finding implied that there may be no best model of investment. Depending on changes in the pattern of industrial fortunes and in constraints on business capital budgets, all models have their season. Unfortunately, the models alone cannot tell us which of them will offer the most appropriate description of investment spending in the next episode.[15] Consequently, professionals rely heavily on surveys of capital budgets and investment spending plans as well as assessments of overall business prospects before completing their investment forecasts. Regardless of the formal model of BFI they might use, most prominent forecasters use their judgment in adjusting their equations' projections.

IV. Investment Forecasts from Surveys

The Bureau of Economic Analysis of the U.S. Department of Commerce (BEA), the Department of Economics of the McGraw-Hill Publications Company, and the Conference Board, among others, survey business capital spending plans. The BEA and McGraw-Hill request intended plant and equipment expenditures. The BEA data provide estimates of capital spending up to four quarters in the future, whereas the McGraw-Hill estimates provide four-year forecasts. The Conference Board survey reports capital appropriations data; consequently, it is necessary to forecast the timing and volume of future investment spending using current and past appropriations. None of these surveys provides a comprehensive coverage of aggregate business fixed investment as reported in the National Income and Product Accounts. For example, the BEA data do not cover farm enterprises, professional persons, nonprofit institutions or real estate operators, nor do they include certain types of expenditures which appear in BFI. The McGraw-Hill figures are comparable to those of the BEA, and the Conference Board limits its scope to the 1,000 largest U.S. manufacturing corporations.[16]

Table 5
Forecast Errors for Alternative Projections of Nominal Investment Spending

	One-Year Forecast Horizon[1]			
	1978	1979	1980	1981
Surveys:				
BEA	6.1%	5.8%	−1.3%	−2.1%
McGraw-Hill	5.7	7.1	−0.2	−3.2
Conference Board	−1.8	3.6	9.0	5.8
Models:				
Time Series	3.6	0.0	2.0	2.7
Accelerator	2.9	2.0	0.5	4.9
q Model	10.0	3.0	−6.3	0.1
Cash Flow	7.8	3.5	−3.2	3.0
Neoclassical	4.1	5.2	3.3	8.2

BEA: From the November surveys of the previous year.

McGraw-Hill: From the October surveys of the previous year.

Conference Board: From past appropriations data of the 1,000 largest manufacturers. See E.S. Grossman and T. Maruyama, "Timing the Contributions of Capital Spending," the Conference Board *Record*, December 1975, pp. 8–16.

Models: From four quarter dynamic forecasts beginning in the fourth quarter of the previous year.

[1]Error statistics are calculated by subtracting the forecast of annual investment from actual investment spending, the difference is then divided by actual investment.

Since the BEA and the Conference Board collect data on actual business investment spending by the firms in their samples, it is possible to compare the figures for anticipated investment with the actual level of spending appropriate for each forecast. Table 5 reports the forecast errors of the survey approaches as well as those of the statistical models for the years 1978 to 1981. Because the forecasting techniques are applied to different sets of data, the error performances are not strictly comparable. Nevertheless, the accuracy of the survey is rather attractive in many instances. In particular, the BEA forecasts for 1980 and 1981, the McGraw-Hill forecasts for 1980 and 1981, and the Conference Board "forecast" for 1978 are remarkably free of error.

Despite the potential value of more all-inclusive business surveys, econometric models of investment behavior will remain a vital forecasting tool. Statistical models can assist analysts in the preparation of long-term forecasts which may cover many years or decades. Econometric models, in theory, also permit business analysts to understand the motives behind investment behavior and to untangle the specific determinants of capital spending. Accordingly, these models permit policymakers to assess the effects of changing tax laws, interest rates, or government purchases on business investment behavior. A variety of forecasts can be prepared, each using unique assumptions about policy and business conditions. To collect survey data rich enough to satisfy these objectives is not feasible.

[15] During the estimation period, for example, the accelerator model's structures equation relied very heavily on the autocorrelation correction using its previous period's error. Without this correction the equation underpredicted structures spending badly during much of the 1960s—errors exceeded $10 billion. The neoclassical equation's uncorrected "raw residuals" were seldom one-third the size of the accelerator model's errors. Yet during the dynamic forecasting experiment reported here, the accelerator model's structures equation performed much worse than that of the neoclassical model.

[16] Though the Conference Board surveys 1,000 firms, only roughly half the sample responds. Appropriations for this subgroup are then extrapolated to cover the full 1,000 firms assuming that the ratio of appropriations to assets for all 1,000 match the ratio reported by the respondents.

In any event, survey techniques and statistical models often complement one another. Few predictions are based on the mechanical simulation of statistical models; forecasters who use econometric models generally adjust the projections to incorporate judgmental assessments of business conditions. It is not surprising that one source of these judgmental adjustments is survey information. Furthermore, some forecasting equations explicitly include businessmen's expectations or capital appropriations to produce estimates of investment spending. Therefore, in practice, the versatility of econometric models and the complementary survey information concerning business intentions are profitably combined by most forecasters.

V. Conclusion

Econometric models help untangle the many elements that have influenced capital expenditures in the past and that determine the future demand for plant and equipment, but no single, accepted description of business investment behavior dominates the competition. This article analyzed the forecast performance of five models of business fixed investment spending. Of these, the time series and accelerator models predict BFI from 1978 to 1981 most accurately. Although these models adequately describe recent investment behavior, their forecast errors can be uncomfortably large, and these errors tend to be related—for prolonged intervals of time, each model consistently underpredicts capital spending. Evidently, none of these forecasting equations has incorporated all the essential determinants of investment behavior.

The principal conclusion of this study is not that the time series model and the accelerator model have performed so well that the competition may be dismissed. Depending on the component of BFI of interest—structures or equipment —, depending on the historical episode, each model can provide relatively accurate forecasts of investment spending. Despite their dissimilar appearances, the differences among the performances of these five models are often not so great. The time series model relies on the past pattern of investment. In the accelerator model, BFI is determined solely by sales. Output also determines investment spending in the neoclassical model, but interest rates, relative prices, and taxes also are important. The lags in the neoclassical model are also twice as long as those in the accelerator model. Capital spending in the q model depends on the ratio of the market value of business assets to their replacement value. The cash flow model explains investment spending as a variable proportion of retained earnings.

It is not difficult to see why there is no common description of investment behavior, but the absence of a consensus is now most conspicuous. Because capital spending is not as strong as many analysts had hoped, there is much debate about what response from Washington, if any, is appropriate. Naturally, the lack of general accord concerning the determinants of investment behavior only enhances the confusion.

APPENDIX

Table 1

CE, CS: Implicit price deflators for producers' durable equipment and nonresidential structures, respectively. (Bureau of Economic Analysis.)

F: Cash flow of nonfinancial corporate business, calculated as corporate profits after tax with inventory valuation and capital consumption adjustment plus capital consumption allowances with capital consumption adjustment less dividend payments.

IE, IS: Gross private investment in producers' durable equipment and nonresidential structures in constant dollars, respectively. (Bureau of Economic Analysis.)

KE, KS: Constant-dollar net stocks of capital equipment and nonresidential structures. These series are fourth quarter to fourth quarter linear interpolations of annual capital stock data (Bureau of Economic Analysis).

P: Implicit price deflator for gross domestic business product. (Bureau of Economic Analysis.)

&. Gross domestic business product. (Bureau of Economic Analysis.)

q: The ratio of the market value of nonfinancial corporations to the replacement value of their net assets. The market value equals equity less farm net worth plus net interest-bearing debt. Specifically, net interest-bearing debt is the sum of bank loans, commercial paper, acceptances, finance company loans, U.S. government loans, and adjusted tax-exempt bonds (ATEB), where

$$ATEB = .5\,MTG + BPI^{*}(.5MTG + TEB + CB)$$

and

MTG = commercial mortgages
BPI = New York Stock Exchange Bond Price Index for all listed bonds (New York Stock Exchange 1982 Fact Book)
TEB = tax-exempt bonds
CB = corporate bonds

The replacement value of net nonfinancial corporate assets equals the sum of reproducible assets, land, and total financial assets less profit taxes payable, trade debt, and foreign direct investment in the United States. (All data are taken from Board of Governors of the Federal Reserve System, Flow of Funds, *Balance Sheets for the U.S. Economy 1945–1981*, Nonfinancial Corporate Business, Table 705, April 1982, except where noted.)

RE, RS: User cost of capital for equipment and structures.

$$RE = (PE/P)(.15 + D)(1 - ITC - TAX\,(WE) - .5\,(1 - DEBT))/(1 - TAX\,(1 + 2\pi))$$

PE/P is the implicit price deflator for producers' durable equipment divided by the GNP deflator.

The rate of actual depreciation for equipment is .15; for structures the rate is .05.

D is the Standard and Poors dividend price ratio for common stocks plus .04.

ITC is the investment tax credit on equipment; the credit for structures is assumed to be zero.

TAX is the statutory corporate income tax rate.

WE is the present value of depreciation allowances for equipment using the most "accelerated" formulas permitted by law. This discount rate is .015 plus π .WS is defined similarly.

π is the expected inflation rate. The values used in this series are as follows:

1947:I to 1959:IV	1.0%	1969:I to 1969:IV	3.5%
1960:I to 1960:IV	1.4%	1970:I to 1972:IV	4.0%
1961:I to 1961:IV	1.3%	1973:I to 1973:IV	5.0%
1962:I to 1963:IV	1.2%	1974:I to 1975:IV	6.0%
1964:I to 1964:IV	1.3%	1976:I to 1977:IV	5.5%
1965:I to 1965:IV	1.4%	1978:I to 1978:IV	6.0%
1966:I to 1966:IV	1.8%	1979:I to 1979:IV	7.0%
1967:I to 1967:IV	2.0%	1980:I to 1980:IV	8.0%
1968:I to 1968:IV	3.0%	1981:I to 1981:IV	7.5%

DEBT is the present value of debt service charges after taxes per dollar borrowed at the prevailing Aa new utility rate. The maturity of the loan equals the tax lifetime of the capital good. The discount rate is the same as that for WE. When DEBT is less than unity, the user cost of capital declines. The .5 reflects our assumption that capital is half financed with debt.

The denominator differs from the conventional (1-TAX) because the tax on inventory profits increases with inflation. Historically, each one percentage point increase in the inflation rate raises the ratio of inventory profits to operating profits—and thus the tax burden on operating profits—by 2 percent.

Table 2

All equations are estimated from 1954:I to 1977:IV. Since the models utilize lagged values of certain explanatory variables appearing on the right-hand side of the equations, the sample data for these variables commence before 1954. The equations are estimated by generalized least squares (GLS), except for the time series model. All distributed lag coefficients are constrained to lie along third degree polynomials, and, when appropriate, the trailing term is constrained to 0. The length of each lag and the imposition of the tail constraint were decided by considering the sensibility of estimated coefficients and their standard errors. While the neoclassical equipment equation contains two sets of lag distributions, the structures equation has only one set of lags. The lags are applied to the variables $(P/RE)_tQ_t$ and $(P/RS)_tQ_t$, respectively. (Evidently, structures are less technology specific than equipment). All error statistics are based on estimated residuals after any autocorrelation adjustment for the period 1954:I–1977:IV.

Column I, the root mean squared error, reports the value of the statistic

$$\Sigma_{t=1}^{96}(\text{Actual Investment}_t - \text{Predicted Investment}_t)^2/96$$

Column 2 reports, as a percent of 96, the number of instances in which the absolute value of the estimated residual exceeds $1 billion. Similarly, column 3 reports the frequency of errors which exceed $2 billion in absolute value.

Column 4 presents the autocorrelation coefficient of the errors. Except for the time series model, the structure of time dependence is assumed to be first-order Markov. The time series model, by design, is constructed so that the errors may follow a moving average process only. In fact, no evidence in support of a nonzero correlogram was found for these equations.

We report GLS results rather than some limited information estimator such as two-stage least squares for one reason. Estimated coefficients can be extremely sensitive to the particular choice of instrumental variables: small sets of instruments give very different results while large sets basically replicate the GLS estimates. Problems of bias cannot be dismissed by appeals to consistency; hence, the GLS estimates may offer a relatively favorable signal to noise ratio, and they may represent an heuristic "center of gravity" in a cloud of competing descriptions. In any case, we once again offer the caveat

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DIFFERENT FORMS OF TECHNICAL PROGRESS

INTRODUCTION

The classics, Smith and Ricardo, used their theory of value to base their the... of accumulation, technical progress, and the long-term trend of distributio... the analysis of the technological development in specified industries suc... textiles, corn production, watch-making, etc. Marx undertook vast studies ... history of technology and related it to the evolution of the productive rela... The chapters on co-operation, the division of labour, and on modern ind... in *Das Kapital* are the best known distillates of that research, and they link u... his theory of accumulation. The modern neoclassicals, on the other hand, ... to separate their microeconomic theory of value – be it at the level of firm... industries – from the macroeconomic theory of accumulation. The static cha... ter of much general equilibrium theory has prevented its use for an analy... technical progress – hence the need for aggregate production functions in ... classical economics for the analysis of accumulation. This dichotomy of the t... of value and of the theory of accumulation is unfortunate, all the more s... the foundations of neoclassical macroeconomics have been undermined in... reswitching debate.

No such dichotomy existed in classical economics. The purpose of the pre... article is to revive this particular aspect of the Marxian theory. We take up ... classical tradition of using the theory of value for an analysis of the effe... "microeconomic" changes of technique, specified in determined chang... physical quantities, on macroeconomic aggregates. We select only a few for... technical progress and we analyse them by means of Sraffa's theory of p... (Sraffa, 1960) in order to overcome the limitations of the classical labour t... of value. The classical theory of accumulation and of the impact of machinery ... then be reproduced in a modern framework.

1. SAVING OF LABOUR

The historically first and conceptually simplest form of technical progress is ... division of labour. A capitalist assembles artisans with their tools in a works... and is thereby able to raise the productivity of their labour without providi... a machine because he imposes the working discipline characteristic for man... facturing and improves performance through enforced specialisation. Since t... amount of raw materials remains basically the same, this form of technic... progress implies that in a single product system

$$(1+r)\,Ap + wl = p$$

(where each industry produces one commodity, and where A is the input–outp... matrix and p the price vector) some coefficients l_i $(i = 1, \ldots, n)$ in the labo... vector l fall whereas the coefficients a_{ij} $(i,j = 1, \ldots, n)$ of the input–output matri... remain the same. The monotonically falling wage curve $w(r)$ which indicate...

...hard d, where d is a row vector of finished goods with $dp(r) = 1$) is shifted ...wards for all rates of profit smaller than the maximum R. This type of progress ...therefore be introduced at every point of the wage curve (except R): If the ...rate is fixed, the rate of profit rises, whereas if income distribution, i.e. the ...P/W of profits P to wages W, tends to remain constant, the rate of profit ...tend to stay the same while wages rise.

To prove the latter point, note that

$$\frac{P}{W} = \frac{P}{K} \cdot \frac{K}{W} = r.\omega,$$

...ere $\omega = K/W$ is the ratio of total capital to wages or the "organic composition ...apital" in price terms.[1] It is a pure number and independent of the standard ...ices. As such it is a superior concept to the conventional capital–labour ratio ...ich is dimensionally hybrid. Moreover, it does not exhibit "Wicksell price ...ts", for the organic composition of capital rises monotonically with the rate ...profit for a given technique since it is equal to total capital measured in terms ...labour commanded divided by total labour employed and since prices in ...ms of labour commanded rise monotonically with the rate of profit. In for...iae:

$$\omega = \frac{K}{W} = \frac{qAp}{wql} = \frac{qA\hat{p}}{ql} = qA\hat{p}, \quad \text{if} \quad ql = 1,$$

...here q is a row vector of fixed activity levels.

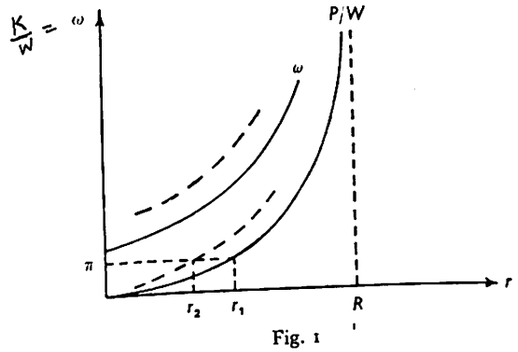

Fig. 1

Fig. 1 shows that if the curve for ω shifts upwards because of a technical change, ...he P/W curve also shifts upwards. As in Marx, the rate of profit then falls from ...to r_2 in consequence of the technical change, if P/W is given and equal to π.

Suppose now that the increasing division of labour in the above restricted sense ...proceeds in all industries at the same pace so that the labour vector falls by some

[1] See Schefold (1976). I apologise for my not-quite-accurate translations of Marx's terms into those ...of Sraffa, and for my light-hearted treatment of economic history. My main purpose is to illustrate a ...new formal approach to the treatment of technical progress by means of the examples which first in...spired me; it is not to propose a particular interpretation of economic history.

factor $\alpha < 1$. As a consequence, all prices $\hat{p} = p/w$ (prices in terms of the wage-rate) at a given rate of profit will also fall by this factor α;

$$\hat{p} = (I-(1+r)A)^{-1}l$$

becomes $$\{I-(1+r)A\}^{-1}\alpha l = \alpha\hat{p} \quad (\alpha < 1).$$

Consequently, the organic composition of capital stays constant, and the distribution of income remains invariant with increasing technical progress if the rate of profit remains constant while the wage rate increases in whatever standard it may be measured. Conversely, if P/W remains constant, the rate of profit remains constant since the organic composition does not change.

This rather surprising result is neat and clear if all components of the labour vector fall in the same proportion, but if some sectors gain more in productivity than others, it will still be true that a fall in a component of the labour vector does not necessarily raise the organic composition of capital since the fall in wages paid per unit of output will be compensated to some extent by the fall in prices of raw materials at the given rate of profit. Thus, the overall effect always may be "neutral" for given r in quite a wide range of circumstances; the organic composition of capital may, for example, stay constant despite the fact that the physical "ratio" of capital goods to labour has risen.[1]

So far we have only been comparing different steady states, the real process of accumulation has not been discussed. If it were to be, many other elements would have to be considered, in particular thriftiness conditions. Suffice it to say that since an overall saving of labour is the archetypical form of Harrod neutral technical progress, the economy can sustain a golden age, once it has begun, if the capitalists continue to invest and save at constant rates and if no outside disturbance takes place, e.g. through abrupt changes in the labour supply. The rate of profit (assumed to be uniform) will be constant and such that the investment process generates adequate savings, given the savings propensity of the capitalists, if there is uniform gradual reduction in labour requirements per unit of output in the sense that the capital–labour ratio measured in terms of labour commanded stays constant as well, while wages increase with productivity in a state of near full employment. Other constellations than this golden age are conceivable but they will not be discussed here.

2. MECHANISATION

We now introduce the formal apparatus of a Sraffa system involving fixed capital.

Fixed capital is a special case of a joint production system where the unit output matrix of the single product system $(1+r)Ap + wl = Bp$ has been replaced by a quadratic output matrix, expressing the fact that each process using a t-year-old machine produces an output of a finished good jointly with a $t+1$-year-old machine. We eliminate old machines as in Sraffa (1960) and represent the reduced system as follows.

A finished good i $(i = 1, \ldots, f)$ – i.e. any good which is not an old machine –

for example, new machines, consumption goods, or circulating capital goods – is produced by means of a machine lasting T_i years. In each year t, $t = 1, \ldots, T_i$, production requires a vector $a_i(t) = (a_{i1}(t), \ldots, a_{if}(t))$ of finished goods together with labour $l_i(t)$ as inputs, to produce the output $b_{ij}(t)$.

It is intuitively plausible (and I have proved it elsewhere[1]) that the equations (called "integrated processes")

$$\sum_{t=1}^{T_i}\left\{\sum_{j=1}^{f}(b_{ij}(t)-(1+r)\,a_{ij}(t))\,p_j - wl_i(t)\right\}(1+r)^{T_i-t} = 0 \quad (i = 1, \ldots, f)$$

determine the prices p_i of finished goods i at the given rate of profit since the total of the discounted sums obtained by selling the quantity of good i produced in each year must be equal to the total of the discounted costs of production incurred in each year.

It can be shown (provided only that the system is capable of producing a surplus (Schefold, 1974*b*)) that the prices of finished goods determined by this set of equations are positive at any rate of profit between zero and the maximum r at which maximum the prices of finished goods in terms of the wage-rate would diverge to infinity).

However, it may be necessary to truncate the life-times of some of the machines in order to obtain the maximum possible real wage at a given rate of profit. If we draw the wage curves for all possible truncations yielding a system which is still productive, we find that the envelope of these wage curves (given by the optimum truncation at each rate of profit) will fall monotonically as is the case with the wage curve of a single product system.[2] This expresses the fact that prices in terms of the wage rate of finished goods rise monotonically with the rate of profit provided the optimal truncation has been made at each rate of profit. The pattern of truncation is complicated – contrary to Nuti's assertion (Nuti, 1973), reswitching is possible – (Schefold, 1974*b*), but prices of finished goods are equal for two truncations at any switchpoint between the truncations.

The equation for the integrated process may be transformed to obtain something akin to a single product system

$$(1+r)\sum_{j=1}^{f}\hat{a}_{ij}(r)\,p_j + w\hat{l}_i(r) = p_i \quad (i = 1, \ldots, f),$$

where the expressions

$$\hat{a}_{ij}(r) = \frac{\sum_{t=1}^{T_i}(1+r)^{T_i-t}\,a_{ij}(t)}{\sum_{t=1}^{T_i}(1+r)^{T_i-t}\,b_{ii}(t)}, \qquad \hat{l}_i(r) = \frac{\sum_{t=1}^{T_i}(1+r)^{T_i-t}\,l_i(t)}{\sum_{t=1}^{T_i}(1+r)^{T_i-t}\,b_{ii}(t)},$$

are called "centre coefficients" (Schefold, 1971, 1974*b*).

This formal system enables us to consider a different form of technical progress: mechanisation. The capitalist buys a newly developed machine and employs some workers to produce a commodity which was previously produced by arti-

[1] Schefold (1971, 1974*b*).

sans. Mechanisation means accordingly the introduction of a "roundabout process".

We shall now add the assumption that mechanisation as such does not permit the saving of raw materials. (Saving of raw materials will be considered separately.) We ignore the tools used by the artisan. It is then an admissible abstraction to assume that production by means of the machine requires in each year of its lifetime at least as much of each raw material (e.g. cotton) per unit of output (e.g. cloth) as is required by the artisans. We assume also for simplicity's sake that the process to be replaced uses circulating capital only and is the first (number 1) in the system, denoted by $\bar{a}_1, \bar{l}_1$. Suppose now (without loss of generality) a new process a_0, l_0 is introduced which produces the machine by means of circulating capital only. This new machine can be formally eliminated from the fixed capital system: the T_1 new processes producing the first good by means of the machine may be taken together with the process a_0, l_0 producing the machine to obtain an integrated process starting (but yielding no output of commodity one) in year zero. The process gives rise to the centre coefficients

$$\hat{a}_{1j}(r) = \frac{\sum_{t=0}^{T_1} (1+r)^{T_1-t} a_{1j}(t)}{\sum_{t=1}^{T_1} (1+r)^{T_1-t} b_{1j}(t)}, \quad \hat{l}_1(r) = \frac{\sum_{t=0}^{T_1} (1+r)^{T_1-t} l_1(t)}{\sum_{t=1}^{T_1} (1+r)^{T_1-t} b_{11}(t)},$$

where

$$a_{1j}(0) = a_{0j}, \quad l_1(0) = l_0, \quad j = 1, \ldots, f.$$

Our assumption about the impossibility of saving raw materials by means of mechanisation can now be expressed as

$$a_{1j}(t) \geqslant \bar{a}_{1j} b_{11}(t) \quad t = 1, \ldots, T_1, \quad i = 1, \ldots, f.$$

This implies $\hat{a}_{1j}(r) \geqslant \bar{a}_{1j}$ for $r > 0$. At any one rate of profit $\bar{r}$ where the roundabout process is superior, it must yield a lower price of production for good one. We must therefore have

$$\hat{l}_1(\bar{r}) < \bar{l}_1.$$

We now denote the vector of prices of finished goods in terms of the wage rate corresponding to the old technique by $\hat{p}^I(r)$. We assume that at each rate of profit the best truncation is chosen in the old system. Each component of $\hat{p}^I(r)$ will then be a continuous and monotonically rising function of r between zero and a maximum rate of profit R_I. Equally, the real wage, measured in some basket of finished goods, will be denoted by w_I. w_I is a monotonically falling function of r. It may have corners which correspond to truncations. The old and the new method will be equally profitable if and only if

$$(1+r) \sum_{j=1}^{f} \hat{a}_{1j}(r) \hat{p}_j^I + \hat{l}_1(r) = (1+r) \sum_{j=1}^{f} a_{1j} \hat{p}_j^I(r) + \bar{l}_1,$$

i.e. if and only if

$$(1+r) \sum_{j=1}^{f} (\hat{a}_{1j}(r) - \bar{a}_{1j}) \hat{p}_j^I = \bar{l}_1 - \hat{l}_1(r).$$

We shall now assume that $\hat{a}_1(r)$ and $\hat{l}_1(r)$ are monotonically increasing functions of the rate of profit. This assumption does not exclude moderately falling physical

efficiency of the machine since the polynomials in the numerators of $\hat{a}_1(r)$ and $\hat{l}_1(r)$ are of greater degree than those in the denominators and since all mechanical processes must satisfy $a_{1j}(t) \geqslant \bar{a}_{1j} b_{11}(t)$ anyway.)

Under this second assumption about "roundabout processes expressing mechanisation" the left-hand side of the above equation is a monotonically rising function of r, the right-hand side is monotonically falling. There exists therefore at most one intersection corresponding to a switchpoint between the techniques.

Next we note that the maximum rate of profit of the new system, R_{II}, is lower than R_I. For since $\hat{a}_1(R_I) \geqslant a_1$, the centre coefficients $\hat{A}_{II}(r)$ of the new system are not smaller and some are greater than those of the old system $\hat{A}_I(r)$ at $r = R_I$ so that

$$\hat{A}_{II}(R_I) \geqslant \hat{A}_I(R_I),$$

hence we have for the dominant roots

$$\text{dom}\,((1+R_I)\,\hat{A}_{II}(R_I)) > \text{dom}\,((1+R_I)\,\hat{A}_I(R_I)) = 1,$$

which implies by definition of the maximum rate of profit in a fixed capital system

$$R_{II} < R_I.$$

It follows that the new technique will have at least one switch point with the old since we assume that the more mechanised technique is profitable at least at one rate of profit. Taking both results together, we find that there is one and only one switch point: the curve of the real wage in the new system, $w_{II}(r)$, intersects $w_I(r)$ in one and only one point, and from above (see Fig. 2).

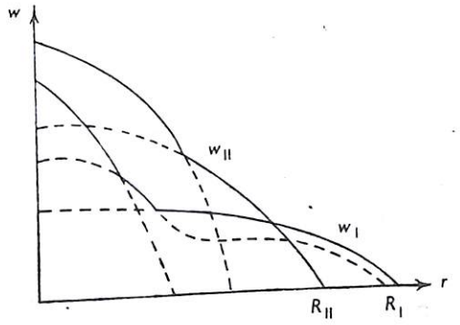

Fig. 2

One minor correction remains to be made: We have taken account of truncations in the old system only, not in the new one. We must suppose that our assumptions about roundabout processes expressing mechanisation are fulfilled for each admissible truncation. Each of these wage curves will then cut w_I in exactly one point, and from above. Hence, the same is true for their envelope w_{II}. w_I and w_{II} are both monotonically falling.

Although it is not really legitimate to ignore the difficulties involved in trans-

sitions between different steady states, we now imagine the successive introduction of a series of "roundabout processes" expressing increasing mechanisation. At each step the maximum rate of profit falls while the amount of labour required per unit of gross output diminishes. The techniques can then be ordered hierarchically according to the maximum rate of profit; intermediate techniques may sometimes not appear on the envelope, but no technique appears twice on it. Fig. 3 shows the two possible constellations for the intermediate technique (subscript II) if three techniques are given.

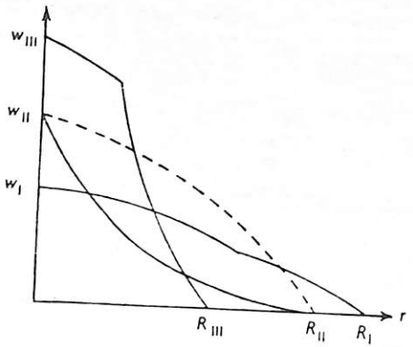

Fig. 3

3. EFFECTS OF MECHANISATION

The diagram looks familiar. Is this perhaps the neoclassical parable? I do not think so, because mechanisation is a special form of technical *progress*. The form of accumulation associated with it is far from the neoclassical equilibrium world where the emphasis is on alternative *given* techniques. The considerable increase in the amount of raw materials used in the more mechanised techniques implies an increase in cost that can only be offset through an even more considerable reduction of labour costs and hence a displacement of labour, if the financial means of some enterprise are not increased and production is not expanded to absorb the redundant labour force. The social importance of this technological unemployment is made to disappear in neoclassical theory where one abstracts from autonomous investment and considers the techniques as alternatives for a stable equilibrium which adapts to savings and (through flexible wages) to the labour supply.

The process of increasing mechanisation was analysed by Ricardo and Marx in different ways. In Ricardo's account the capitalists manage to keep the rate of profit constant so that the rate of exploitation (P/W) rises. In Marx there is a complicated interplay between the rate of exploitation and the rate of profits. The basic story is well known: technical progress will tend to raise the organic composition of capital and thus tend to bring the rate of profit down since class struggle will tend to keep the rate of exploitation in check. Wages will therefore rise in terms of commodities; the value of labour power, i.e. the labour value of the basket of goods consumed by the workers, may nonetheless *fall* in the process.[1]

To bring out the economic relationships between the rate of profit and the rate of exploitation explicitly, it is convenient to start with an unrealistic assumption, i.e. to assume that the activity levels are equal to the von Neumann expansion vector, i.e. that the economy is in "balanced proportions" irrespective of the fact that the rate of profit will be lower than its maximum (and the rate of growth in all probability will be much lower).[2]

Under this assumption we have

$$(1+R)\,qA = qB$$

hence

$$RqA(B-A)^{-1} = q, \quad q(I-rA(B-A)^{-1}) = \frac{R-r}{R}q.$$

Using this formula, we can calculate the organic composition of capital K/W as defined above.

$$\frac{K}{W} = \frac{qAp}{wql} = \frac{qA\hat{p}}{ql} = \frac{1}{ql}qA(B-(1+r)A)^{-1}l$$

$$= \frac{1}{ql}qA\,(B-A)^{-1}(I-rA(B-A)^{-1})^{-1}l$$

$$= \frac{1}{ql}\frac{1}{R}\frac{R}{R-r}ql$$

$$= \frac{1}{R-r}.$$

It thus follows immediately that the organic composition would have to rise at a given rate of profit if the maximum rate of profit fell in consequence of the introduction of mechanisation and if the activity levels were in balanced proportions both in the old and the new system.

On the other hand, the rate of exploitation $P/\overline{W}$ is equal to

$$\frac{P}{W} = \frac{P}{K}\cdot\frac{K}{W} = r\cdot\frac{K}{W} = \frac{r}{R-r}.$$

It is a monotonically rising function for $0 \leqslant r < R$. Therefore, if the workers were

[1] This may look surprising to some since the real wage expressed in commodities is often confused with the value of labour power. In our model the real wage in terms of commodities is simply w, where $w = 1/d\hat{p}$ (total labour equals 1). Suppose that workers consume a multiple λ of the basket of finished goods, $d = (d_1, \ldots, d_t)$ which serves as our standard of measurement. Clearly, $\lambda = w$, since the price of the wage-goods is equal to the wage: $(\lambda d)\,p = w$. The value v of labour power becomes

$$v = (\lambda d)\,p(0) = \frac{w(r)}{w(0)} = \frac{d\hat{p}(0)}{d\hat{p}(r)}.$$

The values, i.e. $\hat{p}(0)$, may fall faster than $w(r)$, the real wage, rises; i.e. $\hat{p}(0)$ may fall faster than $\hat{p}(r)$. Hence it becomes a logical possibility that the value of labour power and the rate of profit fall simultaneously as the wage curves shifts upwards with technical progress.

[2] The existence of "balanced proportions" is proved in Schefold (1971).

sufficiently organised to check the tendency of P/W to rise, they would force down the rate of profit as the organic composition increased.[1]

If the activity levels are not in standard proportions, we have to resort to a geometric argument. The organic composition $\omega = K/W$ equals k/w, where k is the capital–labour ratio and w the real wage-rate, both measured in terms of the basket of wage-goods d. In the familiar wage-curve-consumption-per-head diagram, ω is the reciprocal of $\overline{P_1P_2}$ since $k = tg\alpha$:

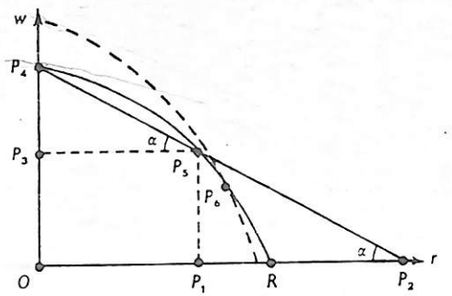

Fig. 4

(It is well-known that the curve of consumption per head c as a function of the rate of growth g is geometrically identical with the wage curve provided the net output produced in the growing economy is used as the standard of measurement for prices. Since output per head $y = w + rk = c + gk$, k (capital per head) can be read from the diagram using $k = (c-w)/(r-g)$. Here it is assumed for simplicity that $g = 0$. For the same reason, a smooth curve has been drawn which implies that there are no truncations. $\overline{OP_1}$ is the actual rate of profit, $\overline{OP_3}$ is the wage, $\overline{P_3P_4}$ is total profits since $\overline{OP_4}$ is consumption per head. Note that the organic composition will rise with the rate of profit for a given technique in most cases even if the wage curve is concave. It always rises for single product systems, as was shown above, and/or if the wage curve is convex. Note also that $K/Y = \overline{OP_2}$.)

The introduction of a more mechanised technique (dotted line) implies the existence of one switch point P_6 between P_1 and R such that the maximum rate of profit falls. Hence it can be expected that P_4 will shift upwards more than P_3 for given P_1; the distance $\overline{P_1P_2}$ becomes shorter while $\overline{P_3P_4}$ rises more than $\overline{OP_3}$.

[1] If we add another bad assumption and suppose that the wage bundle d is equal to the standard net product $q(B-A)$, we get Mr Sraffa's straight-line relationship for the real wage (Schefold, 1971). Since $w(o) = 1$, and since we assume that $d = q(B-A)$, the "standard real wage" is equal to the value of labour power: $v = 1 - r/R$ (see preceding footnote). By eliminating r, we can combine this formula with the equation for P/W and obtain $P/W = (1/v) - 1$, independently of r and R. Hence, if mechanisation lowers R, and r falls only a little, because P/W rises, v falls, too. Those who maintain that Marx was wrong on logical grounds in claiming a simultaneous fall of the value of labour power and the rate of profit are thus mistaken. The contention is also factually incorrect. Marx's point in *Das Kapital* is neither that the average real wage of the employed workers falls in the process of accumulation at full capacity, nor that the value of labour power falls. He only envisages a fall in living standards for either a reserve army without public support or as a general condition during crises when capacity is idle. This has nothing to do with Lassalle's Iron Law of Wages, which is still attributed to Marx in some [illegible] textbooks. Lassalle's dogma was taken up by "opportunist" German Social Democrats towards [illegible] of the nineteenth century although Marx had fought it vehemently.

In other words, at a given rate of profit the organic composition rises while the rate of exploitation goes up. One can prove (for $g = 0$)[1] that P/W is a monotonically rising function of the rate of profit; a check on the former is bound to reduce the latter; the "visible link" is provided by the organic composition. Such a situation is what Joan Robinson called "a technocrat's nightmare"[2]: the capitalist's efforts to raise profits through the introduction of technical progress are frustrated by the nature of the form of technical progress that is known or feasible.[3]

4. OTHER FORMS OF TECHNICAL PROGRESS

Of course, there are forms of technical progress other than the two so far considered. The direct counterpart to the pure saving of labour is saving of raw materials. It is remarkable in that it will almost always tend to lower the organic composition of capital in an indecomposable fixed capital system with positive prices at a given rate of profit. For if an element denoting an input of a finished good in the input matrix A is diminished while the output matrix and the labour vector remain unchanged, the integrated system shows that all prices of finished goods will fall. And since it is likely that the prices of old machines will follow suit (it is certain if the machines are of constant efficiency) it follows that the organic composition will be reduced by more than what corresponds to the reduction in inputs. This result is in striking contrast to that obtained for the division of labour where the saving of labour tended to leave the organic composition of capital unchanged at a given rate of profit. Both forms are similar, however, in that there are no switch points between the old and the new technique in either case (except at R when all saving is of labour).

Saving of raw materials is very important since such savings usually result from a mere increase in the scale of a process. (This observation does not violate our assumption of constant returns for a given technique.) As Kaldor (1972) has noted: doubling the diameter of a pipeline means increasing the flow at least fourfold while the requirements for steel will only a little more than double. Such savings are not always accompanied by direct savings of labour, but they lead necessarily to an indirect saving of labour.

There are changes in production which can hardly be called "technical

[1] Schefold (1974*b*).

[2] Robinson (1969), p. 171.

[3] According to the above analysis, the capital–output ratio is also bound to rise in consequence of the introduction of machinery to replace labour. To prove this, let us calculate the capital–output ratio K/Y. Since $Y/K = (P/K) + (W/K) = r + (R-r)$, the capital–output ratio of an economy in balanced proportions is equal to $K/Y = 1/R$ and rises therefore as R falls. More generally, $K/Y = k/\omega = \overline{OP_2}$ in the diagram above. Hence, the capital–output ratio goes up for a given rate of profit if and only if the organic composition of capital does the same. Since it is fairly well agreed that the capital–output ratio was more or less steadily rising in the first three-quarters of the nineteenth century and fell only afterwards to its twentieth-century level (Dean and Cole (1969), p. 306), and since verbal descriptions of mechanisation in Ricardo and Marx correspond to the picture of technical progress which we have formalised here, one is led to suspect that "mechanisation" in the sense defined above was indeed the dominant form of technical progress in the first half of the nineteenth century and that the rise in the capital–output ratio and in part also the fall in the rate of profit have to be explained by a rise in the ratio of the total *physical* quantity of raw materials to output. But there exist other explanations for the historical rise in the capital–output ratio.

progress" and which nevertheless affect profitability and the organic composition of capital, like the introduction of night shifts. Marx, too, discusses specific forms of technological development in agriculture which are influenced by the law of rent. Saving of some raw materials at the expense of using more of others at least conceivable (though probably not frequent) at a given rate of profit and the introduction of new commodities creating and serving new needs undoubtedly very important.

However, we shall confine ourselves to the discussion of only one other type of technical progress: "inventions" of radically new methods of production to produce the same commodity. This comprises the replacement of one roundabout process by another, or of one type of machinery by another.

There are two possibilities: *either* the invention represents a new method of production to produce not only the same commodity, but the physically same good. The good consists, after the invention, of the same elementary raw materials as before. *Or* some of the raw materials change. In the first case it is at least possible that the switch does not represent a new form of technical progress, but merely a combination of the forms already considered. If the raw materials which make up the product are still the same, and it is, for example, only the machine that has been replaced, and in such a way that the new machine consists of essentially the same raw materials as the old with some new components added to it, it means that we have a more mechanised method to produce the machine, therefore "mechanisation in the second degree"; the process of making the machine has been mechanised. One may think, for example, of the addition of small computers or robots to an otherwise unchanged assembly line to facilitate or replace some manual operations. Mathematically, such a process of iterated mechanisation is basically still a roundabout process with the characteristics of simple mechanisation and it follows that we are really certain to encounter a new form of technical progress which can in no way be reduced to any combination of labour saving, mechanisation and saving of raw materials only in the second case, i.e. if some of the raw materials change of which the final product is composed.

For simplicity, we shall assume that all "inventions" are of this second type, i.e. they involve the replacement of at least some raw materials of which the final product consists. By implication we assume that all changes of technique which do not change the raw materials are either labour saving, saving of raw materials, or mechanisation as defined above. But if the new product after the invention is not composed of the same raw materials as the old, it does not have exactly the same use value. Whether the old and the new good are the "same" commodities must therefore depend on the reaction of the market; the entrepreneur can only guess what the assessment of the consumer will be. If the new good fails to be recognised as a substitute for the old it may still command a market on its own, but that is even less certain.[1]

Thus, more uncertainty is generally associated with "inventions" as we have defined them than with the three specific forms of technical progress which we considered earlier. One may conclude that inventions are apt to lead to large shifts of wage curves in the neighbourhood of the rate of profit since risky inventions will not be introduced unless they promise very considerable reductions of unit costs. Switch points between zero and the actual rate of profit are therefore unlikely for what are perhaps the main forms of technical progress: saving of labour, saving of raw materials, mechanisation and, with some qualifications, inventions. The implications of this observation for the theory of accumulation are important and will be considered in a separate article.

[1] Examples of successful inventions of this type are the replacement of the petroleum lamp by the electric light or the coach by the car. Attempts to replace the metal in the body of a car by plastic have been unsuccessful: it was found that the use value of the car suffered too much.

5. MARX'S TEMPORARY RETREAT TO RICARDO

As a form of technical progress, inventions are at least as old as mechanisation, but they were not always as important. In the Industrial Revolution, machines were introduced to transform the same materials as before into the same products, but by means of less labour. Later, the processes were expanded on a greater scale (saving of raw materials per unit of output). It seems therefore that the potential diminishing influence of inventions and savings of raw materials on the organic composition of capital could not make itself felt before the industrial system was developed, and new materials were introduced.

Once inventions have become an important feature of technological development, the Marxian analysis of accumulation loses much of its force: *a priori*, the organic composition of capital can go either way and one can say hardly more than state the tautology: if the capitalists are unable to keep the organic composition of capital low, the workers must either see the rate of exploitation raised or the rate of profit is depressed. There is then neither an obvious link between the substitution of "capital" for labour at the micro-level with what happens to the capital–output ratio at the macro-level, nor is there any reason why technical progress should exhibit a secular tendency towards an increasing organic composition of capital.

The experience of several decades has led to the formulation of the famous "stylised facts". On the whole output per head and the capital–labour ratio (if measured in a commodity standard) rise with the rate of neutral technical progress while the "pure" ratios rate of profit, rate of exploitation, capital–output ratio, and organic composition of capital (K/W) stay constant. In terms of the diagram of section 3 above this means that the wage curve (supposing, on this level of abstraction, that it is more or less straight) shifts upwards on its left side by *turning* clockwise round the maximum rate of profit which stays *fixed*. Such a tendency would arise in our model, e.g. with saving of labour which may be neutral by itself and if the depressing effect of rising mechanisation on the maximum rate of profit was compensated by savings of raw materials and inventions of the appropriate kind.

Marx himself already worried about the possibility of capital-saving technical progress. It would be unjust to say that he worried because he wished the organic composition to rise and to cause a sharpening of class conflict. After all, he had to explain a phenomenon of which we now know that it was a *fact* occurring at

this time; and we have shown that the one aspect of his story which we have considered proves consistent when formalised.

But for Marx the question was not just one of consistency. He felt insecure whether the observed increase in the mass of material means of production would really cause their *value* to rise in relation to the *value* of labour power *in spite* of various counteracting tendencies. After a long discussion of different forms of technical progress he suggests in "Theories of Surplus Value" that the lengthening of the lifetimes of machines will raise the organic composition, but this argument is in general neither formally nor factually correct. Eventually he realises that the cheapening of raw materials (achieved by whatever form of technical progress in the raw material sector) may *decisively* counteract the tendency of the organic composition to rise which he sees engendered by mechanisation, and he says:

> To this it is quite easy to answer that some kinds of raw materials, such as wool, silk, leather, are produced by animal *organic* processes, while *cotton, linen*, etc., are produced by vegetable organic processes and capitalist production has not yet succeeded, and never will succeed in mastering these processes in the same way as it has mastered purely mechanical or inorganic chemical processes. Raw materials such as skins, etc., and other animal products become dearer partly because the insipid law of rent increases the value of these products as civilisation advances. As far as coal and metal (wood) are concerned, they become much cheaper with the advance of production; this will however become more difficult as mines are exhausted, etc.[1]

The reader is baffled. Did Marx not scorn Ricardo and Malthus for their technological determinism? Marx, who had studied the new science of agricultural chemistry in Liebig, supposed that capitalism was technologically capable of developing the fertility of the soil to the point socially necessary for the survival of the mode of production. It is therefore surprising to watch Marx's retreat to a Ricardian explanation of the tendency of the rate of profit to fall. Formerly Marx had thought that not technical progress (or the lack of it) or natural conditions *per se*, but technical progress as developed by capitalism would create an ever greater obstacle to the continued working of the system. Capitalism was based on the exploitation of labour for the purpose of creating ever more surplus value. Since the possibilities for the production of absolute surplus value are limited, the production of relative surplus value by means of more sophisticated equipment was a necessity. The equipment would tend to cost more and more, the organic composition of capital would rise, and the rate of profit would fall. Thus, the antagonistic nature of the relations of production would eventually lead the capitalists to develop the productive forces in a way detrimental to their own interest. The fall in the rate of profit, observed and discussed by all major classical economists, repeated crises, and the dominant form of technical progress all seemed to confirm the prediction.

This *aprioristic* theory of why technical progress would have to reflect the basic contradiction of capitalism was unsatisfactory since Marx knew that it does

[1] K. Marx, 1862/3, p. 368.

not *tautologically* follow from the theory of surplus value that all production of relative surplus value increases the ratio of constant to variable capital or of total capital to wages. When he noted (in *Theories of Surplus Value*) that the rise in the organic composition does not follow with logical necessity from the structure of capitalism as a particular mode of production, he was compelled to admit that the rise may occur during some periods of capitalist development and not in others. In order to show that the rise would ultimately prevail over the opposing tendencies, he resorted to the purely "technological" Ricardian argument which looks so desperate from Marx' point of view – and so topical from ours.

6. CONCLUSIONS

To summarise: It has been shown that saving of labour, saving of raw materials, mechanisation, and inventions, can be fitted into the modern framework of the theory of prices of production without significantly altering the conclusions which were already clear on the basis of traditional analysis: saving of labour represents a form of technical progress which is neutral on balance so that steady accumulation can go on with distribution remaining unchanged whereas mechanisation is likely to raise the organic composition of capital so that the process of accumulation will run into difficulties. A secular tendency of the organic composition of capital can only be postulated under special historical circumstances. As was documented above, Marx himself was dimly aware of it. In consequence nothing can be said as to whether the four forms of technical progress considered lead to any definite tendency of the organic composition of capital or of the capital–labour ratio.

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TABLE 4. Statistics of Forecasting Errors.*

(i) Individual Securities

	t-statistic			*F*-statistic		
	H_0: $\mu_1 = \mu_2$	H_0: $\mu_1 = \mu_3$	H_0: $\mu_2 = \mu_3$	H_0: $\sigma_1^2 = \sigma_2^2$	H_0: $\sigma_1^2 = \sigma_3^2$	H_0: $\sigma_2^2 = \sigma_3^2$
1973-1979	.004	−7.213	−7.219	51.549	1.564	80.607
1980-1985	−.001	15.922	15.932	59.166	1.170	69.249

(ii) 32 Portfolios

	t-statistic			*F*-statistic		
	H_0: $\mu_1 = \mu_2$	H_0: $\mu_1 = \mu_3$	H_0: $\mu_2 = \mu_3$	H_0: $\sigma_1^2 = \sigma_2^2$	H_0: $\sigma_1^2 = \sigma_3^2$	H_0: $\sigma_2^2 = \sigma_3^2$
1973-1979	.049	−16.398	−17.123	93.431	3.851	359.796
1980-1985	−.002	33.564	29.966	130.361	1.678	218.701

*The means and variances of forecasting errors are indicated as μ_i and σ_i^2, $i = 1, 2, 3$ representing macro-economic factor model, APT and CAPM, respectively.

and the CAPM drop substantially, the rest of the results are similar to those with single securities.

In sum, the above regression results have shown that the economic factor model explains the cross-sectional variations of security returns reasonably well in comparison with the CAPM and APT. While the empirical results do not indicate clearly which model provides the greatest forecasting accuracy (smallest mean forecasting errors), the CAPM and economic factor model have relatively higher forecasting efficiency (smaller variance of forecasting errors).

Tests of Asset Pricing Models Based on the Stock Return Index

The above examination of the risk-return relationships and forecasting efficiency of alternative asset pricing models has been based on a broad market index. A remaining question is whether these empirical findings would change drastically if the market index proxy in the preceding analysis is confined to stocks alone rather than to the more theoretically satisfactory stocks and bonds. If the empirical results indeed change drastically, the market proxy error is likely to be severe and the preceding analysis would be questionable. On the other hand, if the results appear to be very similar, then it is less likely that the market proxy error will substantially alter the basic conclusions. To examine the effect of the market proxy, an identical analysis was carried out using the NYSE index as the stock return index.

The factor patterns and regression results for both broad market and stock indexes are very similar. The relative performance of the three models in terms of R^2 and *t*-statistics remains largely unchanged. Thus, the empirical results appear to be consistent whether the alternative market return proxy is considered or not.[12]

[12]The results based on the NYSE index are available from the authors. The values of R^2 increase slightly when the stock return index is used. This may be because individual stock returns are more closely related to the stock index than the bond index.

IV. Summary

The APT has one major shortcoming in that the factors determining asset returns are not associated with economic variables, despite the fact that the APT requires less restrictive assumptions than the CAPM. This study incorporates a multifactor return generating process into the traditional CAPM such that the resulting model is capable of directly utilizing macro-economic variables in defining factors.

The empirical tests show that there are at least three very significant factors throughout the study period. The first factor encompasses general economy-wide variables and the second factor is characterized by interest rate and money supply. The third factor includes the labor market variables. Interestingly, the market return measure does not appear to be the most important factor.

The risk-return relationship is tested for individual securities as well as portfolios. The systematic risks corresponding to the factors are properly priced and the five-factor model explains the risk-return relationship well. On the basis of R^2, the economic factor model performs better than the traditional CAPM.

The bias and efficiency of forecasting errors are also compared for three models. The size of bias for each model varies over time, and there is not a unique pattern to judge which factor model is superior. While the standard deviation of forecasting errors of the CAPM is smaller, that of the economic model appears very reasonable. Finally, alternative market indexes are used in estimating systematic risks and testing the cross-sectional risk and return relationship. The results from two alternative market indexes are very similar.

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RELATIVE STOCK PRICES AND THE FIRM SIZE EFFECT

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Abstract

A stock's relative price ratio, defined as the ratio of the current price to the average of the highest and lowest prices over some holding period, is shown to be a better predictor of future stock returns than firm size. The price ratio has an even stronger January seasonality than does firm size. After controlling for price ratio variations, firm size has no significant relationship to return. The abnormal returns for the price ratio effect are consistent with those predicted by optimal tax selling considerations.

I. Introduction

The firm size effect is one of the most well documented anomalies in finance. A generation of researchers has scrutinized both the small firm effect and its relationship to other observed anomalies. Reinganum (1981) found that the size effect subsumed the P/E ratio effect, whereas Basu (1983) found that the two effects both had explanatory power for stock returns. Roll (1981) and Reinganum (1982) explored and rejected the possibility that the size effect was an artifact of improper risk assessment for the smaller firms. Roll (1983) and Blume and Stambaugh (1983) investigated the effect of improperly computing portfolio returns and concluded that only a portion of the firm size anomaly could be explained by this factor. Keim (1983) found that the January, or turn-of-the-year, effect was fundamentally related to the size effect, as most of the small firm excess returns were concentrated in the first few days of the year. Constantinides (1984) suggested that the turn-of-the-year effect might be related to tax loss related selling at the end of the year. Schultz (1985) lent support to this tax loss hypothesis by showing that the January effect did not appear until after the implementation of the Federal income tax.

Although the investigations into the firm size and January effects have been more intensive in recent years, the existence of these effects has long been known. For example, for years investors have been "buying at Christmas and selling on Washington's Birthday," a prescription for cashing in on the January effect. Gordon (1962) found that the return on a firm's common stock was inversely related to its asset size.

The purpose of this paper is to examine another traditional selection rule and its relation to the size effect. The rule is known as the relative stock price selection technique. It was originally tested by Schneider (1951) over the time period 1914 to 1948. The technique was a generalization of formula plans widely used at the time of his test. The methodology called for stocks in the Dow Jones Industrial Average to be pur-

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THE DIRECTION OF TRADE – PAST AND PRESENT – AND THE 'LEARNING EFFECTS' OF EXPORTS TO DIFFERENT DIRECTIONS

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This paper looks at the direction of trade in manufactures. The pattern predicted by the HOS model hasn't materialized. But some sense of the historical pattern is made by looking at the distribution of world income, as well as exporting countries' policies and product composition. Given the historical pattern and in particular the direction of Japan's trade, it is argued that developing countries today are under-exporting to one another. This is to their detriment insofar as trade among less developed countries tends to be comprised of manufactures that are skill- and learning-intensive. The scope for an increase in such trade is assessed.

1. Introduction

Historically, the direction of trade has mattered. When, for example, the Atlantic trade opened in the sixteenth century, it involved a new set of commodities and class of merchants, and its implications for economic development were something far greater than a mere quantitative increase in world trade [Brenner (1972)]. In this paper I examine what is today a relatively new trade flow whose commodity composition is also distinct from the point of view of the exporters concerned and whose bearing on technological progress and capital accumulation is also possibly transformative. The trade flow in question is so-called 'South–South' trade, or trade among developing countries, and what follows is part of a general overview on the subject.

I am primarily interested in the gains, if any, realized by those developing countries which export manufactures to other developing countries. Because manufactured exports from developing countries to whatever destination are almost exclusively undertaken by the so called NICs (newly industrializing countries), I focus attention on them. I also mention the gains realized by developing countries which import from the NICs, but only briefly. My discussion is restricted to trade in manufactures (SITC 5–8 less 68), defined

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to exclude processed foods and other raw materials. I adopt this definition because the basis of a country's competitiveness in resource based manufactures tends to be quite different from that in non-resource based manufactures, and combining the two into a single analysis is obfuscating. This is in keeping with the custom in the trade literature to group resource-intensive or 'Ricardo goods' separately although the World Bank, as discussed shortly, does not do so.[1] The fact that the NICs have begun to export manufactures, while at the same time have retained their underdeveloped status in a two-way division of the world into developed and underdeveloped countries, or North and South, leads one to refer to the NICs' exports to their less developed brethren (as well as to each other) as 'South–South' trade; and also leads to a query of why this trade occurs, and to what effect.

1.1. An overview

Several questions must be answered before a coherent picture emerges of the trade patterns which have evolved since the NICs made their debut as international traders. Some of these questions I address in what follows; others I've addressed elsewhere and refer to only briefly. Consideration is given to the logic of how much exports the NICs realize to different directions, the commodity composition of each flow, why some commodities begin their lives as exports to one direction rather than to another, and what is gained (lost) from trade in a particular direction. The most general question which must first be answered concerns proportions: why do the exports of the NICs to high and low income markets assume the relative shares that they do? My paper sets out to answer this question, which, I think can only be made sense of in an historical context.

I argue that since, say, 1860, the distribution of world income has become more highly skewed, as countries with relatively high income per capita have tended to grow faster than low income countries. As a consequence, high income countries or what I call Group I have found the fastest expanding markets for their manufactures in each other while low income countries or Group II have had to rely increasingly on the markets of the rich for their export sales. By historical standards, therefore, the share of Group II's intra-trade is low. Japanese trade history, which is singled out for special attention in what follows, also suggests that developing countries today are under-

[1] In the discussion which follows, the World Bank refers only to that part of the Bank which sponsored a conference on 'Does the Direction of Trade Matter?', February 28 March 1, 1983, Brussels, Belgium. Hereafter I address certain points raised at that conference. I also refer to papers prepared for the conference by Deardorff and by Havrylyshyn and Wolf, the Bank's sponsors of the conference. These papers, as well as an earlier draft of this article, have been published by Johns Hopkins University Press in a collection edited by Havrylyshyn and Wolf entitled *The World Bank Conference Volume on South–South Trade.*

exporting to one another. This is to their detriment given differences in the product mix of exports to Northern and Southern markets.

The second step in understanding trade flows is to ask about product mix: what is special, if anything, about those manufactured exports of the NICs which find their way into other Southern markets? I have argued elsewhere [Amsden (1980)] that South–South trade has the virtue of being composed of a bundle of commodities which is relatively skill-intensive and only marginally more capital-intensive, if at all, than South–North exports (Southern exports to Northern markets). Thus, I contend that trade among developing countries is not the abomination in the eyes of Free Trade that some economists seem to suggest [e.g., Krueger (1978)]. It does not represent the allegedly capital-intensive white elephants of import-substitution which can find buyers only in the South by dint of the protection afforded to them by common markets (e.g., the Latin American Free Trade Association). Support for my contention has come in an extensive econometric study undertaken by Richards (1983). She, too, finds that South–South trade tends to be relatively skill-intensive and no more capital-intensive than the NICs' exports to the North. The World Bank's econometric study on the direction of trade [undertaken by Havrylyshyn and Wolf (1983a)] however, comes up with different results. Havrylyshyn and Wolf use the 'factor content' rather than the 'regression method' and find that South–South trade is not only more skill-intensive but also more capital-intensive than South–North trade. The authors appear to ignore the former finding and to dwell on the latter, which motivates them to conclude that South–South trade violates the NICs' comparative advantage and, therefore, should not be singled out for special support (as were labor-intensive manufactures to the North once upon a time). The discrepancy in findings about capital-intensity may be due to methodology. Unlike the factor content method, which uses input–output data, regression analysis weights all export commodities equally regardless of value. This tends to understate the importance of individual commodities with high values, and these, of course, may be quite capital-intensive. Nevertheless, the discrepancy may also be due to differences in definition. As noted above, the World Bank study defines manufactures to include processed foods. Havrylyshyn and Wolf, however, offer no compelling reason why they add processed foods to the usual definition of manufactures and so their empirical findings on the factor content of manufactures so defined are equally uncompelling.

Not only is the empirical evidence unconvincing that the commodities which enter into South–South trade are largely the legacies of misguided import-substitution policies. The theory which purportedly supports this conviction does not in fact do any such thing. Deardorff (1983) and Khanna (1982) use a general equilibrium framework to prove that in a three-way classification of countries, middle level countries such as the NICs will tend

to export their labor-intensive manufactures upstream, to developed countries, and their capital-intensive manufactures downstream, to underdeveloped ones. But it cannot be inferred from this that the manufactures traded among Southern countries (inclusive of the NICs) will be more capital-intensive than the equivalent value of manufactures exported by the South to the North. The exports of the NICs to other NICs and to Southern countries, predicted to be relatively capital-intensive, may be dwarfed in value by the exports of other Southern countries to each other and to the NICs, predicted to be relatively labor-intensive, such that it is conceivable that South–South trade will be *more* labor-intensive than South–North trade; the very opposite of the prediction which tends mistakingly to be drawn from the neoclassical approach.

It is true that at present few developing countries, other than those which are typically included in the club of NICs, participate in South–South trade as exporters. In light of this, it may be inferred from the Khanna–Deardorff conceptualization that South–South trade as now constituted is relatively capital-intensive. Such a conceptualization, however, ignores skills as a separate 'factor of production': either because ordering, for purposes of determing directionality, is impossible with more than two factors, or because skills typically are lumped together with capital, despite empirical evidence to the effect that capital and skills are best treated as complementary, not substitutive [Stern (1976)]. The result has been to make it easy to seize on the likelihood that South–South trade is relatively capital-intensive and to ignore skills altogether.

Finally, even if it turns out that South–South trade is highly capital-intensive relative to South–North trade, this may hardly be catastrophic. It could only be viewed as such in a static framework wherein all factors of production, including capital, are assumed to be internationally immobile. Yet much capital has flowed into the NICs in recent years so it is not surprising that commodities with capital-intensive production processes have begun to be produced and exported. What might be objectionable is if such commodities were being produced grossly inefficiently by world standards at the level of the firm. No inquiries, however, have been made at the firm level into this matter [but see Amsden and Kim (1984)] and so objections to South–South trade on grounds of inefficiency appear to be off the mark.

When all is said and done, it seems plausible for purposes of argument to take for granted that South–South trade is not only more skill-intensive but also more capital-intensive than South–North trade, although attention will be focused on skill-intensity in what follows. I have explained elsewhere the reasons underlying the NICs' emerging competitiveness in a set of commodities whose most striking characteristic is a high degree of skill [Amsden (1983)]; for example, ships, precision instruments, machine tools and other non-eletrical machinery, etc. My explanation differs in emphasis from a

neoclassical approach because I am skeptical that the international competitiveness of the NICs in the skilled trades can be 'explained' merely by reference to the existence of an abundant stock of skilled labor, as the neoclassical approach tends to do, although to be sure, high profits at competitive prices go hand in hand in such sectors with low levels of remuneration to skilled labor by international standards. The point is that an abundant supply of skilled labor in any newly industrializing country is typically the outcome, not the origin, of skilled production. Unlike many natural resources, skills do not grow on trees. Nor, unlike capital, are they easily imported. Skills are accumulated through a combination of formal education (although not always) and experience. Thus, I would maintain that skills have accumulated in the NICs because skilled trades have proved profitable; and capitalists have ventured into such activities because of underlying conditions of production ('technology' for short). By comparison with the technology of highly machine paced and process centered industries, the skilled trades are relatively small in scale and less dependent on science-based R&D to attain international competitiveness. Each stage in the manufacturing process is less specialized and arcane. Capabilities in design engineering and production engineering interact and reinforce each other so that the NICs are able to move closer to the global technological frontier in such sectors. The abyss between the design of a product and its production is smaller than for other 'sophisticated' manufactures.[2]

There are, therefore, technological reasons for supposing that if South-South trade is encouraged, it will increasingly become characterized by commodities which are high in skill content rather than commodities which are science-based, provide few jobs, and have little hope of becoming internationally competitive. The empirical work on South-South trade referred to above may be taken as presumptive evidence that the skilled sectors are becoming a 'second generation' of import substitutes in the NICs.

It remains to be shown why the direction of 'second generation' exports tends towards the South. Apart from trade concessions, transport costs, and cultural affinities, the answer is a complicated one. No mystery surrounds why the labor-intensive manufactures of the South are destined primarily to the North; the effects of the strategies of the transnational corporations

[2]Heller is unable to explain a change in the factor content of Japan's manufactured exports between 1956–1968: 'The compositional change in the trade bundle implied toward industries with high skill requirements relative to capital inputs is surprising. The stock of capital has grown more rapidly than the skilled labor force... Hence, one might have expected an increase in the relative price of skilled manpower relative to capital, which would increase the competitive advantage of firms that are capital rather than skill intensive. In this case, the compositional change would be the reverse' [Heller (1976, p. 288)]. Heller tries to explain this paradox by a statistical artifact but more persuasive might be the explanation suggested above: the technology underlying skilled industries is likely to give rise to higher rates of growth of productivity than the technology underlying capital-intensive industries in the middle level countries such as Japan in the late 1950s and early 1960s and in the NIC's at present.

merely strengthening the flow. But why are the second-generation manufactures of the South destined largely to other Southern markets, at least initially?

Stewart (1976) argues that South–South trade is likely to occur among products which gain from being adaptable to Southern conditions. This is a demand side explanation which emphasizes commodity characteristics. One might embellish the method of production side of Stewart's argument, as follows. Product and process characteristics are interconnected to the extent that less quality-intensive products require less quality-intensive processes (where quality refers to performance rather than conformance to standards). Southern manufacturers of lower quality capital goods, therefore, are likely to find a more amenable market in the South, at least initially. Moreover, the whole culture of a machinery building sector is shifting to the newly industrializing countries. It is these countries that have the young and inexpensive engineers and skilled mechanics who are capable of providing customized designs and service. It makes sense for other developing countries to source from the NICs a wide range of capital goods – from earth moving equipment to machine tools.[3]

A related reason why 'second generation' manufactures tend to be exchanged among Southern countries is more speculative. Penetration of Southern markets may be riskier than penetration of Northern markets and (therefore?) may incur lower entry costs. Markets in the South are more risky because they are not well articulated and have to be created. Conditions of consumption are also less stable than in the North: governments, income, and the balance of payments are subject to greater fluctuations. The NICs are willing and able to take these risks because the capital outlays required are low whereas they may be prohibitive in the North. Costs of entry between North and South differ, one could argue, because of government regulations (tariffs especially), which are lower the less likely the local production of a commodity; because of different income levels in the two markets and hence, different tolerances for quality (broadly defined, e.g., to include better designs); and differences in demand for after sales service. In short, the NICs may export 'second generation' type products to other developing markets because entry costs are relatively low.

Another point may be alluded to, although it requires additional empirical work, and now has the status of an hypothesis only.

Not all commodities with high skill content (or high capital-intensity) begin their careers as exports to Southern markets. Some are destined first and foremost to the North (e.g., parts and components for automobiles and

[3] A capital goods sector mediates between production and consumption and tends to be characterized by skill-intensity, as mentioned later. Therefore, the types of 'second generation' goods which the NICs are best at producing are precisely those for which demand is growing most rapidly in developing countries. Currently, capital goods ('engineering and metal products') are the single most important commodity group in South–South trade as well as the single most important commodity group in exports from the North to the South [UNCTAD (1983)].

airplanes). Nevertheless, it is arguable that historically, the production of commodities destined to Southern markets has facilitated North-bound trade. Many skill-intensive sectors are such that individual firms, which together produce a wide variety of products, each rely on a pool of qualified labor and sub-contractors that is sector-wide in scope. The labor of one firm tends to be highly substitutable for the labor of another because process technology is not very product-specific. In the mechanical engineering industries, for example, processes such as machining and casting, once learned through producing one item, can easily be applied in the production of other items – and transferred to other firms. South South trade, by extending the size of the market, also facilitates the emergence of specialized satellite shops. Thus, a critical core of labor and suppliers, to which South South trade was the first to lend support, may aid emerging enterprises to produce exports geared to Northern markets efficiently.

Having proposed reasons for the relative size of the shares of exports from the NICs to developed and developing countries, the commodity composition of each, and the direction of second generation exports towards the South, what remains to be discussed are the respective gains which derive from exports to different directions.

I distinguish two types of 'gains from trade', which, however, are quite distinct from the specific technical meaning of the term in neoclassical trade theory. One I call a rent effect and the other a learning effect. The former, static effect, arises when a country exports a commodity in which it enjoys a temporary advantage due to the abundance of a resource which allows it to make super rents at a given international price. The latter, dynamic effect, arises when a country exports a commodity such that its stock of technological knowledge and level of skills are increased as a consequence. Further, I argue that learning effects are greater the greater the skill and capital content of a technology whereas rent effects are greater (in labor abundant economies) the greater the labor-intensity of a technology and the less equal the pay for equal work by international standards. Consequently, I suggest that South–South trade embodies both high learning and high rent effects while South–North trade harbors only high rents. In a word, the direction of trade does matter and it is disturbing that the World Bank sees no virtue in the NICs' learning-intensive exports to other developing countries.

2. The direction of trade in historical perspective

Expectations about the direction of trade have been very much conditioned by the Imperialist pattern of the late nineteenth century, whereby the advanced countries export manufactures to their colonies in exchange for raw materials, and by the Heckscher-Ohlin-Samuelson (HOS) theory of trade, which is modeled on this pattern, whereby trade is predicted to occur between the most dissimilar countries, measured in terms of endowments of capital and labor. This needn't, according to the theory, imply polarities in

income among trading partners; in the extreme, the factor price equalization theorem sees to it that inter-country differences in factor prices are leveled as trade between countries intensifies, so long as each country follows its comparative advantage. Before (and after?) the millenium, however, countries with high endowments of capital per head of the population are expected to find their best trading partners among countries with low endowments of capital per head; and it may be inferred from this that trade flourishes between the rich and the poor. Such an inference follows as a consequence of the commodity-blindness of the HOS model. That is, the economic prosperity of one country relative to another is not seen in neoclassical theory as depending upon whether or not the respective exports of each are manufactures or primary products, or capital-intensive commodities or labor-intensive ones. Thus, the colonial trade model implicitly assumes that the proceeds of Group II's agricultural exports will suffice to purchase Group I's manufactured exports; although they may fall far short of what is necessary, may be used to purchase raw materials and not manufactures, may be repatriated as profits to renters in Group I, etc.

Two stylized facts, however, cast doubt upon such expectations. One has to do with the distribution of world income and the other has to do with the direction of trade. First, over time the distribution of world income has grown more inequitable (despite a secular increase in trade). Second, while it is true that over time trade among poor countries has tended to decline – not absolutely but as a proportion of the poors' total exports, it is also true that over time rich countries have tended to export a larger share of their manufactures to each other. There is reason to suppose a systematic relationship between these two stylized facts: if the world is divided into two trading blocs – the highly industrialized (Group I) and the rest (Group II) – then one would anticipate that the greater the differences in purchasing power between the two groups, the less Group I will export its manufactures to Group II (the very opposite of the HOS predictions), and the more Group II will export its manufactures to Group I. This is because the greater the divergence in productive capacity between the two groups, the less will one be capable of serving as a market for the other.

A simple numerical example may suffice to illustrate this point. Suppose Group I accounts for 70% of world income and 70% of world manufactured exports (which equals 100 units). Of these 100 units (which include the manufactured exports of both Groups I and II), Group I buys 55 units from itself and 15 units from Group II (total = 70 units) while Group II buys 15 units from itself and 15 units from Group I (total = 30 units). Now imagine a change in income distribution such that Group I accounts for 80% of both world income and manufactured exports (also equal to 100 units, but, say, double in value). This change may well result in Group I buying 65 units of exports from itself and 15 units from Group II (total = 80 units) while Group II buys 5 units from itself and 15 units from Group I (total = 20 units). Thus, whereas previously 50% of Group II's manufactured exports was purchased by Group I the figure has risen to 75% (Group I also accounts for a larger share of its own manufactured exports).

We turn now to the available empirical evidence first on directionality and then on income distribution.

2.1. *Some 'stylized facts'*

The best source for data on the directionality of trade appear to be Maizels (1963) for the early period and the United Nations for the later period. Unfortunately, Maizels present no evidence for the early period on the intra-trade of Group II. The only year for which such a datum is available before 'Modern Times' is 1935, in a study prepared by the League of Nations (1945). All the data extant are reported in table 1, to which we return shortly.

As for income distribution, Kuznets was one of the first economists to flag the growing inequality in the global distribution of income over the long run: '...the disparity between the per capita product of the presently low underdeveloped countries and that of the rest of the world must have increased over the last century and perhaps further back...' (1966, p. 393). One of the more detailed studies for the period 1860–1959 indicates a steadily declining Pareto coefficient (which implies greater inequality in the world distribution of income), from 1.576 in 1860 to 0.708 in 1959 [Zimmerman (1962)]. As shown in table 2, there is a positive association between countries' *levels* of per capita income in 1860 and their *rates of change* of per capita income over the next 100 years, with the notable exceptions of the Soviet Union and Japan, which grew much faster than was 'warranted' by their per capita income levels; and 'Oceania' (Australia and New Zealand), which grew much slower. The trend of rising inequality does not appear to have been reversed, except after the energy crisis of 1973. Between the mid 1950s and 1970, per capita income grew faster in the developed than in the developing countries (see table 2).

Nevertheless, the available data on income distribution do not permit a detailed comparison of the percetange of, say, Group I's share of world income and the percentage of its total exports accounted for by intra-trade. This is because data on total world income are unusable for the early period[4] and are altogether unavailable (to my knowledge) for the 1930s. We must be satisfied, therefore, with broad trends, to wit: that income inequality in the world had risen over time although (1) not necessarily monotonically

[4]The countries for which data on income are available vary in 1899, 1913, 1929, and even 1950, the years for which trade data on directionality are available. Therefore, one can't arrive at a total for world income in these years, which is needed to compute Group I's income share.

Table 1

Intra-trade of groups I and II in manufactures, 1899–1980 (percentages).[a]

	Group I[b]	Group II[c]
1899	52	
1913	50	
1929	47	
1935	34	66
1937	40	
1950	41	
1955	47	
1959	52	
1970	75.1	35.8
1979	70.6	35.0
1980	69.0	38.4

[a]*Source*: 1913, 1929, 1937, 1950–1959 from Maizels (1963), 1935 from League of Nations (1945), 1970–1980 from UN, *Monthly Bulletin of Statistics*, May 1982. Manufactures are defined as SITC 5–8 minus 68.

[b]The countries included in Group I for the period 1899–1959, excluding 1935, are North America, Western Europe (including Finland, Spain and Yugoslavia) and Japan. The countries included in Group I for 1935 include: Austria, Belgium, Czechoslovakia, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom, United States. The narrower coverage of countries in Group I in 1935 may bias downwards slightly the 1935 figure for Group I's intra-trade and bias upwards slightly that of Group II. The countries included in Group I after 1959 are those defined by the United Nations as industrialized market economies.

[c]Depending on how Group I is defined, Group II refers to the 'rest of the world', including Russia (the Soviet Union). The inclusion or exclusion of the socialist countries in the 'rest of the world' for 1950 1980 leaves the intra-trade of Group II unaffected. No figures are available for Group II for 1899–1937, except for 1935. The figures for the 1950s are nil.

(equality may have increased during the 1930s and since 1973), and (2) at different rates in different time periods.

Bearing this in mind, an examination of table 1 reveals no exact correspondence between directionality and distribution: between [illegible] and 1929, whereas the share of Group I in world income probably rose somewhat, as

Table 2

Percentage increase in per capita income 1860–1959, 1955–1980.[a]

	Per capita income 1860	Annual per capita income increase 1860–1959		1955–1970	1970–1980
Japan	40	1.78	*	3.6	2.4
North America	420	1.54			
South East Europe	110	1.29			
North West Europe	230	1.28			
Oceania	440	0.81			
Latin America	100	1.18	+	3.1	3.1
Far East	50	0.89			
China	44	0.47			
Southeast Asia	48	0.34			
Soviet Union	95	2.15			

[a]*Source*: Zimmerman (1962) for 1860–1959, World Bank (1982) for 1960–1980. *: industrialized market economies, and +: developing countries, as defined by the United Nations.

suggested by a slight decline in the Pareto coefficient over the thirty year period from 1.006 to 0.911 [Zimmerman (1962)], the percentage of Group I's manufactured exports accounted for by intra-trade declined slightly, from 52% to 47%. One would have expected the reverse given Group I's disproportionate rise in purchasing power. Nevertheless, the trend after the Great Depression does give support to the hypothesis for both Groups I and II. Beginning then, the intra-trade of the more industrialized countries increased, from a low of 34% in 1935 to 69% in 1980. Meanwhile, the intra-trade of the rest of the world decreased, from 66% in 1935 to 38% in 1980. The 66% figure for 1935 is likely to overstate the long run trend for Group II because in periods of world depression (as in the 1930s and in the years following 1973), Group II's intra-trade appears to rise.[5] But it is still highly probable that over time the intra-trade of Group II has declined as the growth of its purchasing power has lagged behind that of Group I.

The hypothesis which links directionality to distribution gains support even during world depressions – which appear as deviations from the expected long run trend in trade flows. It may be noted from table 1 that during the economic vicissitudes of the 1930s and 1970s, the intra-trade of Group I declined sharply while that of Group II increased (for the later period). If the hypothesis is correct, then the share of world income accruing to the less industrialized countries ought to have increased as well during

[5]The League of Nations' figure also appears to be understated for Group I in 1935 compared with Maizels' 1937 figure, perhaps because the countries included in Group I differ. Given an inverse relationship in the changes in the intra-trade Groups I and II during Depressions, and given slightly different country classifications, the 1935 figure of the League for Group II is likely to be overstated as well.

these periods. Interestingly, there is some evidence to support this case: another 'stylized fact' is that the Third World, or at least some of the major Latin American producers, fared especially well during the Great Depression [Diaz-Alejandro (1982) summarizes the evidence on the growth-promoting disequilibrium of the period for Latin America]. There is also evidence that world income distribution became more favorable to the Third World after 1973, when, as theory would predict, the intra-trade of Group II rose nearly 3 percentage points. Table 2 indicates that between 1973 and 1980, the developing economies averaged a 3.1% increase in their per capita income while the comparable figure for the developed countries was only 2.4%. Simultaneously, Group I leaned harder on the Third World as a market for its exports (to pay for its oil): the intra-trade of Group I fell by over 5 percentage points.

It is, however, time to step back, having pushed the relationship between distribution and directionality as far as possible, and to stress that no mechanical connection exists between the two. The poor countries may grow disproportionately poorer, but there is still wide scope for them to increase their trade with one another – both absolutely and relatively. Whatever the distribution of world income, other factors also influence the direction of trade: for example, cross-country variations in import propensities, differences in policies and product mix, etc. The share of trade among Group I countries in the 1930s may have declined due, say, to Germany's retreat to autarchy and it almost certainly rose in the 1960s with the strengthening of the European Common Market. Throughout the period before World War II, trade within Groups I and II may have been lower than otherwise as a consequence of Imperialism.

The latitude open to countries as to where they export and the role played by product mix and policy are well illustrated by an historical examination of Japan's trade patterns. It is to such an example that attention is now turned.

2.2. *Japanese trade and directionality*

Japan is an interesting case to study for rather obvious reasons. It is the only capitalist country within the last 100 years to succeed in entering the ranks of the developed. Throughout most of this century it also occupied a middle rung on the global income distribution ladder and consequently, it poses as a possible model for NICs today.

Table 3 presents more information on the directionality of Japan's trade from 1929 to 1980. Several points are striking in light of the previous discussion. First, as Japan and the industrialized countries have grown relatively richer, the percentage of Japanese exports destined to developing countries has declined, from a high of 82% in 1929 to a low of 46% in 1969–

Table 3

The commodity composition and shares of manufactured exports to non-developed market economies ('rest of the world'), Japan, 1929–1980.[a]

Commodities	% of total commodities (average: 1929–1957)	Percentage to non-developed market economies[b]					
		1929	1937	1950	1957	1969–1971	1980
Capital goods[c]	30	83	95	86	91		
Chemicals	4	65	76	79	85		
Textiles and clothing	46	89	87	77	73		
Other (rest of SITC 6 and 8)	20	71	72	66	49		
Total[d]	98	82	83	70	71	46[e]	52[e]

[a]*Source*: computed from Maizels (1963), except for 1969–1971 and 1980, which are from UNCTAD (1982).
[b]The figures for 1929–1957 are computed from values measured in 1955 prices.
[c]Machinery and transport equipment (excluding road motor vehicles) only.
[d]Excludes metals, which are 2% of the total.
[e]All exports, including non-manufactures, which, however, are negligible.

1971. Nevertheless, in comparative terms, Japan's trade has been highly oriented towards the developing countries regardless of the time period involved. Maizels classifies Japan as a developed country in his trade study but whereas other Group I countries in, say, 1929, exported on average 53% of their manufactures to developing countries, Japan exported 82%. Similarly, whereas the share of Group I's exports to developing countries in 1970 was approximately 25%, the comparable figure for Japan was 46%. These differences appear to exist not for reasons of income distribution but for reasons of history and politics. Japan has long maintained a sphere of influence in the Pacific region which manifests itself in close trade ties. Since 1969, the rise in Japan's export share to developing countries is almost entirely accounted for by increased trade with OPEC. The decline in the share to the advanced capitalist countries may also reflect growing protectionism. In general, the directionality of Japan's trade may be kept diversified as a matter of policy in anticipation of rising protectionism in the West.

A straightforward lesson may be drawn from this by developing countries today, although none is (yet) an imperialist power: the relative size of trade flows to different directions is not predetermined by purchasing power alone but is affected by policy on tariffs, transport costs, etc. As for protectionism in the advanced countries, it is no less a threat to the NICs than it is to Japan, yet in 1980 the NICs were dependent on the North for as much as 62% of their exports whereas the comparable figure for Japan was only 48%.

Second, although all commodities exported from Japan in the early period (before 1960) were highly oriented towards developing countries, it is clear that the more labor-intensive among them (textiles, clothing, and the remainder of SITC 6 and 8) tended to get reoriented towards developed countries over time. Thus, the commodity composition of a country's exports will have an important bearing on directionality, and commodity composition is also open to policy. The effect of product mix on the direction of trade becomes clearer if one looks at the exports of India and Canada between 1929 and 1957 and compares them with those of Japan.[6]

In 1899, the value of India's total exports exceeded that of Japan's; by 1913, export values were equal; by 1929, Japan's manufactured exports exceeded those of India, and the margin widened thereafter. The direction and product mix of the two countries' exports also differed. Unlike Japan, India exported almost nothing but textiles and other light manufactures. India tended to export these commodities more to industrialized countries than did Japan, if only because India was a colony and Japan a colonizer. Consequently, the direction of India's overall manufactured exports was geared more to industrialized countries than was Japan's: the share going to industrialized countries, computed as an average for 1929, 1937, 1950 and 1957, was 45% for India compared with 22% for Japan.

[6]Information on India and Canada was derived from Maizels (1963) unless otherwise stated.

The fact that India exported no capital goods whereas almost 30% of Japan's exports was accounted for by them also underlies these respective percentages. This is because countries midway in their industrialization process appear to export their capital goods to developing countries, historically and at present. The significance of this lies in the fact that numerous capital goods are produced with highly skilled production technologies and the machinery building sector has important linkages with the rest of the economy, as discussed shortly.

Canada in the early twentieth century, one of the 'regions of recent settlement', provides a good historical example of the behavior of capital goods exports in the course of economic development. As table 4 indicates, Canadian manufactured exports have tended to flow mostly towards industrialized countries, not surprisingly in light of Canada's close ties with the U.S. Between 1929 and 1955, the share of Canada's exports going to developing countries never exceeded 36%. But in spite of this, Canada's capital goods exports, not an insignificant percentage of the total, were geared until the 1950s primarily to developing countries.[7]

Another straightforward lesson to be drawn from all this is the following: if past developments are any guide, Third World countries today are underexporting to one another. Whereas the intra-trade of Group II in 1935

Table 4

The commodity composition and shares of manufactured exports to non-developed market economies ('rest of the world'), Canada, 1929–1955.[a]

Commodities	% of total commodities (average: 1929–1957)	Percentage to non-developed market economies[b]			
		1929	1937	1950	1955
Capital goods[c]	19	77	67	50	36
Chemicals	5	85	87	95	100
Textiles and clothing	10	18	27	26	17
Other	64	21	18	8	9
Total	100	36	30	21	16

[a]*Source*: computed from Maizels (1963).
[b]The figures for 1929–1957 are computed from values measured in 1955 prices.
[c]Machinery and transport equipment (excluding road motor vehicles) only.

[7]It is noteworthy that between 1929 and 1955, the share of Canda's capital goods directed towards developing countries fell, from a high of 77% in 1929 to 36% in 1955. This is unlike the case of Japan (see table 3) whose share of capital goods exports to developing countries held firm between 1929 and 1957. It has been shown, however, that after the late 1950s the factor content of Japan's exports to different directions tended to converge [Heller (1976)]. Japan's 'technology exports' (of turnkey plants, technical assistance, etc.) also show a downward trend after reaching a high of 90% in their share to developing countries in the 1950s [Ozawa (1974)]. Both for Canada and Japan, what such declining trends suggest (although not conclusively) is that exports to developing countries prepare the way for exports to developed ones.

was 66%, in 1980 it was only a little over half of this. If the 66% figure is deemed too unreliable, then developing countries today may still be said to be underexporting to one another if Japanese history is any guide.

One reason why this shortfall is significant is that the product mix differs between NICs' 'downstream' and 'upstream' exports, as discussed earlier. South-bound trade may incorporate no fewer (or only slightly fewer) jobs than North-bound trade but first and foremost, it is relatively skill-intensive. We turn now to the ABCs of why skill-intensive production is vital in economic development. Then we allude to the scope for supply side and demand side policies to alter export proportions (although we do not discuss such policies themselves).

3. The 'gains from trade'

3.1. Learning effects

It may seem obvious to some but inconceivable to others, depending on ones theoretical convictions, that commodities embodying different production processes play different roles in economic development. It may also be hubris to argue this in the brief space permitting because what is fundamentally in dispute is the existence of dynamic gains from trade (or domestic production). I, however, merely set out the argument. The subject of 'dynamic gains' excites the passions of many economists because such effects are hard to measure in money terms; and what can't be measured in money presumably doesn't exist and offends the empiricist spirit. Also, such gains can only be incorporated into neoclassical theory in an ad hoc fashion; so they are easiest to ignore.

As production increases, 'learning' increases (to be defined later); and 'learning effects' vary depending on the underlying production process involved. I argue that they are greatest in 'skill-intensive' industries (also defined later), next greatest in capital-intensive industries, and least in evidence in (unskilled) labor-intensive assembly operations.

Another way in which neoclassical theory is commodity blind is in its assumption that so long as firms maximize profits (in an open market economy), it doesn't matter which commodities are actually being produced. Yet one can conceive of a situation, quite relevant to developing countries today, where a labor abundant country is following its comparative advantage and is entirely specialized in the production of labor-intensive manufactures for export. Suddenly, the competitiveness of the country is undercut by cheaper labor from abroad. What the country must do is either cut its own wages, a short run option I discount on the ground that almost any other alternative is both preferable and more practicable, or begin making commodities which utilize production processes which substitute capital and skills for unskilled labor. But where is the country to get the capital and

skill -- and knowledge? It can set up universities or technical schools to provide skills, research labs to provide knowledge, and a machinery building sector to provide capital. Or, if it has access to foreign exchange, it can import all these things (e.g., turnkey plants).

It is, however, a delusion to think that simply because we operate in a market economy, we can buy everything we need for ready money. Some skills and knowledge can only be acquired in the course of production. These are called learning effects, and they have been made to depend on the length of the production run [Arrow (1962)]. In the aggregate (although not in every industry) such skills and knowledge are necessary to import foreign technology successfully, to produce more efficiently, or to graduate to production processes requiring still more skill and knowledge. They complement but cannot be replaced by skills and knowledge acquired off the job, in research and training institutes or via imports. They arise largely because technology can never be entirely explicit and codifiable, which is what neoclassical theory assumes when it takes technology to be universally available in blueprints. I argue later, moreover, that because technology is more tacit the more skill-intensive the production process, learning effects are greatest in such sectors.

Having stated the argument, it is necessary to add that learning effects don't depend upon increased production from trade per se, although trade may uniquely expose firms to new technological environments and consequently help them broaden their technological knowledge. In, however, the presence of specialization in production or a (Keynesian) shortfall in aggregate domestic demand, trade serves to absorb the output in which learning effects are embodied; which is the purposeful way trade is brought into the argument in what follows.

As for a good definition of skill, this is harder to come by. The usual procedure is to begin with raw labor and to add to it dollops of experience (on the job) and training (off the job). The greater the addition, the greater the skill. Alternatively, I think it is possible to start at the other end of the spectrum and to define skill as something which cannot be replaced by a machine. Then the cutting edge of technology is in areas where certain jobs are in the process of being replaced by capital but not yet profitably. Automation would be hypothesized to strike the least skilled first and to progress up the skill ladder. Under perfect competition this would mean that the most skilled (and the highest paid) person would be the chief executive because his or her job would be the least easily automated. Skilled sectors are simply those which employ relatively large numbers of skilled people. These sectors are conceptually and empirically distinct from sectors which employ large numbers of skilled people but large amounts of capital as well, large amounts of capital but few skilled people, little capital and few skills, etc. [Lary (1968)].

One may distinguish three types of production-related learning: learning achieved by workers, learning achieved by organizations, and learning achieved by the economy at-large. The first type of effect has been discussed primarily in the business literature because businessmen find it useful to determine how much workers learn in the course of production in order then to determine their wage norms. I take this as proof of the fact that learning effects exist. Next, what must be shown is why they exist more (require more production per unit of 'learning') the more skill-intensive, and to a lesser extent the more capital-intensive, the sector. To do this one can stay with the business-oriented literature.

Yelle (1979) surveys this literature and notes that learning curves typically follow the mathematical functions $Y = KX^n$ where Y = the number of direct labor hours required to produce the Xth unit, K = the number of direct labor hours required to produce the first unit, X = the cumulative unit number, $n = \log\phi/\log 2$ = the learning index, ϕ = the learning rate, $1-\phi$ = the progress ratio. Typical learning curves are shown in fig. 1.

According to Yelle, the learning curve began receiving attention during World War II when contractors to the American Government searched for ways to predict cost and time requirements for the production of ships and aircraft. Data from aircraft production were utilized the most. When about

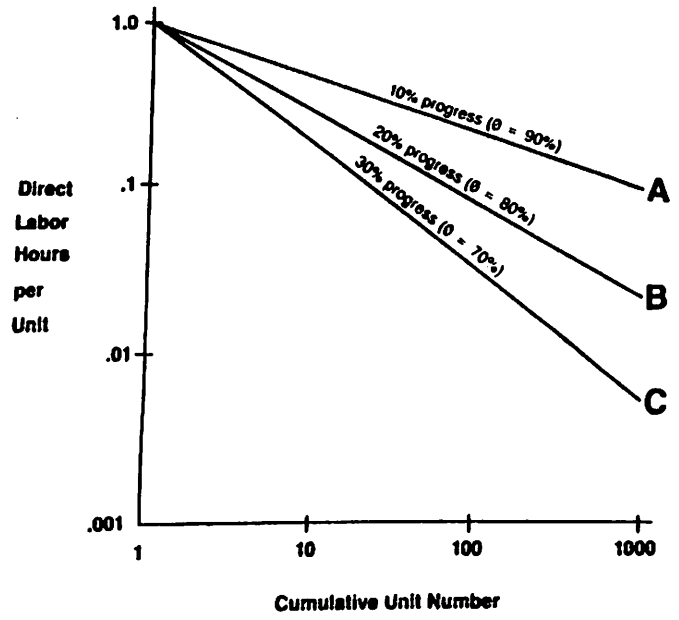

Fig. 1. Typical learning curves all requiring one direct labor hour to manufacture the first unit (i.e., $K = 1$). *Source*: Yelle (1979).

three-fourths of the direct labor in airframe manufacturing is in assembly – a relatively unskilled operation – and the remainder is in machine work – relatively skilled – the result is a largely worker paced operation with an 80% experience curve (curve *B* in fig. 1). But when the proportion of the machine work increases to one-half, the downward slope of the typical curve is not so steep – about 85%. If the ratio is about one-fourth assembly and three-fourths machine work, the slope goes up to about 90% (curve *A* in fig. 1) [Bodde (1976)]. In other words, the more skilled the production process, the lower the progress ratio and the higher the learning rate.

Presumably this is because skilled jobs are composed of a larger number of tasks than unskilled jobs and separately and together require more experience to master. In addition, the learning process will repeat itself the more the production process is changed. Barring exogenous changes in technology, the production process will change the most the greater the extent to which the division of labor is carried. This is because to realize a greater division of labor necessitates changing the production process, almost by definition. The division of labor is also greater the more elaborate the production process, i.e., the greater the application of capital and skills. Therefore, learning will be greater the more skill- and capital-intensive the operation(!).

The business literature on learning also distinguishes between organizational and labor learning. The former arises when organizations acquire knowledge in the course of production which has the effect of shifting the slope of the learning curve. Sahal (1981, in the academic literature) details extensive evidence of the small, incremental improvements in technology which arise in the course of production, although not effortlessly on the part of organizations. Almost all research on technological change in the NIC's report a similar type of innovation. Why such increments may be expected to be greater the more skill-intensive the production process may be inferred from the findings of one of the research projects on the NIC's in which I am participating.[8]

The findings all point to a superiority on the part of firms in the NICs in production engineering, or the operation of plants, over design engineering, or the technical wherewithal to conceptualize new products or processes. As for production engineering itself, I interpret the findings to suggest that in the course of operating a production unit, uncertainty, trouble spots, or

[8]One major research project on the technological capability of several Latin American countries, principally in metalworking, was headed by Jorge Katz, who is currently a private consultant and who is preparing a book which summarizes the research. Research financed by the World Bank is underway on the technological capability of Mexico by Carl Dahlman (World Bank), on India by Sanjaya Lall (Oxford Institute of Economics and Statistics), on South Korea by Alice Amsden (Harvard Business School) and Linsu Kim (Korea Advanced Institute of Science and Technology), and on Brazil by Francisco Sercovich (financed by the Inter-American Development Bank). Dahlman and Westphal (1982) summarize some of the findings to date of these and other research projects.

opportunities for adaptation arise most, and the requisite learning effort to handle them is greatest, where technology is least 'explicit'. The last term is that of Nelson and Winter (1977) and by it they mean technology which is not fully codified or fully understood, and an understanding of which cannot be obtained in blueprint form but must be acquired through experience. It seems to me that the tacitness of technology is greatest where there is least understanding of the scientific principles involved in production and/or where there are many steps in the production process and many alternative and interrelated ways of performing each step.

This became clear in visits to cement plants, a sector chosen for study in order to observe a 'process' or 'continuous flow' technology in operation. What was observed was considerable learning-by-doing on the part of cement makers in NICs, who tended to buy their first mill on a turnkey basis from abroad, and then to tinker with, adapt, and make minor improvements upon the foreign core technology, in order to get it to work at optimum capacity and to take into account local variations in raw materials and costs. The greatest amount of 'adaptive engineering', as it might be termed, centers around the kiln, if only because the scientific principles underlying the process which occurs inside it are still unclear. Thus, kiln-related production engineering involves considerable learning and appears as a highly skilled activity amidst a chemically determined 'line' production process. Much the same skill and learning are observable in the steelmaking industry with respect to the blast furnace, whose scientific principles also remain obscure.

The activities just described, which occur as a distinct and limited part of production in process centered industries, occur over almost the entire gamut of operation in 'discrete' or 'batch' production industries. Metalworking is the prime example. Few metalworking plants in the NICs (or anywhere else) are established on a turnkey basis because discrete technologies tend to be less standardized than process technologies; that is to say, they are less codifiable and replicable. Numerous stages in the production process involve experimentation and learning activity, and consequently demand considerable skill. Take, for example, the headstock in machine tools. There are general rules about how to reduce noise in the headstock but no prescriptions can be detailed enough to do away with discretion which the machinist must exercise in order to build a headstock which is noiseless.

One might add that the NICs tend to have a competitive advantage in skilled sectors like metalworking, not only because skilled workers there are relatively cheap but also because the interface is closer in such sectors – and hence competitiveness is greater – between design engineering and production engineering [Amsden (1983)]. Suffice it to say here, however, that where technology is least explicit, learning effects and skill tend to be greatest. Because the outputs of skilled production processes in the NICs tend to find their way primarily or initially as exports to developing countries, South-South trade is both more skill-intensive and more learning-intensive than South–North trade.

Finally, and not surprisingly, one must search outside the business literature for enlightenment on production-related learning effects which are realized economy-wide. Such learning effects are diffused from firms in one manufacturing branch to those in another through transfers of technology, labor, and capital or the products thereof. The sector with the greatest linkages is the producer goods sector because the output of its technology, labor and capital is by definition the input of other sectors [Rosenberg (1976)]. There also appear to be significant linkages between firms *within* many branches of the producer goods sector which together supply a diversity of products. As noted earlier, metalworking tends to involve production processes which are not product specific and parts of which most firms share in common.

By producer goods is meant capital goods (machinery and transport equipment other than passenger road vehicles) and intermediates (certain chemicals and certain materials of rubber, clay, iron and steel, glass, pulp and paper, etc.). Whether one looks at Japanese, Indian, American, or Canadian production coefficients (the proportion of raw materials, labor and capital contained in a unit of output) the findings are similar: while some *producer* goods tend to be highly capital-intensive, most *capital* goods, particularly those which enter with the greatest frequency into international trade, tend to be overwhelmingly skill-intensive.[9] Thus, it is in the capital goods sector that strong linkages and high skill-intensity overlap. Exports of capital goods by the NICs, moreover, flow almost entirely to other developing countries. When capital goods are defined to exclude not only consumer durables but also consumer related parts, components and accessories, then the percentage in the late 1970s of capital goods exports to developing countries from the three leading NICs was as much as 70% for India, 63% for Brazil, and 44% for South Korea [Plesch (1982)].

3.2. *Rent effects*

Another 'gain from trade' might be termed a rent effect. Such a gain is defined to arise to indigenous capitalists when they export a commodity which utilizes intensively an unemployed factor [à la Lewis (1954)] which produces at international standards of productivity but is paid at less than international rates. Unskilled commodities are the chief examples, and the

[9]Saunders (1978) points out that non-electrical machinery tends to be traded far more than electrical machinery and while the two may be equally skill-intensive, the former is less capital-intensive.

chief gains which accrue to countries which export them are super rents and employment.[10]

Lucky is the country whose competitive strength lies in a set of exports which contains both high rent and learning effects. Alas, this has been most true historically for Group I countries. Today, however, both effects tend to coincide in the NICs' exports to other developing countries. This is because there is reason to believe that skilled labor in the NICs is paid less than its international equivalent so that producers of skill-intensive commodities realize both super rents and greater technological capability.

We turn now to a discussion of the extent to which South–South trade may be increased, in all types of commodities.

4. The scope for South–South trade

It should not be thought that because world income distribution has grown increasingly unfavorable to the Third World that developing countries are incapable of affording each other's exports. The value of the manufactured imports which the Third World has been absorbing far exceeds the value of the manufactured imports which have originated from within the Third World itself. In 1980, the imports of developing countries from the North exceeded those from the South by a factor of roughly 6 [UNCTAD (1983)]. There is thus ample scope, if only by way of substituting Southern exports for Northern ones, to increase South–South trade. Nor does it appear to be a bad idea to begin to substitute certain Southern exports for Northern ones in light of the commodity composition of the latter.

In the space remaining, I map out the possible scope for substitution although not in any detail. A welcome research project would be one which did so in order to ascertain precisely for which importables demand in the Third World currently exists. The object would be to treat the Third World as one large country conserving foreign exchange with the rest of the world and creating new jobs, but at the same time increasing specialization and the division of labor internally (as well as internationally). As for supply side

[10]Exporters of commodities with high learning effects almost certainly benefit from exports of commodities with high rent effects (although there are some costs as well): if labor-intensive exports lead to faster aggregate growth, demand for all commodities may be expected to rise, the foreign exchange earned by unskilled exports makes it easier for the country in question to raise international loans, and the profits earned from exports of unskilled commodities may finance investments in other sectors directly or indirectly. All these advantages, however, cannot substitute for those inherent in learning-intensive goods. It remains true, therefore, that exports of unskilled commodities largely benefit capital accumulation while exports of skilled and highly capitalized commodities also represent longer term investments in technological capacity. It might also be inferred from the theory of unequal exchange set forth by Emmanuel (1972) that Third World countries do not gain from, and indeed are exploited by, exporting manufactures at world prices but at lower than world wage rates. This, however, is an equilibrium argument. That is, its conclusions rest on an equalization of the rate of profit internationally.

capability, it is hard to see no matter how extensive the research project how it could be ascertained if any firm in the South is technically capable of producing an import-competing product from the North. But one can envision the same type of institutional arrangements for import-substitution at the level of all developing countries which exist at the national level in many of them. In South Korea, for example, before the government permits imports of, say, capital goods, it determines first if such goods can be supplied locally. Many other Third World countries enforce comparable 'laws of similars'.

Table 5 presents a breakdown of the product mix of Northern exports into Southern markets. What is striking is the high value of many product groups which are traditionally regarded as labor-intensive: wood products and furniture, leather and footwear, clothing, and miscellaneous light manufactures. In 1980 these products together totalled ten plus billion dollars. By any reckoning of the 'law of comparative advantage' these commodities ought not to be imported from outside the Third World but ought to be produced and exported within it, and not by the NICs but by the even less

Table 5

Exports of manufactures by product group from 21 developed market-economy countries to developing countries (DC) and the world, 1980 ($ million).[a]

Product group	DCs Exports to DC	World	DC as a % of world
Food products	4,495	19,009	23.6
Drinks and tobacco products	2,316	11,855	19.5
Wood products and furniture	3,140	23,556	13.3
Rubber products	2,816	12,756	22.1
Leather and footwear	1,052	10,311	10.2
Textiles	8,711	40,406	21.6
Clothing	1,990	18,756	10.6
Chemicals	29,149	122,817	23.7
Pulp, paper and board	4,918	33,592	14.6
Non-metallic mineral products	3,844	17,834	21.6
Iron and steel	16,162	60,035	26.9
Worked non-ferrous metals	2,556	17,110	14.9
Road motor vehicles	24,152	114,966	21.0
Other engineering and metal products	96,094	355,862	27.0
Miscellaneous light manufactures	8,087	47,473	17.0
Total	209,485	906,335	23.1
Petroleum products	4,561	39,142	11.7
Unwrought non-ferrous metals	985	20,002	4.9
Total manufactures	215,031	965,479	22.3

[a]Source: special tabulations by the UNCTAD secretariat, as cited in UNCTAD (1983).

developed countries. What these numbers indicate is the ample scope for participation in South–South trade by all Third World countries and not just a few.

A second group of Northern imports which may be next in line for displacement is the following: textiles ($8,711) and iron and steel ($16,162). Some NICs have already become major producers of steel (South Korea, India, Mexico, Brazil and Taiwan). Group II might still have to import some of its specialty steels from the North but a few of the NICs have begun to import substitute even these lines. As for textiles, its product cycle has been 'born again' so that advanced countries can now produce the finer grades of textiles competitively with high-technology equipment. It is unclear whether the NICs (e.g., South Korea) are technically capable of producing high count textiles competitively or whether they have chosen not to invest in higher counts because of poor market prospects.[11] If the latter is the determining factor, then trade agreements among developing countries may be sufficient incentive for greater import-substitution by the leading textile producers. After all, the 'revealed' market of the South for textiles is greater than that of the North. In 1980, whereas the South imported some $8 billion of textiles *from* the North, it exported only roughly $5 billion *to* it [UNCTAD (1983)].

There remains the largest single (and fastest growing) category of imports from the North by developing countries: engineering and metal products other than road vehicles. This is the product group which is highest in skill content and which contains the largest potential learning effects for the NICs. Group II countries may be underexporting to each other because of shortfalls in this product classification. Whether the NICs are technically capable of graduating to more sophisticated capital goods is difficult to say, but perhaps is a moot point. More to the point is the fact that the NICs are economically capable of producing a greater value of capital goods than they have been recently, when inadequate demand has held them back.[12] At present, if the NICs are underexporting capital goods to the South, it may well be because they are underproducing them. For them to export more what may be needed most is not a technical capability beyond their grasp but demand management policies to help them grow faster. In general, for South–South trade to grow even more rapidly in the future than at present may require two sets of policies: one to improve trade ties, transportation and credit among developing countries, and another to stimulate the economies of developing countries to enable them to produce more.

Finally, one may conclude by mentioning the unmentionable: planning and

[11] This was found to be the case in interviews with large cotton textile firms in South Korea.

[12] Excess capacity in the capital goods sector has been endemic in India for many years, has become a problem in South Korea since the 1970s when the Government's turn to heavy industry appears to have stalled, and exists in Brazil, where the association of custom made heavy equipment manufacturers (ABDIB) reports great excess capacity.

the rationalization of South–South trade may become more critical in the future if the world returns to the economic conditions of the 1930s. As it is, the intra-trade of developing countries tends to increase during periods of global depression, as noted above. In 1980, a year of general economic malaise, trade in manufactures among developing countries grew two and a half times as fast as exports to developed market economies [UNCTAD (1983)]. But growth may have to be even faster if the events of the 1930s are any guide and the North abandons the ideology of Free Trade and imposes even tighter restrictions on imports. What this paper suggests, and what Lewis (1969) intimated previously, is that the advantages of South–South trade are such that this might hardly be an unmitigated evil.

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THE TIMING OF REGIONAL DEVELOPMENT*

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Consider a country composed of regions of different qualities, or endowments of amenities and natural resources for production and consumption. Initially only the highest quality regions are occupied. As national population grows, successively lower quality regions are occupied. The equilibrium timing of occupation of uninhabited regions differs from the optimal timing, typically being too late. Policies which would result in better timing are analyzed.

1. Introduction

Papers by Buchanan and Goetz (1972), Flatters, Henderson and Mieszkowski (1974), and Stiglitz (1977) examine the role of central governments in allocating resources across the inhabited regions of their countries. The presence of externalities such as external economies of scale in production, congestion of public facilities, and fiscal externalities means that when people move between regions they do not account for the full social cost of their movements on the residents of the regions they both enter and leave. Because of this, in general, the equilibrium allocation of population across regions will be non-optimal, indicating a need for policies that tax and subsidize residence in, respectively, over- and underpopulated regions. These analyses assume the number of inhabited regions of a country is fixed throughout the problem.

This paper examines a related but distinctly different problem. Consider a country with a spectrum of different quality regions, as defined later. When a country's population is low relative to its land area, only the best quality regions (e.g., coastal ones) are occupied. As a country grows, population spills out of the best quality regions into successively lower and lower quality regions. Both because of the externalities noted above and because of the non-convexities inherent in the lumpy process of regional formation or

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ause of developments in the 1970s.[61] The East Asian growth
ve further damaged these theories, for, neither Japan nor South
Taiwan have developed products and processes in the kind of
ces envisaged by Posner, Hufbauer, Vernon and others. It might
that the East Asian growth processes provide a confirmation
y of Mandel[62] and Gordon, Edwards and Reich[63] that capitalism
w stategies in the way of restructuring of the labour force and
t technique as old strategies of accumulation are worked out.
linked such changes in strategies with relocation of economic
t is not really possible to test these theories until comparative
depth have made of the strategies for rekindling of capital
n in post-war western Europe and of the Japanese and the four
rategies for accumulation in the 1960s. We have also to look
different roles stock-markets and banks seem to play in Japan,
ern Europe and the U.S.A. In the latter regions, operators in
narket can play havoc with many old-established firms (and
rejuvenate moribund enterprises), whereas it has been claimed
s not happen in Japan.[64] The East Asian phenomeno can provide
search programmes in the general area of the study of modern
The papers collected in this volume throw light on many aspects
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The Paradigm of Late Industrialization*

Alice H. Amsden

THE PARADIGM OF LATE INDUSTRIALIZATION THROUGH LEARNING

The First and Second Industrial Revolutions shared in common the generation of new products and processes. By contrast, economies commencing industrialization in the twentieth century generated neither, products and processes new to this century more likely than not being generated by older industrializers. Instead, economies commencing industrialization in the twentieth century have transformed their productive structures and have raised their incomes per capita on the basis of borrowed technology. They have produced products, with processes, conceived in unallied economic and political units. The means by which they managed to do so is what I refer to as *learning*.

The nature and role played by technical knowledge, therefore, distinguishes the industrial revolutions in England, Germany, and the United States, on the one hand, from the industrialization that occurred in agrarian societies in the twentieth century. If industrialization in England in the eighteenth century occurred on the basis of *invention*, or change in production methods associated with the personal management of owner-entrepreneurs of small-scale firms; and if it occurred in Germany and the United States in the late nineteenth century on the basis of *innovation*, or the massive commercialization of inventions by salaried managers in large-scale productive enterprises; then it occurred among backward countries in the twentieth century on the basis of learning. Twentieth century industrializers experienced their critical phases of industrialization by borrowing technological knowledge accumulated in the First and Second Industrial Revolutions.

The twentieth-century paradigm of late industrialization through learning is quite general to a diverse assortment of countries with different growth

* This article is based on a book by Alice H. Amsden entitled *Late Industrialization in South Korea: The General Properties of Expansion Through Learning*, Boston (Mass.), Harvard Business School.

records: Japan, South Korea, Taiwan, Brazil, India, possibly Mexico, Turkey, and so on. (Although this list might be expanded, one could not add to it the city states of Singapore and Hong Kong, because neither began from an agrarian base.) Growth rates differ among late industrializing countries, but in all cases industrialization has been a process of learning rather than generating new inventions or innovations, and learning has been based on a similar set of institutions. This article is intended to illuminate such institutions as well as to suggest why countries like Korea and Taiwan have performed better than other late industrializers. The conventional explanation is that they have conformed more to free market forces, but in fact, the fundamentals of their industrial policies are the same as those of other late industrializers. In all cases there is defiance of the market mechanism. Instead, it is suggested below that some late industrializing countries have performed better than others because the institutions of late industrialization have been better managed.

Industrialization on the basis of learning rather than invention or innovation is not unique to the twentieth century. The global process of industrialization has always tended to be combined and uneven, with leaders and laggards, forerunners and followers. If England pioneered on the basis of invention in the eighteenth century, Continental Europe and the United States pursued on the basis of learning in the nineteenth. If Germany was itself an innovator in the nineteenth century, it also studied the examples of early England and its emulators. The United States in the nineteenth century has been described as both borrower and initiator.[1] Learning, moreover, cannot be separated neatly from the creation of new knowledge. The interregnum between the First and Second Industrial Revolutions — in the period from the 1840s to the 1870s — witnessed the European and American emulators introducing incremental improvements to technologies devised earlier. Such maturation also occurred behind a technological frontier that was unstable.

Nevertheless, a process of industrialization whose central tendency is learning rather than invention or innovation deserves treatment as a distinct phenomenon or typology. The dynamics of growth and structural change are different, depending on the presence or absence of new technological discoveries. In conventional theories of growth, the advanced countries are taken as models and increases in productivity are made to depend on new innovations, exogenously determined. Yet, by definition, new innovations are absent in late industrializing countries so conventional growth theories are irrelevant. The productivity increases of late industrialization depend on endogenous factors, such as how rapidly foreign technology is absorbed (the rate of investment), whether it is utilized at the proper scale (decreasing costs), and how well it is applied (learning-by-doing). The rate of investment, economies of scale, and learning-by-doing are all related positively to the growth rate of output, so the growth dynamic in late industrialization is a closed loop, running from productivity to growth to productivity.

The nature of competition is also different in the First, Second, and late industrializing paradigms. Inventors are aided in the conquest of markets by either a new product or a new production technique. Their expertise in a particular area of specialization allows them to retain their competitiveness by generating a stream of innovations. Learners, by contrast, cannot innovate and must compete initially on the basis of low wages. The threat from still lower wage countries in labor-intensive industries, however, means that late industrializers cannot specialize in such products if they wish to grow or catch up. The whole process of catching up and diversifying into new industries is profoundly at odds with the principle of specialization. The accretion of competitiveness in late industrializing countries abides by a different set of rules from those implicit in the law of comparative advantage.

Finally, late industrialization qualifies as a distinct paradigm both because it is based on learning rather than the creation of new technical knowledge and because it is historically specific. Learners in the twentieth century confront an environment that is different geo-politically and socio-economically from those of earlier learners. For one, the gap between backward and advanced countries is wider. For another, the involvement between backward and advanced countries through institutions like those of Bretton Woods is unique.

THE SPEED OF INDUSTRIALIZATION

While the most successful twentieth century industrializers like Japan and Korea have invited inquiry about their rapid growth and structural change, the nineteenth century European emulators have drawn attention to their slowness. In the words of David Landes[2]:

> "In this effort to study and emulate British techniques, the nations of western Europe were favored by a number of advantages. Their supply of capital and standard of living were substantially higher than in the 'backward' lands of today. And with this went a level of technical skill that, if not immediately adequate to the task of sustaining an industrial revolution, was right at the margin. In short, if they were in their day 'underveloped', the word must be understood quite differently from the way it is today. Nevertheless, their Industrial Revolution was substantially slower than the British. Why the delay? Surely, the hardest task would seem to have been the original creative acts that produced coke smelting, the mule, and the steam engine. In view of the enormous economic superiority of these innovations, one would expect the rest to have followed automatically".

[1] N. ROSENBERG, *Technology and American Economic Growth*, New York, M. E. Sharpe, 1972.

[2] Cf. D. S. LANDES, *The Unbound Prometheus*, Cambridge, Cambridge University Press, 1969.

Why indeed the delay? And why was it that industrialization beginning in the late nineteenth century and then following World War II appears to have been far faster than that of the Napoleonic War period?[3] Part of the answer to this set of questions lies in the advance of science, which is worth discussing briefly. The advance of science underlies the distinction between industrializing by invention and industrializing by innovation in the First and Second Industrial Revolution respectively. Scientific advance also had an electrifying effect on the growth rates of twentieth century late comers.

Invention and innovation, as the terms are typically used, are intimately connected insofar as innovation presupposes invention in a logical sense. In textbook treatments of new technological developments, invention is associated with the idea and, like Creation in the Bible, comes first, followed by innovation or the application of the idea to commercial uses. I, however, regard invention and innovation not as abstract stages, one preceding the other in new tecnological discoveries, but rather as descriptions of particular historical periods, invention preceding innovation in an intergenerational sense. As representations of two distinct time periods, one key difference between the two lies in their degree of scientific content.

The scientific content of the inventions of the First Industrial Revolution moved the world far beyond the mysticism of the Middle Ages towards an opaque understanding of how mechanical devices worked. The Second Industrial Revolution, however, represented a discrete giant step forward insofar as technological change began to occur not by observation, trial, and error, but, far more than previously, on the basis of theory and experimentation.[4]

The application of science to production provided the basis for the stream of German and American innovations that lowered the British flag. For three interrelated reasons, the advance of science also made it monumentally easier for technology to be transferred, which a century later made a profound impact on the backward countries. One, higher scientific content increased the codifiedness or explicitness of technology, making it more of a commodity and hence, more technically and commercially accessible and diffusible from country to country (although even in mature industries, technology remains idiosyncratic). Two, the application of science in the fields of transportation, communications, and management improved the *mode* of technology transfer. Technical assistance can now be dispatched over longer distances to larger numbers of people more quickly and anonymously, not being dependent on the know-how of a particular person. Three, the crowding out of art by science in the design of new processes has had its analogy on the shop floor, in their utilization. The rise in the scientific content of technology has dealt a blow to the skilled crafts worker.[5]

Nevertheless, the impact of the advance of science on the backward regions was ambiguous. Despite the benefits, it created a far wider gap in income levels and technological capability than previously and strengthened the hand of the stronger nations over the weaker. This is reflected in the speed of industrialization. After all is said and done, the speed with which late learners in the twentieth century have industrialized may not be any faster than that of the European emulators in the early nineteenth century. What is decisive is how one dates the onset of industrialization and how one decides when a country can legitimately be described as industrialized.

If one dates the start of industrialization in the European emulators from, say, 1776, when the new economic order in Britain was given theoretical recognition by Adam Smith; and if one dates the closing of the gap between Europe and England from, say, 1850 to 1873, after which England began to be overtaken, then Korean industrialization, dating from the time Korea was opened by foreign imperialist, does not appear especially fast. Modern Korean history began in the 1870s, when the thousand-year-old Yi dynasty began to shatter as a consequence of Japanese intrusion, much as the Tokugawa regime in Japan had been shaken by the appearance of Admiral Perry only two decades earlier. This amounts to a delay in the onset of industrialization in Korea of about ninety years, from the 1870s to the 1960s. The revolutionary period of Korean industrialization continues, moreover, in that rapid growth and structural change are still in full swing and Korea has not yet come anywhere close to catching up with the most advanced countries. Even in mature industries, required labor hours per unit of output in the late 1970s were far higher than in Japan, by a scalar that averaged roughly 2.8.[6] In the mid-1980s Korea's share of industrial

[3] Maddison provides time series data on trends in output and per capita income which suggest that both variables grew faster in sequentially later industrializers. See A. MADDISON, *Phases of Economic Development*, Oxford, Oxford University Press, 1982.

[4] Cf. J. D. BERNAL, *Science in History*, vol. 2, The Scientific and Industrial Revolutions, Cambridge (Mass.), MIT Press, 1965.

[5] As recently as 1903, when the Ford Motor Company was founded, building automobiles was a task reserved for crafts workers who had received training in the bicycle and carriage shops of Michigan and Ohio. According to Eli Chinoy: "Final assembly, for example, had originally been a highly skilled job. Each car was put together in one spot by a number of all-around mechanics" (as cited in H. Braverman, *Labor and Monopoly Capital*, New York, Monthly Review Press, 1974, p. 146). That all-around mechanics have reappeared in the experimental workshops of the Volvo Motor Company after three-quarters of a century suggests that the assembly line may not be the final word in cost-cutting. Nevertheless, it made operations far easier to transfer to late industrializing countries, where all-around mechanical skills were scarce. The skilled crafts person has played only a minor role in late industrialization.

[6] The industries included in this calculation are cotton, textiles, paper, rubber tires, caustic soda, cement, iron castings, and ball bearings. The engineering method was used to calculate productivity, which involves computing required labor hours per unit of output. The study was undertaken by Han'guk Saengsangson Ponbu (Korea Productivity Center), *Worinara Saneup Oe Saengsangsong Hyunwhangkwa Opero Oe Kwajae* (*The Level of Productivity in Korea's Industry and the Future Task*), Seoul, 1985. For a comparison of productivity levels and growth rates in Korea and Japan, calculated as output divided by employment, see Kim, Chok-kyo, Ji-seong Yoo, and Kyu-cheon Whang, *Han'guk, Daeman, Ilbon Oe Jaejoup Saengsonseong Bunsuk* (*The Analysis of Manufacturing Productivity in Korea, Taiwan, and Japan*), Hangyang University, Institute for Economic Research, Seoul, 1984.

activity arising from indigenous R&D was minuscule. Korea's growth rates only surpass all records once industrialization started.

Nevertheless, the reasons why late industrialization was slow in starting can be explained by the same set of factors that explain why such countries grew faster than the European emulators once their industrialization got underway. The institutions of late industrialization that underscore its success, and whose absence was responsible for delay, are the following: an interventionist state, large diversified business groups, an abundant supply of competent salaried managers, and an abundant supply of low-cost, well-educated labor. Each of these institutions is now introduced briefly and Korea's finesse in managing them is indicated. Later, attention is redirected towards the state and the overall process of catching up.

KOREA AS A SPECIAL CASE OF LATE INDUSTRIALIZATION

The state in late industrializing countries intervenes with subsidies deliberately to distort relative prices in order to stimulate economic activity. This has been as true in Korea, Japan, and Taiwan as it has been in Brazil, India, and Turkey. In Korea, Japan, and Taiwan, however, the state has exercised discipline over subsidy recipients. In exchange for subsidies, the state has imposed performance standards on private firms. Subsidies have not been giveaways, but instead have been dispensed on the principle of reciprocity. Adherence to the principle of reciprocity has made a critical difference in economic performance, as discussed shortly.

Below the level of the state, the agent of expansion in all late industrializing countries is the modern industrial enterprise — large in scale, multidivisional in scope, and administered by hierarchies of salaried managers. Even in Taiwan, an economy with a reputation for small-scale enterprise, the large size firm (often a government enterprise) spearheaded industrialization in the early stages of growth. As Table 1 indicates, in 1973 Taiwan had a higher percent of output accounted for by firms employing 500 or more workers than any other nonsocialist country (for which data are available). In Korea the modern industrial enterprise takes the form of diversified business groups or *chaebol*, the top 10 among them accounting in the early 1980s for as much as 30% of shipments and 67% of sales (see Table 2). The *chaebol* are large even by the standards of late industrialization. In 1986, *Fortune's* list of the 500 largest international firms included 10 private, non-oil producing firms from Korea compared to 5 from other developing countries.[7] The large size of the *chaebol* and their wide diversification into nonrelated products have allowed them to survive the hardships of late industrialization, to penetrate the lower end of a large

[7] See "The International 500", *Fortune*, August, 1987.

number of foreign markets, and to supplant the need for multinational firms to undertake major investments in new industries. While Korea has depended heavily on foreign loans, it has entertained almost no direct foreign investment outside the labor-intensive sectors.

Salaried managers are a key figure in late industrialization because they are the gate keepers of foreign technology transfers. Once the government takes the initiative in major investment projects in deciding what, when, and how much to produce, the task of how to produce falls to the salaried manager. Squeezed between the state on the one hand and the salaried manager on the other, the role of the private entrepreneur in large-scale enterprise in late industrialization has been much reduced by the standards of the entrepreneurial histories of advanced countries.

Salaried managers have performed especially well in Korea because of heavy investments in education, from the primary level on up. In terms of sheer quantity, a large number of engineers has meant competition among them for the best jobs and the fastest promotions, thereby driving up

Table 1

Distribution of Manufacturing Value Added by Firm Size[a], *1973*[b]

Country	*1-9*	*10-99*	*100-499*	*500 or more*
Korea	5.8	13.8	27.7	52.7
Taiwan[c]	4.4	16.7	22.5	56.4
Hong Kong	7.4	30.2	32.1	30.2
Brasil	3.4	23.7	36.1	36.6
Turkey[d]	11.7	10.1	27.5	48.4
Peru	4.0	23.9	46.4	25.7
Japan[d]	8.7	28.4	24.9	37.9
Canada[d]	2.0	21.1	37.4	39.3
Czechoslovakia	0.2	5.4	18.2	76.1
Austria	0.8	21.5	36.2	41.5
United Kingdom		15.7[e]	24.4	60.0
United States[d]	2.4	18.3	30.5	48.7

[a] As measured by number of workes employed.
[b] Value added in producers' values.
[c] Value added in factor values, 1971.
[d] Net value added in factor values.
[e] 1-99.

Source: All countries, except Taiwan: United Nations, *The 1973 World Programme of International Statistics. Summary of Data from Selected Countries*, New York, 1979. Taiwan: Executive Yuan, *The Report of Industrial and Commercial Census of Taiwan and Fukien, District of the Republic of China, 1971*, as cited by S. Ho, "Small-Scale Enterprises in Korea and Taiwan", World Bank staff working paper No. 384, Washington, 1980.

Table 2

Business Concentration Ratio (BCR) in Korea (1974-1984)[a]

BCRn[b]	*1974*	*1975*	*1976*	*1977*	*1978*	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*
BCR1	4.9	4.3	4.7	7.9	6.9	8.3	8.3	10.5	10.4	11.8	12.0
2	7.2	7.5	8.1	12.5	12.9	12.8	16.3	19.1	19.0	21.2	24.0
3	9.0	9.8	11.3	16.0	16.9	17.6	23.9	27.6	27.4	30.5	35.8
4	10.3	11.4	12.9	18.2	20.7	22.1	30.1	35.2	35.6	38.7	44.3
5	11.6	12.8	14.5	19.8	22.9	24.6	35.0	41.3	42.2	46.7	52.4
6	12.7	14.1	16.1	21.3	24.7	26.6	38.2	44.9	46.0	51.0	56.2
7	13.5	15.3	17.5	22.8	26.4	28.5	41.0	48.0	49.2	54.2	59.4
8	14.3	16.2	18.4	24.0	27.7	30.3	43.6	50.9	52.2	57.1	62.1
9	14.7	16.7	19.3	25.2	28.9	31.6	46.0	53.3	55.1	59.8	64.8
10	15.1	17.1	19.8	26.0	30.1	32.8	48.1	55.7	57.6	62.4	67.4

[a] Manufacturing sector only.
[b] BCRn is defined as (total sales figure of top n firms among business groups/GNP) × 100 for each year.

Source: SEOK KI KIM, "Business Concentration and Government Policy: A Study of the Phenomenon of Business Groups", Boston (Mass.), Harvard Business School, D.B.A. dissertation, 1987.

productivity. Moreover, enough of them have been trained to ensure that enough of them pursue the career intended by their education.

In terms of quality, or the way salaried managers have been utilized by the modern industrial enterprise, three points stand out in the Korean case. First, firms have showed a preference to hire engineers over administrators. Whereas between 1960 and 1980 the number of Korean managers grew by a factor of 2.2, the number of Korean engineers grew by a factor of over 10 (see Table 4). Second, even as managerial capitalism in Korea has spread, overhead has been kept in check. As Table 3 indicates, in the 20 years between 1960 and 1980 the ratio of white collar workers (excluding clerks) to blue collar workers remained constant, even declining slightly, from 0.13 to 0.10. Korean firms have not created huge overheads but instead have appointed managers to the shop floor, in production positions, which is where the competitive advantage of late industrializing countries lies. Third, the number of layers of management has been kept quite small in Korea. Engineers at the plant level keep in close contact with the ranks.

Turning now to production workers, late industrializers have exceptionally well-educated work forces by comparison with earlier phases of industrialization. Moreover, the wages of these workers have been

prevented from rising rapidly by a conspiracy of forces: political repression, an unlimited labor supply at the onset of growth, an absence of international opportunities to migrate, and the insignificance of a class of skilled crafts persons, who were the organizers of trade unions in earlier periods. Korea, however, has set a number of world records in the area of labor which has made its work force unusually productive.

On the one hand, Korea appears to have the longest work week in the world, a throwback to the work week in effect in the harsh factory system under Japanese colonialism (see Table 4). On the other hand, Korea's growth rate of real wages possibly exceeds that of any previous industrial revolution (including Japan's) and probably that of any contemporary one (see Table 5). High real wage increases have acted as a stimulant to firms to acquire technological capability and have acted as an inducement to workers to work hard. In addition, Korea's work force is highly segmented, which has energized a new labor aristocracy. Korea has the dubious distinction of having one of the highest gender wage gaps, although this honor sometimes falls to Japan (see Table 6). On average, Korean women earn less than half of what men earn. Korea also has one of the largest wage dispersions within the manufacturing sector. According to Table 7, Korea's wage dispersion by industry is among the world's highest. Korea's new labor aristocracy

Table 3

Managerial Resources in the Manufacturing Sector by Category, 1960-1980

Employment *Category*	*1960*	*1970*	*1980*	Increase *1980/1960*
Engineers	4,425	16,252	44,999	10.2
Managers	31,350	47,166	69,585	2.2
Sales	5,025	27,778	68,716	13.7
Service	13,660	22,740	49,522	3.6
Clerical	17,330	143,849	356,362	20.6
Production	404,735	1,188,406	2,206,851	5.4
Total	479,975	1,447,520	2,797,030	5.8
Administrative/ Production (ratio)[b]	0.13	0.96	0.10	—
Administrative and Clerical/Production (ratio)	0.18	0.22	0.27	—

[a] Includes transportation and communication workers in the manufacturing sector.
[b] Administrative includes engineers, managers, sales and service workers.

Source: A. H. AMSDEN, *Late Industrialization*, op. cit.

is male, occupied in one of the basic industries, and employed in a large-scale firm.

A further introduction to the state in late industrialization is now presented because, of all institutions, it is the most controversial.

THE STATE

The first step to understand why backward countries in the twentieth century eventually expand is to ask why they became backward in the first place. The development process is enormously complex, but one can say as a first approximation that the onset of economic expansion has tended to be delayed by fatal weaknesses in the state's ability to act. If and when industrialization accelerates, it has done so at the initiative of a strengthened state authority. By contrast, one cannot say that countries in the twentieth century that have fallen behind have been relatively defiant of the market mechanism while those that have advanced have conformed to it, an alternative theory.

Table 4

Hours of Work in Manufacturing (1976-1985)

Country	*Average Workweek*
South Africa	47.0
Argentina	45.6
Mexico	46.0
Puerto Rico	38.0
United States	40.1
Hong Kong	47.1
Israel	38.7
Japan	46.0
Korea	53.3
Malaysia	48.4
Belgium	34.3
France	40.1
Germany	41.2
Norway	38.1
Sweden	37.8
United Kingdom	41.5

Source: ILO (International Labour Organization), *1986 Yearbook of Labor Statistics*, Geneva, 1987.

Table 5

Real Nonagricultural Wage Increases, Korea, Brazil, Argentina, Mexico and India, 1970-1984

Year	*Korea*[a]	*Brazil*[a]	*Argentina*	*Mexico*	*India*[a]	*Taiwan*
1970	100	100	100	100	100	—
1971	102	110	105	103	100	—
1972	104	114	99	104	—	100
1973	119	119	107	104	106	107
1974	130	119	126	107	97	98
1975	131	127	124	114	110	110
1976	154	129	80	123	120	126
1977	187	134	76	125	116	138
1978	219	142	77	122	124	151
1979	238	134	87	121	130	163
1980	227	130	100	116		166
1981	225	118	91	119		171
1982	241	115	79	117		180
1983	261	97	97	86		188
1984	276	84	112	83		191

Note: Base = 100. Deflated by consumer price index.

[a] Real earnings manufacturing sector.
[b] Average wages for skilled workers in construction. Data are from the Central Bank.
[c] Rupees per hour for industrial workers.

Source: A. H. AMSDEN, *Late Industrialization*, op. cit.

Table 6

International Comparisons of Manufacturing Wage Differentials by Sex, 1980

Country	*%*	*Country*	*%*
Sweden	89.3	Belgium	69.4
Burma	88.8	U.K.	68.8
Denmark	86.1	Syria	68.8
Norway	81.9	Ireland	68.7
Netherlands	80.1	Greece	67.8
El Salvador	78.9	Switzerland	67.7
Australia	78.6	Egypt	63.1
France	77.0	Luxembourg	61.2
Finland	75.4	Cyprus	50.2
West Germany	72.7	Japan	48.2
New Zeland	72.4	South Korea	44.5

Note: (Female/male average wages)*100. In most cases, 1980 wages. Hourly wages except for Cyprus, Egypt (weekly), and Burma (monthly). Adults only for United Kingdom.

Source: ILO (International Labour Organization), *1981 Yearbook of Labor Statistics*, Geneva, 1982 as cited by J. W. Lee, "Economic World Development and Wage Inequality in South Korea", Ph. D. Dissertation, Harvard University, Boston, 1983.

Table 7

Wage Dispersion Among Manufacturing Industries in Select Countries

	Year	
	(1)	(2)
	1973	*1982*
Country	*Standard Deviation of Log Wages*	
Bolivia	.204	.168
Canada	.225	.239
France	.143	.126
Germany	.137	.141
Japan	.216	.263
Korea	.349	.314
Mexico	.147	.155
Norway	.075	.107
Poland	.126	.097
Sweden	.067	.081
USSR	.117	.101
United Kingdom	.087	.140
United States	.206	.241
Yugoslavia	.126	.120

Source: A. B. KRUEGER and L. H. SUMMERS, "Reflections on the Inter-Industry Wage Structure", Harvard Institute of Economic Research, discussion paper No. 1252, July 1986.

There are many reasons why some countries in the twentieth century found themselves behind others in income and wealth. The probable reasons can be grouped into four categories: natural resource endowment, demography, commercial factors, and social forces. The natural resource explanation for backwardness can be dismissed out of hand. The association between resource endowment and per capita income is visibly weak. The attribution of underdevelopment to excess population is now also pretty well discredited. Population explosions are currently believed not to have led to failures to industrialize but rather to have emerged as a consequence of them.[8]

There remains, therefore, two major contending views, the market and the institutional. The market explanation for economic development poses as the grand mover and shaker of the past 200 years of economic progress.

[8] The argument that rapid rates of population increase are the consequences of failures to develop is most cogently put by H. MYINT, *The Economic of the Developing Countries*, New York, Praeger, 1964.

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Netherlands	80.1	Greece	67.8
El Salvador	78.9	Switzerland	67.7
Australia	78.6	Egypt	63.1
France	77.0	Luxembourg	61.2
Finland	75.4	Cyprus	50.2
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No one could possibly deny the overarching role that the market has played in speeding growth. Yet one must distinguish between the market and the market *mechanism*. The former refers to the means to satisfy supply and demand. The latter refers to rules to allocate resources. All industrializations have made use of the market. Nevertheless, adherence to the market mechanism cannot explain very satisfactorily why late industrializers delayed so long in starting to expand, or why they eventually succeeded in growing.

The economic histories of backward countries are quite varied, yet the archetypal late industrializer in the twentieth century was at one time or another a colony of one of the Great Powers (Japan included among the potentates). Colonial histories differ, but the typical economic regime of a colony was quite exemplary from the viewpoint of competitive theory. Basically, colonies followed policies of free trade and exploited their static comparative advantage in agricultural commodities. Their growth, therefore, could not be said to have been stunted by a failure to be guided by the market mechanism.[9] Indeed, it could be said to have been stunted by a failure to follow interventionist policies, namely of throwing up trade barriers and offering financial incentives to cradle infant industries.

This leads to the final explanation, one related to social relations. Quite simply, industrialization was late in coming to backward countries because their states were too weak to mobilize forces to inaugurate economic development and fend off a wave of foreign aggression begun in the second half of the nineteenth century. Their states' weakness, moreover, arose from internal social conflict—ethnic, racial, regional or class. Such conflict precluded arrogating enough power to a central authority to prevent foreign intervention, invasion, or the catastrophic loss of statehood altogether. Korean history in the period 1871-1962 is dominated by the struggle to create a state with the ability to plan and coordinate economic expansion.

States in modern history have always intervened to spur economic development, but state intervention has intensified over time as industrialization has increasingly taken the form of catching up.

Intervention by means of the subsidy serves as a symbol of late industrialization, not just in Korea and Taiwan but also in Japan, the Latin American countries, and so on. The First Industrial Revolution was built on laissez-faire; the Second, on infant industry protection. In late

[9] L. REYNOLDS argues that under colonial regimes of free trade, the backward regions grew at a fairly rapid clip, although to be sure, there were exceptions to the rule. According to Reynolds: "... against the view that 'life began in 1950', ... the third world has a rich record of prior growth, beginning for most countries in the 1850-1914 era". (See L. REYNOLDS, *Economic Growth in the Third World, 1850-1980*, New Haven, Yale University Press, 1985, p. 4) In anticipation of the obvious objection, that developing countries are still desperately poor, Reynolds writes: "Certainly people in Western Europe and the United States are much better off than people in Sri Lanka [the example he uses], though not as much better off as the World Bank Table suggests ... conversion from the local currencies to U.S. dollars at official exchange rates exaggerates the actual difference in consumption levels" (*op. cit.*, p. 40).

industrialization the foundation is the subsidy, which includes protection as well as financial incentives. The pivotal role of the subsidy has rendered the government not merely a banker but an entrepreneur, using the subsidy to decide what, when, and how much to produce. The subsidy has also changed the process whereby relative prices are determined.

Industrial expansion depends on savings and investment, but in backward countries especially, savings and investment are in conflict over the ideal interest rate, high in one case, low in the other. In Korea and other late industrializing countries, this conflict has been mediated by the subsidy. Throughout most of the 25 years of Korean industrial expansion, long-term credit has been allocated by the government to selected firms at negative real interest rates in order to stimulate specific industries (see Table 8). The high real interest-rate policy that started in 1965 — in the spirit of liberalization — ended in 1972 with a return to low real interest rates. However, even during those seven years domestic savings were never sufficient to meet investment demand. The government, therefore, arranged long-term international credit for favored firms at rates far below those obtainable domestically. Thus, the government established multiple prices for loans, some more favorable than others, and only one of which could possibly have been «right» according to the law of supply and demand. Moreover, the most critical price, that for long-term credit, was wildly wrong.

As for the foreign exchange rate, another key relative price in economic expansion, it has also been deliberately distorted by late industrializers, which need a high rate to export and a low rate to repay foreign debt and import raw materials and producer goods that cannot yet be produced domestically. Exchange rates have a negative impact on growth if they are grossly distorted. In Korea, however, they were distorted within reasonable bounds, but only had a positive impact on growth when they operated in conjunction with other policies to stimulate exports. As Figure 1 indicates, there is no close relationship between exports and the real effective exchange rate. Exports have been heavily subsidized. They have also been heavily coerced, so inside the range of reasonableness, market prices have been altogether irrelevant. According to a survey of exporters in the mid-1970s conducted under the aegis of the World Bank, over half of the respondents claimed that export quotas had a negative effect on their firms.[10] Exporters, however, were compensated for having to export by being allowed to sell in the domestic market at inflated prices. Such prices were distorted due to protection. Tariff barriers and nontariff barriers comprise a key ingredient in Korea's industrial policy. Even imports supposedly liberalized in the mid-1980s are subject to an average tariff rate wich may amount to as

[10] YUNG WHEE RHEE, B. ROSS-LARSON and G. PURSELL, *Korea's Competitive Edge*, Baltimore, Johns Hopkins for the World Bank, 1984.

Table 8

Cost of Foreign Capital (annual averages)
Unit: %

		1966-70	1971-75	1976-80	1981-83
I.	Domestic Bank Lending Rate[a]	24.4	17.0	18.0	12.5
	(Curb Market Interest Rate)	(54.2)	(40.1)	(41.3)	(30.6)
II.	Foreign Interest Rate[b]	6.4	7.9	11.5	11.1
III.	Foreign Inflation Rate (GNP Deflator)[c]	4.9	8.4	5.9	4.1
IV.	Exchange Rate Depreciation[d]	5.1	7.8	5.5	10.1
V.	GDP Deflator (Rate of Change): Korea[e]	14.6	18.7	19.7	9.9
VI.	Real Foreign Interest Rate (II-III)	1.5	-0.5	5.6	7.0
VII.	Interest Rate Differential Between Home and Foreign Markets (I-II-IV)	12.9	1.3	1.0	-8.7
VIII.	Real Private Cost of Borrowing Abroad (II + IV-V)	-3.1	-3.0	-2.7	11.3

[a] Discounts on bills of Deposit Money Banks (three year moving averages).
[b] LIBOR (90 days).
[c] Average of Japan and United States.
[d] BOK (Bank of Korea) standard concentration rate (three year moving averages).
[e] Three year moving averages.

Source: Bank of Korea, *Monthly Bulletin*, various issues as cited by YUNG CHUL PARK, "Korea's Experience with External Debt Mangement", in G. SMITH and J. CUDDINGTON (eds.), *International Debt and the Developing Countries*, World Bank, 1985.

much as 30% and there persist nontariff barriers equal in subtlety to those in Japan.

From this perspective, the price determination of savings and investment and of exports and imports is the outcome of a far more complex process than the market model would suggest. Economic expansion in late-industrializing countries has come only at the cost of such complexity. As a general property of late industrialization, interest rates are more favorable for some investors than for others. Exporters and importers face different exchange rates. Some imports are duty free; others are subject to high trade barriers. In the case of Korea, exports are subsidized but exporters are coerced to exceed export targets.

Whatever one wishes to call such a mixture of policies, one cannot call it «getting relative prices right» or «conforming to market forces». I call such a mixture of policies market augmenting, in recognition of its immediate objective, which is to increase either home or overseas demand for domestically supplied output (in Korea's case, output supplied by Korean-owned firms).

Economic paradigms are largely defined by the internal mechanism that is built into them to exert discipline over firm behavior. In the case of the market paradigm, discipline is dispensed by the invisible hand. With the subsequent erosion of competitive market structures, which was inconsistent with the market paradigm, Schumpeter recognized a new disciplinarian in technological change. It was the creative gales of new technological discoveries that uprooted old monopolies and increased productivity, not steadily but in great spurts.

There is no mechanism in the market-augmenting paradigm that is equivalent to the invisible hand or to technological change. To the extent that oligopolists the world over compete along dimensions other than innovation, oligopolists in late industrializing countries also compete, although the dimensions that they compete along relate to their status as learners and they tend to compete far more vigorously because growth is faster. However, there is no neat mechanism in the market-augmenting paradigm that can be relied upon to drive firms automatically to compete with one another, because growth itself does not happen automatically. Growth in late-industrializing countries depends on government intervention to augment supply and demand.

Few aspiring emulators of the Korean model appreciate just how extensive subsidies have been, just how pervasive protection is, and just how encouraging government support continues to be in Korea. Government support has included expansionary rather than contractionary policies in times of external shock and almost unfailing bailouts of financially troubled, large-scale firms (at what sometimes appear to be great social savings and at other times, great social costs). With such discretionary power under the control of mere mortals, two questions arise: What mechanism will discipline subsidy recipients? And no less pertinent, what mechanism will discipline the donor of subsidies, the state itself?

All paradigms have their hidden premises, a large number of firms confronting one another in the same industry in the case of the market conforming paradigm, an undulating stream of new technological discoveries in the case of Schumpeter's. Although the market augmenting paradigm does not have an automatic disciplinary device, it nonetheless has a premise on which industrial expansion depends. The premise of late industrialization is a reciprocal relationship between the state and the firm. This does not simply mean close cooperation, which is sometimes the way business government relations in Korea and Japan are simplistically depicted. It means that in exchange for subsidies, the state exacts certain performance standards from firms. The more reciprocity characterizes state-firm relations, the higher economic growth.

Korea has industrialized unusually rapidly partly because the state has imposed relatively stern discipline on private firms. In exchange for subsidized long-term credit, even the most politically favored firms have had to produce rather than speculate, to train their workers rather than exploit them, to invest in R&D as well as rely on foreign technical expertise, and to export as well as savor demand in the protected home market. Exports represent perhaps the most important disciplinarian and an objective, opaque criterion by which firm performance is easily judged. Additionally, firms have been subject to five general controls in exchange for government support.

First, the government has owned and controlled all commercial banks. One of the first acts of the government of Park Chung Hee was to nationalize the banking system (the government of Syngman Rhee had denationalized it a decade earlier to appease American pressures). Although pressures to liberalize in the 1980s led the government to privatize the commercial banks, thereby strengthening aggregate economic concentration and income inequality, the government maintained its control over commercial banking. Government control of the purse has helped orient the *chaebol* towards accumulating capital rather than seeking rents.

Second, in luring firms to enter new industries with the plums of protection and subsidies, the government has imposed discipline by limiting the number it has allowed to enter (although usually not to fewer than two firms per industry (see Table 9)). This has ensured the realization of scale economies and the rise of the mammoth business groups that the government foresaw as necessary to compete internationally.

Third, discipline has been imposed on «market-dominating enterprises» through yearly negotiated price controls, in the name of curbing monopoly power. At the end of 1986 as many as 110 commodities were controlled, including flour, sugar, coffee, red pepper, electricity, gas, steel, chemicals, synthetic fibres, paper, drugs, nylon stockings, automobiles, and television.[11]

Fourth, investors have been subject to controls on capital flight, or the remittance of liquid capital overseas. Legislation (Tuk-Pyul Pon-Jen Ka-Ching-Cho-Pul-Pup) has stipulated that any illegal overseas transfer of $1 million or more was punishable with a *minimum* sentence of 10 years imprisonment and a maximum sentence of death. In the 1980s, the degree of compliance with the law has fallen into doubt.[12] In the 1960s and 1970s, its harsh terms are believed to have been a credible deterrent to

[11] KYUNG-JAE-KI-HEOK-WAM, Ko-Shi Je 86-7 Ho, "1987 Hyun-do Shi-Jang-Ji-Bae-Chok Sa-Up-Ja Ji-Jong" (Economic Planning Board, Notification No. 86-7, "Designation of Market-Dominating Enterprise for the Year of 1987").

[12] Still, a bankrupt shipping magnate was believed to have committed suicide in 1987 for fear of being prosecuted under the law's terms. See "Chairman's Death Makes Waves", *Business Korea*, May 1987, p. 14.

Table 9

Structure of Manufacturing Industry
(Unit: Number of Commodities, 1 billion Won)[a]

		Monopoly	Duopoly	Oligopoly	Competitive	Total
1970	No. of Commodities	442 (29.6)	279 (18.2)	495 (33.2)	276 (18.5)	1,492 (100)
	Shipment	110 (8.8)	204 (16.3)	439 (35.1)	498 (39.8)	1,252 (100)
1977	No. of Commodities	667 (31.6)	425 (20.1)	674 (32.0)	343 (16.3)	2,219 (100)
	Shipment	2264.0 (16.3)	1,536 (11.0)	4,716 (33.9)	5,404 (38.8)	13,920 (100)
1982	No. of Commodities	533 (23.6)	251 (11.1)	1,071 (47.4)	405 (17.9)	2,260 (100)
	Shipment	5,649 (11.4)	3,275 (06.6)	24,967 (50.6)	15,481 (31.4)	49,372 (100)

[a] Figures in parentheses are shares in percentage.

Monopoly: $CR_1 > 80$ percent, $S_1/S_2 < 10$.
Duopoly: $CR_2 > 80$ percent, $S_1/S_2 < 5.0$ $S_3 < 5$ (monopoly is excluded).
Oligopoly: $CR_3 > 60$ percent, (Monopoly and duopoly are excluded).
Competitive: $CR_3 < 60$ percent.

Source: Compiled from the Census of Manufacturing data base, Economic Planning Board, by KYU-UCK LEE, S. URATA and I. CHOI, "Recent Developments in Industrial Organization Issues in Korea", Korean Development Institute and the World Bank, 1986.

private investors who might otherwise have used public subsidies to build personal fortunes abroad.

Fifth, the middle classes have been taxed and the lower classes have received almost nothing in the way of social services. This has enabled a persistent deficit in the government account to reflect long-term investments (see Table 10).

As for the question, «Who will discipline the state?» the answer in Korea is the student movement. Beginning in the period of Japanese colonial rule, the student movement emerged as an unusually belligerent and obstreperous force. Subsequent history suggests that if the state goes beyond the limits of tolerable abuse and corruption, it encounters destabilizing student

Table 10

Sources of Current Account Imbalances in Current Market Prices (Unit: Billion Won)

	Public Sector					
	Private Sector (A)	Goverment (B)	Government Invested Corporations (C)	Subtotal (D = B + C)	A/GNP (percent)	D/GNP
1963	-11.67	14.34	-16.06	-2.02	-2.4	-0.4
1964	-3.39	23.26	-13.79	9.47	-0.5	1.3
1965	-27.88	36.49	-16.15	20.34	-3.5	2.5
1966	-65.20	38.82	-15.14	23.68	-6.3	2.3
1967	-70.89	51.26	-54.39	-3.13	-5.5	-0.2
1968	-136.63	57.03	-36.19	20.84	-8.3	1.3
1969	-110.80	29.98	-63.73	-33.75	-5.1	-1.6
1970	-195.55	60.91	-63.12	-2.21	-7.3	-0.1
1971	-179.19	42.81	-130.31	-87.50	-5.4	-2.7
1972	35.80	-9.16	-200.51	-209.67	0.9	-5.2
1973	51.31	24.86	-107.94	-83.08	1.0	-1.6
1974	-422.54	-36.09	-223.50	-259.59	-5.8	-3.5
1975	-337.19	-129.29	-482.24	-611.53	-3.4	-6.2
1976	-20.73	329.49	-455.95	-126.46	-0.2	-1.0
1977	472.45	18.08	-749.27	-731.19	2.8	-4.3
1978	-281.57	448.27	-1,031.84	-583.57	-1.2	-2.5
1979	-1,675.45	493.31	-1,170.45	-677.14	-5.8	-2.3
1980	-2,381.04	20.81	-1,344.91	-1,324.10	-6.9	-3.9
1981	-1,513.67	5.89	-1,869.06	-1,863.17	-3.6	-4.4
1982	489.47	-124.05	-2,260.19	-2,384.24	1.0	-5.0

Notes:

a) A, B, and C refer to the difference between savings minus investment in each sector.

b) Figures for savings and investment of government invested corporations, which include nonfinancial operations of Federations of Agricoltural and Fisheries Cooperatives, are obtained from BOK's flow of funds tables.

Source: Yung Chul Park, *op. cit.* as cited by A. H. AMSDEN, "Growth and Stabilization in Korea, 1962-84" in L. TAYLOR (ed.), *Stabilization and Development: A Structuralist Approach*, Oxford, Clarendon, forthcoming.

protests. As this is being written, the student protests against the military dictatorship that came to power in 1980 are being joined by the middle classes and workers.

It is unclear whether the strong economic measures of the Korean state could have been taken under political democracy, although Japan and the étatiste European countries suggest that such measures and political democracy are compatible. What is clear beyond a doubt is that little industrialization may be expected in backward countries (and maybe in advanced ones) in the absence of a strong central authority. Even getting relative prices "right" according to textbook theory would require a state strong enough to battle the class of subsidy losers.

THE PROCESS OF CATCHING UP

Landes mentions labor supply only briefly in his analysis of catching up, and he certainly does not view abundant labor as Europe's competitive asset. To the contrary, he sees the attainment of competitiveness by learners in the nineteenth century as burdened by lower labor costs. He argues that after industrialization gained momentum in Britain, the same abundant supply of impoverished rural laborers that had made possible Europe's pre-factory industry began to act as "... a deterrent to mechanization and concentration".[13] For Gerschenkron as well, labor did not lend a competitive advantage to late developers, because a suitable labor force did not exist: "... industrial labor, in the sense of a stable, reliable, and disciplined group that has cut the umbilical cord connecting it with the land and has become suitable for utilization in factories, is not abundant but extremely scarce in a backward country".[14]

The creation of competitiveness on the basis of an abundant labor supply is the *differentia specifica* of latter day twentieth-century learning. The United States and Germany caught up with Britain on the basis of innovation, not cheaper labor. Even when Japan penetrated deeper into world markets in the 1910s and 1920s, its cheap labor was but one of several assets it used to gain market share. Therefore, the conquest of world markets beginning in the mid-1960s by late industrializing countries on the almost exclusive basis of low wage rates represents a new phenomenon, a truly new international division of labor.

Nevertheless, low wages were not a sufficient basis to enter world markets in the mid-1960s, even in the industries in which backward countries could be expected to have a comparative advantage, the industries

[13] Cf. D. S. LANDES, *op. cit.*, p. 139.

[14] See A. GERSCHENKRON, *Economic Backwardness in Historical Perspective*, Cambridge (Mass.), Belknap, 1962, p. 9.

that are labor intensive. Through the lens of Korea's leading sector in the 1960s, cotton spinning and weaving, one comes to appreciate that, in the short run, the lowest wage supplier is not necessarily either the lowest labor cost or total cost supplier, no matter how labor-intensive the industry.[15] Korea's system of subsidies and incentives originated in attemps by the government to support the powerful cotton spinners' and weavers' cartel, whose members found it problematic to compete against Japan. The inadequacy of low wages as a basis for late industrializing countries to compete applied *a fortiori* in the basic or heavy industries (which comprise manufactures of chemicals, basic metals, nonmetallic mineral products, machinery, and transport equipment).

After a country invests in labor-intensive manufactures, the next logical step from both a technical and demand-side point of view is to invest in heavy industry. Certain sub-branches of heavy industry have prospered even in small countries, as evidenced by industrial activity in small countries like Austria, Belgium, and Switzerland (the only advanced country that does not appear to have some heavy industry is Denmark). Yet the heavy industries have drawn criticism from economic historians and advisors alike for being an irrational symbol of liberation from backwardness and a violation of comparative advantage.

Symbolism apart, the real significance of the heavy industries for late industrialization lies in the turning point they represent for the unit of production and the basis on which it realizes value. For one, with the heavy industry sector comes the modern industrial enterprise and, hence, salaried management. The salaried management of the cotton spinning and weaving industry in Korea was far less professional than that of the heavy industries. For another, with the heavy industry sector comes a new mode of competition, oligopoly. Of equal importance, transition from light to heavy industry involves a transition from competing on the basis of cheap labor to one of competing on the basis of modern facilities and skills, given whatever labor costs made entry possible. It usually follows that competition against low wage firms is redirected against firms that are also competing on the basis of modern facilities and skill, whatever their initial entry costs. Firms that compete on the basis of modern facilities and skills tend to be from advanced countries. For late industrializers, therefore, the transition from light to heavy industry involves a transition from competing against firms from other low wage countries to competing against firms from high ones, with vastly more experience and technical expertise.

Complicating the process of catching up for late industrializing countries, the progression from light to heavy industry has not been undertaken by the same set of firms. Leading firms in the light industries did not become

[15] Cf. K. D. Woo, "Wages and Labor Productivity in the Cotton Spinning Industries of Japan, Korea and Taiwan", *The Developing Economies*, XVI, 2, June 1978.

leading firms in thechnically more complex industries, with the exception of electronics. The experience gained in producing black and white television sets provided the know-how for big *chaebol* like Samsung and Lucky-Goldstar to advance from assembly to higher value-added activities in consumer electronics, and then from there to computer electronics. Nevertheless, electronic products accounted for a small share of total exports, only 10% in 1976 — before the rise of heavy manufactured exports — and only 11% in 1984, afterwards.[16] Korea's major exports from 1965 to 1975 were apparel, cotton textiles, and miscellaneous manufactures. In the case of cotton spinning and weaving, unambiguosly Korea's leading sector at the time, there were almost no techno-managerial externalities. The cotton textile firms that benefited internally from international competition in the form of exposure to better management techniques and improved production processes did not serve as the organizational building blocks for the economy's more skill — and capital-intensive pursuits. None of the leading *chaebol* evolved from a base in cotton textiles. With profit maximizing horizon that were short term, entrepreneurs who were conservative, and managers who were oriented more towards the art than science of production, textiles firms did not become the agents of further industrialization.

Catching up, therefore, involved the state's creating competitive advantage through a highly politicized process of resource allocation and big business' creating the organizations to compete. Not least critical became their acquisition of technological capability.

OVERCOMING TECHNICAL IGNORANCE

Whatever the time period, learners rely heavily on foreign know-how to narrow the gap. If they are at all successful at learning, they visit international expositions, attend conferences and lectures, read technical journals, hire experienced workers, visit overseas plants, engage foreign technical assistants, consult machinery suppliers, and buy, borrow, beg, and steal foreign design. The form of technology acquisitions has tended to change, however, as technology itself has become more science-based, and as the firm has come to be viewed less as a means to earn a livelihood and more as a means to earn a profit. The central tendency has shifted from the absorption of foreign technology through copying and self-teaching to the adoption of foreign technology through investing in foreign licenses and technical assistence. The former mode of technology acquisition may be called *imitation*, and the latter, *apprenticeship*.

[16] Bank of Korea, *Quarterly Economic Review*, Seoul, various issues.

In Korea, massive imports of foreign technical assistance were viewed as a means to attain technological independence, and were part of a larger effort in both the public and private spheres to avoid foreign control, particularly by Japan. Massive doses of foreign technical assistance were purchased in preference to depending on foreigners to run Korean plants. Whether in Korea's shipyards, steel mills, machinery works, automobile plants, or electronics factories, the credo became to invest now in in-house technological capability — even if outside expertise was cheaper — to reap the rewards of self-reliance later.

To understand how Korea attained competitiveness, it is necessary to understand the nature of the technological backlog that Korea, and other late learners like it, borrowed. This is most easily accomplished by drawing a comparison between Korea and a still earlier industrializer, Germany, during the stage of its catching up. Thorstein Veblen has written on Imperial Germany, the forerunner not just of Korea but also of Japan, and draws a comparison between German assimilation of foreign technology and England's borrowing from Continental Europe in the period of Tudor rule. According to Veblen, the necessary technological proficiency of Germany

> "was of a kind to be readily acquired; much more so than the corresponding technological proficiency acquired by the English in Tudor times by borrowing from the Continent. In this earlier English case what had to be borrowed and assimilated was not only a theoretical knowledge and practical insight into the industrial arts to be so taken over, but a personal habituation and the acquisition of manual skill on the part of the workmen employed; a matter that requires not insight but long continued training of large numbers of individuals — apprenticeship...".[17]

By contrast, Veblen argues, the technology which Germany borrowed in the nineteenth century:

> "is a different affair in respect of the demands which it makes on the capacities and attention of the community into which it is introduced. It is primarily an affair of theoretical knowledge, backed by such pratical insight into its working conditions as may be necessary to the installation of the mechanical equipment. In all this there is little of an obscure, abstruse or difficult kind, except for such detailed working out of technological applications of theory as call for the attention of expert specialists".[18]

Like the Germans before them, Korean firms were generally not taxed by the need of their operatives to acquire manual skills. Few apprenticeships existed in Korea, and formal vocational training did not commence immediately even in some of the largest firms. Although the *chaebol* sent

[17] Cf. T. VEBLEN, *Imperial Germany and Industrial Civilization*, New York, Viking Press, 1965 (1° edition 1915), p. 187.
[18] *Ibidem.*, p.188.

vast numbers of employees abroad for training, the incidence was greatest at the upper end of the job hierarchy — although inclusive of foremen. And while large numbers of technical assistants consulted in Korea, including operatives with specialized skills, little effort was made to drive these operatives into exile in Korea. A far graver problem for Korea than for Germany, however, was the acquisition of theoretical knowledge, The problem for Germany, according to Veblen, was minor, as was soon manifested by Germany's success at innovating. Korea, on the other hand, lacked theoretical knowledge at the world frontier, not only in the machinery building sector, which Veblen dwells upon, but also in the continuous process industries and, to an acute degree, in electronics. Therefore, the benefits of backwardness notwithstanding, the shift of the world technological frontier in the century after Germany industrialized left Korea relatively further behind, and made it far more difficult for Korea to solve what even for Germany was the most intransigent problem of technology transfer: the detailed working out of technological applications of theory.

The problem of technology transfer, however, cannot be seen merely in technical terms. Socially, it touched upon the tribulation common to all early capitalist development, of getting adventurers in the field of business to take technology seriously. In Germany, what contributed to the triumph of manufacturing over finance as the dominant mode of profit making was that: "These German adventurers in the field of business, being captains of industry rather than of finance, were also free to choose their associates and staff with a view to their industrial insight and capacity rather than their astuteness in ambushing the community's loose change".[19] The German production engineers advanced the notion that industrialization depended on technical competence:

> "The responsible staff and corps in these industries, being men who had come through the schools instead of through the country store and the pettifogger's law office, were not incapable of appreciating that range of theoretical and technical knowledge that is indispensable to the efficient conduct of modern industry; and so the German industrial community was as surely and unresistingly drawn in under the rule of the technological expert as the American, at about the same period [the late nineteenth century], was drawn in under the rule of the financial strategist".[20]

It would be an exaggeration to say that the industrial community in Korea became "surely and unresistingly" drawn in under the rule of the technological expert, because, by world standards, there were no experts in Korea. Nevertheless, like their German counterparts, the production engineers who were the gatekeepers of technology transfer came through

[19] *Ibidem.*, p. 194.
[20] *Ibidem.*, pp. 195-96.

Table 11

Indicators of Human Capital in Seven Late Industrializing Countries

Item	*Year or Period*	*Argentina*	*Brazil*	*India*	*Korea*	*Mexico*	*Singapore*	*Turkey*
Postsecondary students abroad as a percentage of all postsecondary students	1970	1.0	1.0	1.0	2.0	1.0	—	—
	1975-77	0.3	0.7	0.3	1.7	1.0	12.5	3.2
Secondary students as a percentage of secondary age population	1965	46.0	—	29.0	29.0	17.0	45.0	16
	1978	46.0	17.0	30.0	68.0	37.0	57.0	34
Postsecondary students as a percentage of eligible postsecondary age population	1965	—	—	4.0	5.0	3.0	9.9	4.4
	1978	18.0	10.0	9.0	9.0	9.0	8.8	7.7
Engineering students as a percentage of total postsecondary age population	1978	14.0	12.0	—	26.0	14.0	40.8	17.6
Scientists and engineers in thousands per million of population	Late 1960s	12.8	5.6	1.9	6.9	6.6	—	—
	Late 1970s	16.5	5.9	3.0	22.0	6.9	5.2	15.9
Scientists and engineers in R&D per million of popolation	1974	323	75	58	—	101	—	—
	1976	311	—	46	325	—	263	222[a]
	1978	313	208	—	398	—	317	—

(—) = Not available.

[a] 1975.

Source: Adapted from Westphal, L. et al., "Reflections on the Republic of Korea's Acquisition of Technological Capability", in N. ROSENBERG and C. FRISCHTAK (eds.), *International Technology Transfer: Concepts, Measures and Comparisons*, New York, Praeger, 1985, for Argentina, Brazil, India, Korea and Mexico. UNESCO, *Statistical Yearbook* various years, for Singapore and Turkey.

the schools. And in a society hungry to catch up, with a steadfast faith in the value of education, the practical knowledge these professionals wielded went a long way toward winning them influence and esteem. The industrial community in Korea, therefore, became surely and unresistingly drawn in under the rule, if not of the expert, then of the technological trainee.

Once the entrepreneurs recognized that government subsidies could make manufacturing activity profitable, and that Korean engineers could build ships that floated and steel that bore weight, they increasingly turned their attention away from speculating towards accumulating capital.

Symptomatic of the passionate desire to organize and hasten the process of catching up, the Koreans, like the Germans, pushed ahead with forming a native cadre of engineers and technicians. The number of schools in both Germany and Korea was large, unusually so by contemporary standards. The plain fact of the matter is that Korea was a successful learner partly because it invested heavily in education, both formal schooling and foreign technical assistance. As Table 11 indicates, even by comparison with Singapore, Korea has the highest percent of engineers and scientists per capita. Other indices in Table 4 also indicate that the magnitude of Korea's investments in education is exceptional.

As for foreign technical assistance, the preponderance of it came from Japan, a fact that gave Korea an edge over other late industrializing countries that were culturally and geographically further afield than Korea from Japan. Japan may not have been as close to the world technological frontier as the United States, but it emerged as the world's premier producer, and communicated to Korea both the most efficient production techniques and a seriousness about the manufacturing function.

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The Japanese Model of Post-Fordism

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1 A Change in Capitalism from Fordism to Post-Fordism

The Regulation school, which originated in France since 1970s, has analysed the post 1973 world depression and the resultant capitalist restructuring as a product of break down of the post-War 'Fordist' regime of capital accumulation.(1) According to this school, the long post-War boom in the advanced capitalist countries was generally realized through a Fordist regime of accumulation. In 1920s Henry Ford organized his car factory with a belt conyeyer system to increase productivity, paying wages substantially above the social average so as to enable his workers to puchase their products and also to maintain the necessary number of workers for heavy monotonous works. Similarly but in a social scale, the post-War Fordist regime of accumulation realized both increase in labour productivity and roughly proportional increase in real wages. These lay behind the continuously expanding effective demand for consumer durables and other products. Such a regime of accumulation was formed and maintained by a set of institutions and a social consensus concerning the social positions of workers and trade unions as well as the role of state for Keynesianism and social welfare policies. The social mode of organic regulation including such institutions worked smoothly to forster the Fordist regime of accumulation in the long post-War boom period.

Regulationists especially in their concept of Fordism thus focus on the role of effective demand, by absorbing one element of Keynesianism. However, unlike Keynesians, they see the factors which achieved the continuous pot-War long boom in a wider range of social relations and institutions relating to the capital-labour relations, not confined to governmaental macro-economic policies. In this regard, the analyses of economic coordination and the politics of

relations of production in the post-War advanced capitlist countries have newly been pursued as a development of Marxian political economy while flexibly absorbing approaches and views from the Keynesian and the Institutionalist school.

Then furhter in the Regulationist view, the economic crisis since the 1970s occurred as the Fordist mode of regulation exhausts its potentials. Capitalism was forced to restructure a new mode of regulation appropriate to a new regime of accumulation. The new regime of accumulation is called post-Fordism. The contents of the post-Fordist regime of accumulation are not yet very clear, and may vary even among advanced capitalist countries. Among them Japan is often regarded as a typical or ideal model for post-Fordism. The so-called Japanese style of labour management is underlined as the basis for the successful restructuring of Japnese capitalism with increased competitive power and flexibility of firms in commodity markets, the labor process and financial markets. The newly developing micro-electronic (ME) informational technologies are fully utilized in various aspects of such restructuring.

A change in capitalism from Fordism to post-Fordism then appears to be a model change from the US type to the Japnese type particularly in the way of labour management. While the US Fordism used to enforce the task fragmentation, functional specialization, mechanizaion and assembly-line principles, the Japnese model of post-Fordism is based on work teams, job rotation, learning by doing, flexible production. The model change is seen not only necessary by the capitalist firms in the U.S. and European countries in order to be comepetitive with Japanese firms but also desirable even from the view of workers so as to maintain more stable jobs for multiple skills.(2)*

This sort of Regulationist approach is somewhat consonant to

recent Japanologist general tendency to emphasize that Japan has successfully formed an exceptional, stable, crisis-free and relatively harmonious economic order on the basis of more flexible socilal human relations in work places.(3)* However, there are certain problems in such approach and tendency. In particular, the Japanese model of post-Fordism is treated as too exceptional, stable and excessively idealized. In reality, a historical change from Fordism to post-Fordism must be observed in a more global transition from the post-War long boom regime of capital accumulation to a world economic crisis and a new period of restructuring. Japanese capitalism could not at all be outside of the global economic crisis, and has serious difficulties in common with other capitalist countries. In the process of coping with such economic difficulties, Japnese capitalism is rather dismantling the stable and harmonious social positions of its workers and reducing the role of post-War traditional Japanese style of labour management. A historical change from Fordism to post-Fordism in the Japanese case is surely worth careful studies in both its specialities and universal ground and common features compared with other capitalist countries. Let us bigin with examining the common features and specilities in the Japnese model of Fordism.

2 The 'Fordist' Period in Japanese Capitalism (1955-73)

The notion of a 'Fordist regime' of accumulation well applies to Japanese experience in the post-War long boom with some specific features or qualifications. Just after World War II, Japan started from the heavily destructed economy, and experienced successively a chaotic disatrous inflation, the depression of 1949-50 following restoration of a balanced state budget with a fixed exchange rate 1

dollar = 360 yen, and a sudden export boom prompted by U.S. special procurements for the Korean War in 1950-53. After such experiences, 1955 is generally taken as the starting point for the stable period of Japan's high economic growth. Symbolically, the labor's annual Spring offensive (Shunto) strategy of a unified movement demanding for wage increases began in this year. This represented the emblematic transformation from more militant trade union movements into a unified labor strategy focussed almost exclusively on wage rates. The so-called post-War Japanes style of labour management was established by this period, which conprises three basic characteristics ; i.e. customary guarantee of life-long employment until the age of 55 or 60 for the regular employees in big corporations, a seniority escalation system of base wages, and company based trade unions.

If a characteristic feature of the Fordist regime of accumulation is the internal expansion of the market for capitalist commodities, especially consumer durables produced by improved methods of mass production, this pattern is also discernible in Japanese process of high economic growth beginning from about 1955 until 1973. Despite continuous rapid increases in labour productivity, Japanese rate of export dependence (exports/GNP) remained constant at around 10% in the years 1956-60, and rose only slightly to 11.7% in 1970, as we see in

Table 1 Japan's Export Dependence 1935-87

(Exports/GNP)

1935	1947	1956	1960	1965	1970	1975	1980	1984	1987
18.8%	0.8%	10.0%	9.5%	10.0%	11.7%	11.2%	12.5%	13.5%	9.7%

Source: 1935-56, Hitotsubashi University Economic Research Institute, [Annotated Economic Statistics of Japan] (Tokyo: Iwanami-shoten,1961).
1960- , Bank of Japan, Comparative Economic and Finacial Statistics.

Table 1. It was far below the pre-War Japanese level of 18.8% in 1935 and differed in its constant nature from the upward motion (if not very rapidly) following the crisis of 1970s. It was much lower than that of most contemporary European capitalist countries. Therefore, Japanese high economic growth with an average annual growth rate of real GDP of 10.1% in the years 1955-70 was clearly domestic oriented in its market.

A different impression may arise from the rapid increase in the Japanese share of world manufactured exports from 5.5% in 1957 to 9.9% in 1970 and to 11.5% in 1973. But this increase in exports corresponded with Japan's rapid economic growth, almost twice the average of the advanced capitalist countries.

A factor which enabled Japanese capitalism continuously to expand the domestic market in line with its rapid economic growth and increasing productivity was the annual rise in real wages through Shunto. The annual labor offensive thus served as an important gear for Japanese capitalism to realize a 'Fordist mode of regulation'. We should note, however, that Shunto and the life-time employment system for regular workers with the seniority wage system was a result of concession by Japanese capitalist firms to tame down militant workers struggles, especially protests against dismissals. Such militant workers struggles in the preceding period of reconstruction after the World War II had often threatened Japanese big corporations and their managers. Yearly increases in real wages through Shunto and the life-time employment custom with the seniority wage system also served for big corporarations to maintain the increasing necessary number of male experienced workers with relatively low wages for the younger workers. They also served to purchase workers' loyalty to companies in their work places.

At the same time, the increase in real wages was an inevitable result of expanding employment of regular workers in the process of rapid economic growth, and it was actually accelerated as the labor market tightened toward the end of the period of high economic growth. I am sure that there was no intention among Japanese business circles, bureaucrats and politicians to raise real wages as an essential source of effective demand for increasingly mass produced consumer durables. Realization of a 'Fordist regime' of accumulation in Japan was rather the anarchic result of socio-economic factors.

In fact the increase in real wages was by no means regularly proportional to the increase in labour productivity in Japan. If stable proportionality between rising productivity and real wages is essential to the conept of 'Fordism', Japanese capitalism did not form a pure 'Fordist regime'. As shown in Table 2 below, real wages lagged behind the increases in labour productivity in Japanese manufacturing in this period until 1970.

Table 2 Productivity and Wages in Japanese Manufacturing

(Annual percentage increase in each five years)

		1955-60	60-65	65-70	70-75	75-80	80-85
Labour Productivity	(1)	9.7	6.8	12.5	5.1	9.2	6.9
Nominal Wages	(2)	6.2	10.1	14.7	18.0	8.3	4.6
Consumer Prices	(3)	1.6	6.1	5.4	11.5	6.5	2.8
Real Wages	(4)	4.6	3.7	8.8	5.8	1.7	1.8
Product Wages	(5)	4.7	8.8	10.9	12.9	8.2	7.3
(4)/(1)	(6)	0.47	0.54	0.70	1.14	0.18	0.26
(5)/(1)	(7)	0.48	1.29	0.87	2.53	0.89	1.06

(1) Based on manufacturing GDP per person employed.
(5) Caluculated from productivity multiplied by labour's share (= 1- profit share).
(6), (7) Simple division, not percentage increase.

Source: (1), (5), Based upon P.Armstrong and A.Glyn, Accumulation, Profits, State Spending: Data for Advanced Capitalist Countries 1952-1983, Oxford Institute of Economics and Statistics, July 1986, updated from OECD, Historical Statistics 1960-86, 1988.
(2),(3), (4), are from Japan Productivity Center, [Practical Labour Statistics], (Tokyo: Japan Productivity Center, 1988.)

As product wages in Table 2 are caluculated upon the basis of real GDP in manufacturing defined in terms of the manufacuting GDP deflator, the difference between the motion in real wages and that in product wages relates mainly to the disparity between the consumer price index and the manufacturing GDP deflator. In 1960-65, while consumer prices went up fairly rapidly, the manufacturing GDP deflator did not rise much. Reflecting this disparity, while the growth rate of real wages still remained far below the growth rate of productivity, the growth rate of product wages surpassed it, so as to reduce the net profit share from 41.5% in 1960 to 36.1 % in 1965. The reduction in the net profit share was not much, however, and recovered in the next five years to 40.7% in 1970.

Excepting 1960-65, real wages and product wages rose more or less parallel and both of them less than the growth of productivity up until 1970. Especially in 1955-60, as both were less than one-half of the growth rate of productivity, obviously the production of relative surplus value took place so as to raise the net profit share from 26.5% in 1955 to 41.5% in 1960. The favourable rate of distribution for capitalist firms was established in this period and then maintained fairly well throughout the 1960s. Viewed from the demand side, this situation meant that Japanese capitalism needed the expansion of markets for their products besides the growth of wage workers' consumption expenditure.

Another important source of increasing effective demand in Japan was investment in plant and equipment. Actually private investment in plant and equipment increased by as much as 22% a year on the average in 1956-73, more than twice as fast as the real growth rate of GDP, and occupied 25.1% of Japanese GDP. So long as more and more capital goods were absorbed by such investment, the internal effective demand

for goods could increase even without a proportionate increase in real wage rates. In this regard Japanese high economic growth was more of an investment boom to make physical assets of capitalist firms grow faster than the physical flow of consumable goods for workers. The very high rate of investment of Japanese capitalist firms introducing new industrial technologies and consumer durables from the U.S. was financed not only by reinvestment of their own profits but also by 'over-borrowing' from banks based on the high rate of savings, approximately 15-20% of Japanese personal income. A substantial portion, amounting to 40-50 per cent of the necessary fund for investment in plant and equipment was obtained by such loans from banks and other financial institutions with almost zero or negative rate of deposit rate for paople's saving. This financial transfer of purchasing power thus added to a substantial deviation from a pure and simple model of 'Fordist regime' of accumulation in the Japanese case during the long boom.

There was a third important domestic source of effective demand in Japan's high economic growth, namely increasing real income in rural agricultural households. The domestic market for agricultural machinery, fertilizer, electric home appliances, houses, cars etc. was continuously increasing in the rural areas. As the proportion of employed population in primary industry decreased sharply from 41.0% in 1955 to 19.4% in 1970, the number of agricultural families also decreased, but only from 6.0 million to 5.3 million. In the same period, while average nominal wages in all industries increased 4.3 times (real wages increase 2.3 times), the average nominal income of agricultural families cultivating a typical Japanese farm of 0.5-1.0 ha. also increased 4.4 times, reaching 1.3 million yen a year. This matched the average annual 1.4 million yen nominal income of all

Japanese households. The portion of purely agricultural income in it, however, declined sharply from 66.9% to 29.0% as more than 70% of income of agricultural families came to be earned outside of farming, mainly as wages.

Labour productivity in agriculture simultaneously increased substantially, enabling farm households to sell more labour-power outside of village in the form of seasonal or part-time workers or even as regular workers in nearby factories. Thus, the life style and living conditions in rural areas changed greatly from the pre-War situation in which an impoverished agricultural population remained roughly constant during a period of rapid industrialization. The changes well show how Japanese villages served both as a powerful source of cheap wage workers and as an expanding domestic market especially for consumer durables.

Although a considerable portion of income of rural families became dependent upon wages, which were often earned by main family members temporarily working in the urban areas, the increased rural purchasing power surely served widely to spread the very modernized life-style with motorization throughout the country. Modern houses with a series of home electric equipments more and more substituted for old houses with thatch roofs. The government policies effectively helped such changes in rural villages. Especially protective policies to maintain rice prices for producers both by subsidy and by import restriction worked in steadily levelling up the agricultural income. At the same time, public expenditure to construct highways and modernize rural roads much helped to form an automobile society throughout Japan. While the level of social welfare policies for the urban working people was still relatively low in this period of Japan, these economic policies for rural agricultural areas did serve to

modernize Japanese rural areas.

Following the relatively favourable period for agricultural areas due to severe shortage of foods just after the World War II, Japanese rural areas experienced a modernization process and joined to a long boom, by extending effective demand for various cpitalist products. This is an important feature of Japanese Fordist period which differs from the pre-War dual structured regional development between rapidly growing urban cities and very stagnant poor agricultural areas. The regional development was in this regard substantially equalized in the post-War Fordist period than in the pre-War period. However, disparity in socio-economic life between different regions surely remained and continuously served as a basis for the dual structure of Japanese labour market. As we see in Table 3, there used to be a wide difference in wages between large and samll businesses. The wages of small manufacturing enterprises hiring 29-5 persons was just 54.2%, and those of enterprises hiring 99-30 was 65.8% of those of big enterprises in 1960.

Table 3 Wage Disparity between Different Sizes of Enterprises

(Manufacturing)

Size of Emplyoees	Over 500	499-100	99-30	29-5
1960	100.0	73.6	65.8	54.2
1965	100.0	83.7	78.3	72.6
1970	100.0	83.4	76.2	71.4
1975	100.0	85.7	75.8	70.3
1980	100.0	81.9	70.5	67.6
1985	100.0	79.4	68.7	64.7

Source: Ministry of Labour, Monthly Statistical Research of Labour.

As extention of employment in the urban cities contiued in the the whole process of high economic growth in 1950s and 60s, depopulation in rural villages began to spread toward the end of this

long boom, and caused difficulty to maintain reproduction in increasing number of villages which were remote from cities. Regional economic development became substantially distorted in a way so difficult to restore.

Simultaneously, overaccumulation of capital in relation to the limited supply of labour-power appeared for the first time in the history of Japanese capitalism, and made rises in both real wages and product wages faster than a rise in productivity at the beginning of 1970s (Table 2). The pressure of labour shortage began to reduce the wage disparity to some extent since about the middle of 1960s (Table 3). The Fordist regime of accumulation in Japan became thus untenable toward the end of the post-War long boom, as a basic condition in flexibility of the labour market was much eroded and then disappeared. As a corollary, labour discipline in the work places tended to loosen even in Japanese capitalism, and the working days lost by labour dispute increased.* (4) The difficulty of capital acuumulation basically due to labour shortage worked to end the Fordist period of prosperity, together with the rising prices of primary products finally including the oil shock in the world market as a result of global over acuumulation of capital in relation to the limited elasticity of supply of them. The difficuty of overaccumulation of capital to aqueeze the real rate of profit was accompanied by the accelerating vicious inflation in the process of breakdown of the Bretton Woods international monetary system. (5)

3 'Post-Fordism' in Japanese Capitalism (1973 -)

Japanese capitalism was not at all exceptional in experiencing an acute inflationary crisis in 1973-75. Actually Japan joined with other

advanced capitalist countries in a fall of real rate of profit due to overaccumulation of capital in relation to both the laboring population and the limited flexibility of supply of primary products. The difficulty of capital accumulation was combined with the explosion of the money and credit supply so as to generate an inflationary crisis also in Japan. As Japnese government implemented an 'adjustment inflation' policy and consciously accelerated inflation in order to mitigate a damage to Japanese exporting industries by a sharper appreciation of yen, Japanese inflation became particularly vicious at that time. The annual rate of inflation of wholesale prices reached 16% in 1973-75, and it recorded 31.6% in 1974. As overaccumulation of capital proceeded with accelerating inflation, speculative stockpiling of various commodities increased and much disturbed the Japanese economy by making it difficult for firms to obtain necessary materials at profitable prices. The high rate of reliance on imported energy among the advanced capitalist countries seemed especially fatal to Japanese capitalism in this process of acute inflationary crisis. Although the Japanese rate of unemployment was still quite low at 1.9% in 1975, Japnese manufacturing and mining production fell rapidly by 20.4% from the end of 1973 to the beginning of 1975, and one in three Japnese firms was estimated to be running deficit at taht time.

Neverthless, the Japanese capitalism managed to recover relatively quickly from the first oil shock, and showed certain strengths in the face of the following global great depression and the shock repeated by the second oil crisis. Japan's strength in international trade, dramatically reversing the trade balance from a big deficit during the oil crises to a wide surplus, seemed particularly impressive. The financial positions (as shown in the

ratio between the financial assets and liabilities) of Japanese big firms also substantially improved and often turned from big borrowers to net lenders or financial big investors even in the case of manufacuturing corporations. A relatively low rate of unemployment in Japanese official statistics was seen as a further evidence of the exceptional strength of the Japanese economony. It surely increased but mildly to 3.0% by 1987.

The so-called Japanese style management is frequently cited as the basis for the exceptional strength of Japanese capitalism. The life-long employment system for regular workers, the seniority wage system, and trade union organization based on company are generally seen as the three main characteristics of Japanese style of labour management. 'Look east and learn Japanese style of management' has become a fashionable slogan throughout the world in the 'Post-Fordist' period of crisis and restructuring. Capitalist managers hope to find in it ways of obtaining loyal cooperation from workers in changing methods of production and operation by introducing ME information technologies. Even among progressives in the West, including some of Regulation scholars, Japanese style management tends to be idealized as a model to realize a 'post-Fordist mode of regulation' in a harmonious stable economy with less unemployment and some form of a profit-sharing principle for workers.

From the managerial point of perspective, the loyal cooperation of regular workers under Japanese style management was surely useful for raising productivity and industrial competitive power by introducing new ME automation technologies. Japanese unions and workers generally did not resist transfer from old jobs or workplaces to new positions within the comapany. Japanese unions, which were organized on the basis of the company unit and not on the basis of

specific skills or kinds of work, generally focussed demands on the annual wage increase as long as their members were not dismissed prior to retirement (55-60 years old). This post-War pattern of Japanese management and trade union was actually fully utilized for the formation of flexible production lines and business operations as an essential characteristic of the 'post-Fordist regime of accumulation'.

Flexibility of Japanese capitalist corporations was indeed much increased in various ways by the combination of both spreading new ME information technologies and cooperative attitude of Japanese workers in adjusting themselves to new technologies. Flexible production of multiple models of cars, electric equipments and so forth on the same conveyer belt line, flexible adjustment of supply according to the movement at points of sales (POS), flexible reallocation of work places including multinatianlisation by more of business and manufacturing corporations, muliplication of commodity products and operations, flexible and more economical combination of segmented workers often increasing a proportion of irregular part-timers and workers employed by outside firms, flexible rotation of workers by giving them multiple tasks in the work places, all these practices thus became easily common to Japanese capitalist corporations in their attempt to restructure and to 'rationalize' through the pressure of economic crisis.

The 'success' in executing these practices explains to a considerable degree why Japanese capitalism could intensify industrial competitive power in the world market much faster than other advanced countries in the current great depression. It is clear that not only the technological changes but also institutional and ideological elements played certain roles in organizing the formation of a 'post-Fordist regime' of accumulation by Japanese firms in such a way to

increase their managerial flexibility.

However, if recent Japanese capitalism is seen as an ideal 'post-Fordist regime' for achieving a harmonious and stable economic life, this is simply not true for most working people. The economic life of general wage workers has become rather unstable and difficult to improve. As we seen in Table 2, real wages have stagnated since the latter half of the 1970s, forming a wide and growing gap with labor productivity (Table 2 (6)) after 1975. Unlike in the 'Fordist regime' of accumulation, wages now tended to be treated mainly as a cost to be economized, as Japanese industrial restructuring followed a more export-oriented strategy. Resultantly Japan's rate of export dependence (export/GNP) rose from 11.2% in 1975 to 13.8% in 1984 (Table 1). At the same time, Japanese unions, which had succeeded in raising real wages if not to levels fully proportional with increasing productivity, ceased to be effective even in this area.

However, a big gap between the increase in productivity and the stagnant real wages did not serve to restore much the profit share of Japnese capitalist firms until quite recently. The gap served rather as a flexible basis to absorb the increased costs of energy resources and some primary products imported from abroad, and also to maintain export dollar-prices relatively lower even in the process of severe appreciation of yen from 360 yen a dollar at the beginning of 1970s to 120-140 yen level a dollar in the latter half of 1980s. The domestic prices of manufactured products and the manufacturing GDP deflator tended competitively lowered as ME automation spread. As a result, 'product wages' measured in terms of the manufacturing GDP deflator went up much faster than the real wages in Table 2, so as to make a recovery of profit rate difficult.(6)* A characteristic feature of Japanese post-Fordist regime of accumulation is thus in its cometitive

pricing strategies.

As ME technologies generate factory automation (FA) and office automation (OA), the experiences and skills of regular workers became more and more superfluous in the workplace. Capitalist firms began to employ more irregular cheap workers, many of them housewives as part-timers. While the number of male workers employed increased by 3.7 million from 24.3 million in 1973 to 28.0 million in 1986, female workers employed increased more by 3.9 million from 11.9 million to 15.8 million. Among female workers, the number of part-timers increased from 1.7 million to 3.3 million, by 1.6 million, in the same period. Although these changes partly reflect a shift from the primary industry (agriculture) to urban tertiary industry, they reveal a feature of 'post-Fordist' transformation with more of flexibility in labour management. Espeicially unskilled women part-timers became effectively utilized in flexible FA and OA lines in more and more work places. As a result of such 'rationalization', the rate of organization of Japanese trade unions, traditionally based on regular (male) workers, declined from 33.1% in 1973 to 27.6% in 1987. The social power of trade unions to raise real wages in the process of increasing productivity had thus to weaken.

As Keynesian expansionist economic policies failed in reactivating economic growth and resulted in a huge amount of state debt with an increasing burden of interest payment, Japanese economic policies turned to a neo-conservative direction since 1981, in accord with Thatcherism and Reaganomics. Aiming at reconstruction of a balanced national budget without tax increase, Japanese government began to reduce the financial support to health and medical services, curb subsidies to private universities and schools, and to trim government subsidised programmes in various areas. Such a reduction

of the economic role of the state and a farewell to welfare state as well as to Keynesianism were implemented together with deregulation in various fields including labour acts, and also with privatisation of public enterprises by emphasizing need for reactivating the fundamental rational workings of a market economy. Although such a policy stance well suited the post-Fordist regime of accumulation with more of flexible competitive strategies of capitalist firms, it certainly added to the economic difficulty of working people.

More and more housewives have been driven into the labor market as suppliers of cheap, often part-time, labour, as real wages of regular male workers stagnated and costs of education, taxes, medical services, housing soared as a result of neo-conservative economic policies. At the same time, the life pattern of housewives working outside the home, many as pat-timers, was generalized in Japanese society. The result has been to split and reduce the value of labor-power per person which is necessary to sustain the economic life of a whole family.(7)* This effect contributed to the stagnation of real wages for general workers, forming a sort of vicious circle.

Since Japanese style labor management was formed in the main for regular workers in big corporations, its function of protecting the economic life of its members inevitably weakened as growing number of unorganized irregular workers replaced experienced regular workers. The lifetime employment system for regular workers which was an essential element of Japanese style labor management is no longer secure. In the process of privatization of the Japan National Railway (JNR), for example, more than one third of the total, 130,000 experienced workers, were fired. Privatization and division of JNR into several private companies, together with privatization of Nippon Telegraph and Telephone Public Corporation (NTT) and Japan Tobacco and

Salt Public corporation, was an imporatant part of the administrative reform carried out by the Nakasone Cabinet. Privatization actually constituted a powerful blow to the strongest and most militant trade unions within the Sohyo Union Federation. Sohyo had to decide to dissolve itself in 1989 so as to form a new Federation (Rengo) fused with traditionally more conservative Domei (the Japanese Confederation of Labour). Although two smaller national centers for trade union movement remaines, the dissolution of Sohyo emblems the weakened social position of workers movement in Japan through the combined pressures of great depression, ME industrial renovation, and neo-conservative policies of the state.

Meanwhile, in the depressed industries like shipbuilding, steel making, and petro-chemicals, numerous regular workers were dismissed as yards and factories closed. While Japan's official rate of unemployment rose to a historic height of 3.0% (unemployment is very strictly defined and must be at least doubled in order to be compared with the rate of unemployment in other advanced capitalist countries) in 1987, labour markets in Hokkaido and Kyushu were more deteriorated with the decline of heavy industries. In these circumstances, middle aged and elderly unemployed workers face great difficulty in finding appropriate work. Wage differentials segmented by categories such as gender, educational background, regular or irregular positions etc. are widening in the 'Post-Fordist' restructuring of Japanese economy. As we see in Table 3, wage disparity between big and middle or small enterprises in Japanese manufaturing, which had once reduced in the process of high economic growth, also widened again since the latter half of 1970s.

Thus ironically in the very period when Japanese style labor management became idealized in abroad as a stable and harmonious

ground for both capitalist firms and workers, the essential features of Japanese post-War labor management were collapsing. Flexible managerial strategies in the 'post-Fordist mode of regulation' is well being incorporated in Japanese firms including their growing global operations. The same process is increasing unevenness, instability and income stagnation for the mass of Japanese workers who now face the violent forces of the capitalist market economy largely bereft of protection by trade unions and state welfare policies.

The recent phase of Japanese economic recovery in the latter half of 1980s depends again more on the expansion of the domestic market. The Japanese rate of export dependency (exports/GNP) has thus been reduced again (Table 1). This shift back to a more domestic oriented recovery was a result of adjustment to both the increased trade frictions with the U.S. and other advanced capitalist countries and the effect of appreciation of yen. However, it has not caused by or resulted in an increase in real wages proportional to productivity, unlike in the process of previous high economic growth until 1960s.

In addition to general replacement demand for consumer durables and houses, definitely a new important element of domestic demand has arisen from 'the new rich' who has greatly gained directly or indirectly by wide appreciation of urban land prices, rent for real estate and stock prices. Inflow of rich foreign business men and women especially into Tokyo area added to this element for luxurious consumption demand and for office spaces. More expensive luxurious cars, gorgeous flats of more than two or three hundred million yen became selling. The price of land more than doubled in the two years to the end of 1987 in the metropolitan area, and the increase in the total estimated land prices in Japan was 248 trillion yen in 1987, almost matching the 276 trillion yen of Net National Income of the

year. It is also said that so much increased housing prices enforced general people in big cities to resign themselves even to hope to purchase a house by saving and resultantly to spend more for other consumer durables. Therefore, the recent economic recovery depending more on the domestic demand does not mean a return to the previous Fordist regime of accumulation, but strongly maintains a post-Fordist feature of uneven development with continuous economic difficulty for the majority of working people.

On the other side, the post-Fordist regime of accumulation in Japan has clearly formed uneven development also among different regional areas. The economic great depression since 1973 did not push back the redundant working population into the rural agricultural villages unlike the historical experience of previous depressions. As a substitute, the tertiary industries continued to grow on the basis of new ME information technologies in urban areas. The proportion of Japanese working people in the primary industry declined from 17.4% in 1970 or 12.7% in 1975 to 8.3% in 1987, while that in the tertiary industry increased from 47.4% in 1970 or 52.1% in 1975 to 58.5% in 1987. Thus, depopulation with devstating effects in the rural villages which located remote from urban areas has further proceeded. Beside wide appreciation of yen, cut of subsidy and the open-door policy for agricultural products as an integral part of the neo-liberalist deregulation policies, which also follow the U.S. political demand, continuously hit Japanese agricultural farming and the rural economy.

Re-allocation of manufacturing and business activities to more economic sites of operation upon the basis of ME technologies has served newly to stimulate local economy to certain extent, but it did not help deteriorating numerous rural villages remote from cities or

resort places. The difficulties of old manufacturing and mining areas with depressed industries also remained. Therefore, uneven regional development even within the local prefectures became conspicuous in the process of post-Fordist restructuring of Japanese economy.

At the same time, centralization of business and financial activities, especially those of headquaters into the metropolitan Tokyo area has been strengthened as an ironical result of development of information technologies. Technological possibility to form a more decentralized regional economic order by means of various information media does not seem easy to realize under the current post-Fordist regime of accumulation in Japan. While a generally accessible range of informations is rapidly widening, the imporatnce of more specific timely informations often of a face to face type seems growing in the recent unstably changeable world of business, particularly as Japanese economic activity has become more and more internationalized. It is observed that more than 300 headquaters and operating departments are annually moving into the Tokyo area.(8) Even the Kansai-oriented giant corporations have often shifted their headquaters to Tokyo, sometimes even by spliting the headquater into both sites. A ratio of average personal income in Osaka prefecture (which is the center of Kansai business activity) compared to that in Tokyo Metropolis fell from 84.3% in 1973 to 78.6% in 1985. Such regional centralization of economic activity is a basic cause of the soaring land price problem in the Tokyo area, giving rise to 'the new rich', and pushing out general working people onto more distant living places from their working places so as to enforce many of them to commute for more than three hours a day.

4 The Need for Alternatives

With all its specialities, the Japanese model of post-Fordism represents common tendencies in the advanced capitalist countries. The model was formed as a result of capitalist restructuring through the universal great depression. A change in industrial technologies by the growth of ME information technologies enabled to reduce a possible size of investment to plant and equipment. Introduction of new method of production and business operation became realizable by smaller units of flexibly mobile investment. The social position of trade unions has been clearly weakened as an effect of technological changes so as to enable capitalist firms flexibly to employ more of cheaper irregular workers. Rapid changes in costs, types and models of commodities combined with more international marketing have intensified competition among capitals. Capitalist firms are more interested in their market shares rather than in maintaining monopolistic prices.

To certain extent, neo-conservative state policies which became dominant in the capitalist world in 1980s reflect and foster such changes in a capitalist economy. Keynesian welfare state with various social controls of the free market sytem was ideologically abandoned. Deregulation, privatization, and cuts of social expenditures were implemented so as to reactivate the flexible and competitive power in a capitalist market economy. The social position of workers and trade unions have severely been attacked by such a shift in state policies for neo-liberalism.*(9)

Insofar as the model change from a Fordist to a post-Fordist regime of accumulation in Japan contains these socio-economic alterations, it is not specific to Japanese capitalism but more or

less common to advanced cpitalist countires in the past decade. At the same time, the change has to be regarded as a historical reversal backward over a century and is really not confined merely to a model change within a long wave cycle over half a century period. Scaling up the units of investment in plant and equipment, strengthening the social position of workers and trade unions, and increasing economic roles of the state were mutually related together and formed a basic tendency in a cpitalist societies in different features from the late 19th century until the post-War age of Keynesianism or Fordism. The post-Fordist regime of accumulation reversed all these continuous tendencies especially in 1980s under the neo-conservative policies in major capitalist countries.* (10)

The alleged advancement or strength in the Japanese model of capitalism must be in its relatively smooth and fast adjustment for such a reversed historical tendency. It is clear that the loyal and cooperative attitude of Japanese workers and trade unions specifically facilitated introduction of new ME type of technologies in work places and remodeling Japnese firms suitably for the post-Fordist regime. As I have argued, this remodeling has not at all been an harmonious and even development, but expanded various disparity, unevenness, and regional disfigures in the Japanese economy. The success story of the Japanese model of post-Fordism thus actually belongs mainly to capitalist corporations with their improved financial positions and strengthend competitive power in the world market, but not to the majority of working people, peasants and weaker people like the aged, the sick or many women.

After a decade of neo-liberalist post-Fordist period, the social choice of more of general people began to oppose such an unfair and uneven development. Beginning from a series of local elections, the

government party (Liberal Democratic Party: LDP) became hard to win in 1989 and lost the majority in the House of Councilors by the national election in July. LDP will lose further in the general election for the House of Representatives in February 1990. There are three major political issues fought in these elections; the Recruit scandal, the introduction of consumer tax, and the oppening policy for the freer import of rice and other agricultural products. All these issues relate in one way or the other to the neo-liberalist potitical attitude in believing in the freer market system which tends to allow money-making even by means of political corruption, and to shift the burden of depression to the shoulders of the weak general people while contrastingly by enabling the new rich easily more wealthier.

The need for alternatives seems obvious and actually begins to move people's political choice even in the alleged stable and harmonious Japanese society. There are conspicuous two related tides in such a recent movement. The rural areas, which were traditionally strong bases for conservative LDP, become quite unstable and often give serious loss to LDP at various levels of elections. The disfigured uneven regional development and worries for the future regional development seem deeply move people's political choice. Simultaneously, participation of women to political actions has become more and more positive recently from grass roots in the rural social activities such as citizens movement against nuclear power-generations, co-op movement, local elections etc. Although the reorganized trade union movement, the major portion of which is represented by Rengo, is attempting to strengthen its influence in the political scenery, the need for alternatives is thus no longer solely based upon it but begins to work more broadly from below.

Therefore, the alternative socio-economic strategies for 1990s

cannot be a simple return to the Keynesian macro-economics or Fordist regime. The alternatives must be flexibly proposed through more democratic social participation and choice of the weaker general people to decision making at various aspects, regional issues and multiple levels of social life. We have to see whether trade union movements in Japan can be reconstructed in accord with such a direction to strengthen workers' control in the work places, though this seems at the moment the most difficult aspect in the Japanese model of post-Fordism from the view of economic democracy for the people, by the people. Flexibility in the post-Fordist regime of accumulation on the basis of developed ME information technologies, however, can possibly be and should be remodeled in such a democratic way for the future. Democratization of socio-eoconomic order must thus remain as an important demand for the pathway in 1990s for common pepole not just in the East European countries, if in a different context of difficulties.

(I am grateful for Mark Selden's thoughtful editorial advice on some parts of this paper particularly in the first two sections.)

Notes:

1. The works of the regulation school have recently been introduced to Japanese general readers by K.Hirata et.al.ed.(1987) among others, and also by translated Japanese versions of M.Aglietta(1981), A.Lipietz (1987) and R.Boyer (1988). I shall not explore details of various regulationist positions here but concentrate on the main

conceptual framework of the school.

2. An example of this type of view is in M.Kenny and R.Florida (1988). T.Kato and R.Steven (1989) criticizes it and is presenting an international argument.

3. See E.Vogel (1979) and C.Johnson (1982) as representative works along such a tendency.

4. The average working days lost through labour disputes increased from 2.8 million in 1966-69 to 6.2 million in 1971-75.

5. See P.Armstrong, A.Glyn, J.Harrison (1984) and M.Itoh (1980, 1988,1990) as for more detailed analyses of the whole process of the overaccumulation crisis in the capitalist world economy.

6. Net profit share in Japanese manufacturing did not recover much from the trough 15.2% in 1975 to 19.1% in 1980 and 17.7% in 1985, after a big fall from 40.7% in 1970. cf. P.Armstrong and A.Glyn (1986) and OECD (1988).

7. Such an effect of spreading and reducing the value of labor-power by increasing the number of wageworkers in a family was noticed already by K.Marx in his Capital, vol.I, (Harmondsworth, Middx: Penguin Books, 1976), p.518.

8. This is an observation in W.K.Tabb (1988).

9. The public sector was traditionally stable in employment, and tended to enable stronger trade unions to grow.

10. Economic stagnation and increasing critique of a non-democratic socio-political order in real-existing socialist countries ideologically played a role in strengthening such neo-conservativist or neo-liberalist belief in a free market system and reduction of social control. On the other side, the neo-conservativist political stance which prevailed in the capitalist world in 1980s may have somewhat influenced the direction of restructuring (perestrika) of

socialist economies in their attempts to catch up to the advanced capitalist economies. Probably we have to think more of need and possibility of democratic social control of the market system from both sides of the world in 1990s.

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