慶應義塾大学学術情報リポジトリ
Keio Associated Repository of Academic resouces

Title	GROWTH DETERMINANTS, PROCESSES, AND BARRIERS IN A SOCIALIST ECONOMY
Sub Title	
Author	FEIWEL, GEORGE R.
Publisher	Keio Economic Society, Keio University
Publication year	1970
Jtitle	Keio economic studies Vol.7, No.1 (1970.) ,p.28- 45
JaLC DOI	
Abstract	
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AA00260492-19700001-0028

慶應義塾大学学術情報リポジトリ(KOARA)に掲載されているコンテンツの著作権は、それぞれの著作者、学会または出版社/発行者に帰属し、その権利は著作権法によって保護されています。引用にあたっては、著作権法を遵守してご利用ください。

The copyrights of content available on the KeiO Associated Repository of Academic resources (KOARA) belong to the respective authors, academic societies, or publishers/issuers, and these rights are protected by the Japanese Copyright Act. When quoting the content, please follow the Japanese copyright act.

GROWTH DETERMINANTS, PROCESSES, AND BARRIERS IN A SOCIALIST ECONOMY*

GEORGE R. FEIWEL

I

Obviously there are differences in the manner of decision-making and decision-implementing in the different spheres of economic activity in modern capitalist and socialist economies, or alternative organizational variants of the system in which the means of production are predominantly owned by het state or collective. Whereas one of the claimed advantages of the socialist economy is that the decision on the rate and pattern of investment, determining and conditioning the pace and pattern of development, does not need to be governed by individual intertemporal preferences regarding consumption, the experience of the countries that adopted the Soviet mode of development point to the restricted limits for the maneuverability or manipulation of the range of the rate of saving-investment in centrally planned economies. Setting excessively high target investment rates ignores, *inter alia*, both limiting factors, various barriers and ceilings, leading *de facto* to a lowering of the long-term growth rate of production and consumption, below the economy's actual potential under given circumstances. The rate of growth of particular sectors is limited for technical and organizational reasons and constrained by environmental factors and difficulties in equilibrating the balance of foreign trade. Increase in capital expenditures will not be helpful in raising the pace of expansion of output beyond a certain limit, as Professor Michal Kalecki has illuminated.(1)

One of the crucial advantages of the socialist economy is that it is capable of solving (present institutional constraints aside) the perplexing problems of realization (effective demand), simply by appropriate setting of relative levels of prices and wages; simultaneously resolving (or rather being capable of resolving) the problems of financing investments and other non-consumption expenditures.

There is an understandable proclivity on the part of the central planner to speed up the rate of economic development and to fix as a target an immediate growth rate of national income at the highest possible level, or to maximize the "short-run" growth rate.

The question of setting the "maximal target growth rate of national product" is often reduced to the question of the "burden of investment." *Ceteris paribus*, the higher the target growth rate, the larger must be the share of investment in

* I am indebted to the John Simon Guggenheim Memorial Foundation and to Faculty of Graduate Studies and Research-University of Tennessee for Partial Financial Assistance.

(1) M. Kalecki, *Zarys teori wzrostu gospodarki socjalistycznej* (Outline of the Theory of Growth of the Socialist Economy) (Warsaw: 1963, 1968)

national income, and, *ipso facto*, the smaller the share of consumption in national income.[2] *Ceteris paribus*, in the immediate (short-run) future, consumption levels would be formed at relatively lower levels, while for, longer periods the growth of national product might overcompensate for the relatively low share of consumption in earlier periods. The longer the span of time under consideration, the more likely it is that the balance sheet of postponement of current (short-run) consumption in favor of future consumption will be favorable. The sacrifice of present consumption is likely to be rewarded by higher consumption levels in the future. It is not only the future overall size of consumption that really matters, but the key question is that of the time pattern (distribution). The crux of the matter is the extent to which the present should be sacrificed for the future and what the likely adverse effects and barriers to overinvestment are.

The cost of greater capital formation is the present consumption (and productivity, to the extent that it depends on consumption levels) that has to be foregone.

With a higher rate of growth of national income, the share of investment in national income (productive investment plus changes in stock building) is increased and the share of consumption is reduced. The burden of investment is not confined to its direct adverse effects on consumption. The rising growth rate may be accompanied by emerging labor barriers and difficulties in payments for growing imports by correspondingly larger exports. The overcoming of those impediments by intensive mechanization or partly by autarchy and forcing of ineffective exports to pay for the imports, would require in turn *rising investments*. Therefore, growth acceleration would result both directly and indirectly in raising the share of investment in national product. The inroads into the share of consumption in national income would be sharper in the more immediate future than in the case of an economy not circumscribed by labor shortages and foreign trade barriers. The barriers constrain the decision to accelerate growth rate, but they are not the only growth-inhibiting factors once a certain rate of expansion is reached. Even the raising of investment in order to raise the growth rate of national income may prove to be counter-productive in view of the emerging technical and organizational ceilings connected with the abrupt overexpansion of certain branches. If an overambitious target growth rate is selected without taking into account the impact of those constraints, it may prove to be abortive and self-defeating.

In case of full utilization of the labor force, the increase of the growth rate may be achieved only by accelerating the rise of labor productivity by means of either/or (or combinations of) 1) the capital-output ratio (the volume of additional investment required to produce an incremental unit of national product); 2) a more intensive exploitation (accelerating the retirement) of the existing stock of capital (shortening the time of exploitation of fixed assets, reflected in the rise of the coefficient [parameter] of amortization, a—amortization being an inverse process

(2) In the classical sense, once full employment of resources is assured, resources channelled to capital formation are withdrawn from the manufacturing of current consumption goods. Investment and consumption are considered as alternate uses of fully employed resources.

to the increments of national income propelled by investment [disinvestment]); and 3) improvement *independent of investment activity.* The existing stock of capital may be utilized more effectively (a larger volume of output may be produced), e.g., by improvements in plan implementation, organization, and management of the economy; by eliminating waste; by an economy of materials; and by eliminating or mitigating bottlenecks (through noninvestment measures) that arise due to failures to synchronize plans or due to the nonuniform degree of plan fulfillment (overfulfillment); etc.

II

Professor Kalecki focused attention on three key factors which are singled out as the major determinants of change in gross national product: 1) the output effect or productivity of current gross productive investment commissioned during a year, expressed by the component $1/mI$; 2) the counteracting or inverse process to the augmentation of gross national product propelled by capacity-creating investments (viz., the negative effect due to disinvestment), i.e., resulting from the actual replacement of worn-out plant and equipment. *Ceteris paribus*, the existing production capacity "shrinks" periodically; the parameter of amortization (a) denotes the rate of curtailment of the existing fixed productive capacities as a result of retirement of capital goods of "old vintage." Consequently, the GNP declines (ΔY), owing to this capacity-reducing coefficient, by aY per unit of time (per annum).[3]

3) Finally, there is the coefficient of improvement, independent of investment, called the parameter of independent improvement, u. This *non-investment* source of periodical (annual) increment (or rather change, as the effect may be negative) of GNP results primarily from more effective utilization of existing capacities (such as increase of employment in existing plants and the number of shifts worked), reorganization of production processes, generally changes in plan implementation and in the functioning of the planned economy, non-investment measures to eliminate the obstacles for a full utilization of existing productive potential, measures to alleviate disproportions of the various degrees of plan fulfillment resulting in "unbalancing" the material balances, widening of bottlenecks, mitigation of interruptions of interbranch and interenterprise flows,

(3) For an illuminating analysis of relationships between depreciation charges and replacement in a growing economy, where depreciation and replacement are not identical (depreciation exceeds replacement), see E. Domar, *Essays in the Theory of Economic Groth*, (New York: 1957), pp. 154–94. Influenced by Domar's work, the problem was treated in the Polish literature, *inter alia*, by W. Lissowski, *The Question of Capital Consumption* (Warsaw: 1958), expecially Chapter 5; Lange, *Theory of Reproduction and Accumulation* (Warsaw: 1965), Chapter 5; and W. Piotrowski, *Modernization of Means of Production and New Investments* (in Polish), (Warsaw: 1965). It may be noted that Feldman, in his growth model, has taken the identity of depreciation and replacement for granted. Domar commented, "I wonder if those two use Marx's cheme are aware that in a growing economy replacement and depreciation are not identical." Domar, *Essays . . .*, p. 226.

economy in the use of materials, elimination of waste, decrease in work stoppages, improvements in the organization of work, refinement of employees' skills, etc. The annual contribution to GNP (ΔY_u) yielded by those non-investment measures equals uY, where u stands for the coefficient of the effect of these improvements[4] (measures). Thus, the impact of gross investments, disinvestments, and non-investment growth determinants on the increase (change) of GNP in a given year can be summarized and the relation elucidated in equation form:

$$Y = 1/m \cdot I - aY + uY \tag{1}$$

Since, in the analysis of a dynamic economy, the preoccupation is with the variation of *rates* at which various economic quantities are growing over time,[5] by dividing both sides of the equation by Y we get proportionate or percentage changes where $\Delta Y/Y$ measures the proportional rate of growth of aggregate volume of production:

$$\frac{\Delta Y}{Y} = 1/m \cdot \frac{I}{Y} - a + u \tag{2}$$

It should be emphasized that both a and u are rates per unit of time (per annum).[6] If we denote the rate of change of GNP ($\Delta Y/Y$) by r, we get what may be appropriately called Kalecki's "fundamental growth equation:"[7]

$$r = \frac{1}{m}\frac{I}{Y} - a + u \tag{3}$$

A brief digression as to the definitional framework and meaning assigned to principal variables is in order.

The planner's maximand is r (or Y).[8] Y is defined as the volume of gross domestic material product, gross value added in material production, but including so-called material services such as transportation, catering, laundry, trade, but excluding residential housing, administrative services rendered by the government, education, public health, entertainment, etc.,[9] in a given year in constant-

(4) Feldman assumed, *ex definitione*, an efficiently operating socialist economy.

(5) Cf. J. E. Meade, *The Growing Economy*, 1968, pp. 11–20, and *The Collected Scientific Papers of Paul A. Samuelson* Cambridge, Mass, vol. II, 1966. Feldman appears to be the first among Marxist economists to have concentrated on growth *rates*.

(6) Cf. H. Dunajewski, "Dimensions Algebra and Its Application to the Theory of Growth," *Ekonomista*, No. 4, 1964, pp. 776–77.

(7) Cf. Domar, *Essays* . . . ; R. F. Harrod, "An Essay in Dynamic Theory," *EJ*, March 1939, pp. 14–33, and *Towards a Dynamic Economics* (New York: 1966); J. Robinson, *Collected Economic Papers*, I. pp. 155–74; F. Hahn and R. Matthews, in *Surveys of Economic Theory* (New Yowk: 1965), pp. 5–12; K. K. Kurihara, *The Keynesian Theory of Economic Development* (New York: 1959), Chapter 4; and D. Hamberg, *Economic Growth and Instability* (New York: 1956).

(8) Those who stress the welfare implications of economic growth would probably strongly object to the treatment accorded to non-material services, which is deeply ingrained in the Marxian or classical distinction between productive and nonproductive services.

(9) Cf. W. Brus, "To Count or not to Count," *Zycie gospodarcze*, June 3, 1962; L. Zienkowski, *How to Count National Income* (Warsaw: 1959); and B. Studenski, *The Income of Nations*, Part II, pp. 23 ff (New York: 1961).

price valuation ("real terms"). To avoid double (multiple) counting, only value added at each stage of material production is computed. In contradistinction to the concept of gross product (or "gross gross output"), GNP avoids this duplication and is independent of the number of stages of production, intra-enterprise flows, and changes in organizational structure. Kalecki maintains that for purposes of long-term planning concentration on material production has something to recommend it, for it is easier and more accurate to measure the real value of commodities than that of services. It is also convenient not to include the residential rent in GNP, as the capital coefficient is very high in this case and, therefore, the employment of overall capital-output ratio in which residential rent is included is fairly meaningless as such a coefficient is greatly influenced by the relative share of residential construction in total investment. In long-term planning, services are to be accounted for by appropriate planning of employment (such as administrative activities of the government) and by planning of dwelling space.[10]

To elucidate growth processes, capital consumption is an elusive and difficult quantity to determine, as the life span of capital goods is not only a function of physical deterioration, but is also due to dynamic factors of obsolescence, itself a result of an economic decision.[11] For the purposes of studying growth relationships, GNP and its components should be reckoned in factory prices, i.e., transfer prices less turnover tax.[12] In practice, turnover tax, a type of sales tax, is levied chiefly on consumer goods. Counting GNP in transfer prices leads to a spurious presentation of national income dynamics,[13] by assigning excessive weights to goods charged with (widely differentiated and no infrequently a multiple of cost elements) turnover taxes. Kalecki offers the following example: If, on the same machinery, the same workers switch production to consumer goods, instead of producer goods; then, if transfer prices are used for purposes of efficiency calculation, an illustory improvement of efficiency of machinery and productivity of labor emerges. In tracing the growth dynamics over a span of time, income and its components are being expressed in "real terms"—measured in constant prices (factory prices of a base year). One of the problems is the introduction of new products which were not priced in the base year and relating their prices to those of similar goods,[14] a problem which, as I have suggested elsewhere, un-

(10) Kalecki, *An Outline of the Theory . . .*, pp. 12–13. Domar suggested that the realization, for instance, that housing and railroads have very high capital-output ratios helps one to understand Soviet investment policies in this field. In Hague (ed.), *Theory of Capital* (New York: 1963), p. 339.

(11) Joan Robinson has argued that net investment is an elusive concept, primarily in view of the difficulties of defining and measuring capital and its physical specification change. For may purposes, it is best to include replacement of plan and equipment in gross investment. *Accumulation of Capital*, p. 42. Cf. Dormar in Hague (ed.), *op. cit.*, p. 339, and J. Pajestka, *Employment and Investments*, (Warsaw 1961), pp. 15 ff.

(12) For the concepts of factory prices, turnover tax, and transfer prices, see my *Economics of Socialist Enterprise*, (New York: 1965) Chapter 2.

(13) Cf. my review of T. P. Alton's, *Polish National Income and Product in 1954, 1955, and 1956 American Economic Review*, December 1966.

(14) Kalecki, *op. cit.*, pp. 15–16.

dermines the control of the central planner over pricing and costing, and managerial behavior in general.

ΔY denotes the absolute increment of national income product of unchanged composition during a given year, computed as a difference between the size of GNP at constant prices at the beginning of the following period ($Y_t + 1$) and the beginning of a given period (Y_t). It is assumed that during the year in question (t), both the volume and composition of product remain invariable, and the change occurs at the juncture of two consecutive years. Generally, the components of national product may be conveniently classified as those constituting: 1) the means to augment the national product, i.e., productive investments and increase of working capital—called productive accumulation; and 2) the components of national income which constitute the end of the creation of national product, i.e., private and collective consumption and nonproductive investments—all treated as consumption in the broad sense of the term.

A closed economy's GNP could be decomposed into the following components: Gross productive investment refers to addition to the stock of plant and equipment (reproduction and expansion of capacity) earmarked to produce goods and material services. In contrast, investments not earmarked to produce such goods and services are classified as unproductive investments. They include the creation of capital goods for housing, hotels, recreational, cultural, and public health facilities. Investment expenditures do not give rise to increase in newly installed, created and commissioned productive capacity until the investment project has been completed and put into operation. Investments made in the preceding period ($t - 1$) are assumed to add to the stock of means of production in operation in the successive period (t). As a consequence of the capital formation a larger volume of output is obtained in the next period ($t + 1$). Hence, investment generates a process of output expansion with a time lag, depending on the period of gestation of the investment.[15] The lag period assumed is not considered to reflect the actual period of gestation,[16] but to stress the dynamic aspect of the phenomenon (period analysis). The production of successive periods is linked up in a chain through the capital formation undertaken in each period.

Whereas national income accounting reckons increases in the stock of uncompleted machinery and equipment as increases in the size of working capital (work in process) and increases of incomplete construction as constituents of investment, Kalecki classifies construction and machinery in process as gestating investments and treats them as additions to the stock of inventories (working capital). Since,

(15) The length of the period depends on the length of the period of gestation of investments and the lapse of time between completion of investment and the emerging flow (stream) of ouptut from new capacities (fruition of investments). Moreover, the process of learning and transition to full-speed production may be of varied duration. Creation of capital *precedes* output fruition, that is, producing deleted effects in terms of increase of output.

(16) Cf. M. Kalecki, "The Impact of Time of Contraction on the Interdependence of Invest ment and National Income and the 'Coefficient of Freezing," *Ekonomista*, No. 1, 1957, pp. 3–13.

for purposes of analysis, it is more meaningful to consider as investments only those capital goods which have been completed and commissioned during the year in question,[17] to emphasize investments (both productive and unproductive) as gross, a clear-cut division between replacements and new investments cannot be drawn.[18] Investment is considered in its capacity-creating effect and not in its income-generating effect—about which later.

Another component of GNP is the augmentation of working capital, i.e., value added or changes in the stock of inventory; goods in process, as defined above; raw materials and final goods. The last two components are collective consumption and individual consumption of goods and material services. The former includes noninvestment goods used by central and communal administrations, and by enterprises rendering nonmaterial services, such as office stationery, medicine, food and linen for hospitals, decorations for theaters, etc.

In an open economy, GNP includes exports minus imports.[19] It is assumed that the country neither extends nor receives foreign credits; exports equal imports; there is no accrual of foreign credits. The intent is to rule out the situation that a gap of any size in foreign trade, however large, will always be covered by credits. Such an assumption would eliminate altogether the problem of barriers that circumscribe the limits for setting the growth rate of national product. Under this assumption, the GNP equals by definition the sum of gross productive investment plus change in working capital plus individual and collective consumption plus non-productive investment (including the last three elements in consumption), broadly conceived as GNP in constant prices, equals by the nature of the definitional equation (or identity) the sum of productive accumulation (i.e., productive investment plus increases of working capital) conditioning expanded reproduction, and consumption (broadly defined).

To simplify the exposition, Kalecki has assumed that the increase of inventoires (T) to the increase of national product (of unchanged composition), i.e., $T = vY$, where v stands for the capital output ratio of increase in stocks. Admittedly, the assumption is particularly invalid in cases where the redistribution of national product in favor of investment takes place. Significant diversion from consumption to investment generally raises considerably the volume of gestating investments (included, in accordance with the definition adopted, as constituents of working capital). As the share of gestating investments in current investment expenditures in construction is usually preponderant,[20] v would under such

(17) Domar wrote in another context: "What we want is investment which could be functionally related to an increase in productive capacity; what we get from statistics are capital expenditures as defined by the Bureau of Internal Revenue, with a few corrections." Domar, *Essays*, p. 26.

(18) Cf. Joan Robinson, *Accumulation of Capital*, p. 42.

(19) Cf. Kalecki, *Outline of Theory*, pp. 16–18.

(20) Cf. Z. Knyziak and W. Lissowski, *Economics of Programming of Industrial Investments* (Warsaw: 1967), p. 30; and A. Plocica, *Investments in Poland* (Warsaw: 1967).

circumstances materially increase.[21]

To focus attention on both constituents of productive accumulation, Kalecki has presented a more expanded version of his fundamental equation. The growth equation may be rewritten as relating the growth rate to the aggregate productive capital formation, composed of fixed productive investments and additions to the stock of inventories per annum.

The fundamental equation (3′) can be rewritten so as to bring on the lefthand side the rate of fixed investment required to sustain a growth rate (r):

$$\frac{I}{Y} = m(r + a - u) \tag{3′}$$

The relationship (v) between the increase in stocks of inventories (T) and the increase in output (ΔY), i.e., $T = v\Delta Y$, can be rewritten as:

$$v = \frac{T}{\Delta Y} \tag{4}$$

By multiplying both sides by YY, we get

$$v \cdot \frac{\Delta Y}{Y} = \frac{T}{Y} = v \cdot r \tag{5}$$

Adding equations (3′) and (5), we get

$$\frac{I + T}{Y} = r(m + v) + m(a - u),$$

hence,

$$r = \frac{1}{m + v}\left[\frac{I + T}{Y} - m(a - u)\right] = \frac{1}{m + v}\frac{I + T}{Y} - \frac{m}{m + v}(a - u) \tag{6}$$

Denoting the rate of accumulation, i.e., the share of (gross) aggregate productive accumulation (the sum of productive investment plus change in stocks $I + T$) in GNP by i, we get:

$$i = \frac{I + T}{Y} \tag{7}$$

Similarly, it follows from the defintional equation that $Y = C + I$, that the share of consumption in gross national product equals:

$$\frac{C}{Y} = 1 - i \tag{8}$$

Denoting k for $m + v$, k then stands for overall investment-output ratio, i.e., investment in this designation includes both fixed capital goods and additions to the stock of inventories, and the capital coefficient k denotes the quantum of fixed

(21) Cf. Kalecki, *op. cit.*, p. 25.

capital goods plus the quantity of stocks (working capital) resuired to produce one incremental unit of national product. By substituting those notations for $(I + T)$ and $(m + v)$ in equation (4), we get the expanded version of Kalecki's fundamental growth equation:

$$r = \frac{1}{k}i - \frac{m}{k}(a - u) \tag{9}$$

The importance of the "expanded version" lies in its focus on inventories as a crucial growth determinant,[22] and in its indication of how the equation can be profitably employed by further decomposing the elements or introducing new ones.[23] In order to simplify the exposition, proportionality of the increase of stocks to the increase in national product is postulated. Hence, it is of no major significance for the argument presented whether the expanded or simpler versions are used.

III

The crucial differences between socialist and capitalitst economic systems reflected in the interpretation of the coefficient of improvement independent of investment activity. Whereas under effective socialist planning, productive resources ought to be fully utilized, under capitalism the utilization fluctuates with the vagaries of effective demand (the relation between effective demand and the size of stock of capital). Then the coefficient ceases to be an independent one, for it also reflects cahnges in the possibility of finding markets to sell the products that could be produced with the available stock of capital, mainly through the establishment of proper relationships between prices and wages. The coefficient reflects solely the effect of organizational and technical arrangements not requiring investment outlays.

If appropriate rates of growth had been chosen and if an effective planning system has been adopted, the problem of capacities in socialism would not have arisen. Professor Kalecki's model emphasizes the need to choose an appropriate growth rate and the consequences that follow from a choice of an excessive rate. It is understandable that for purposes of exposition and clarity of the argument he assumes the utilization of capacity to be full and constant.

One might infer from Kalecki's model that the stress is on the preparation of alternative plan variants. It is left up to the political decision-maker to choose the appropriate one. But he should be aware of the costs involved.

The model emphasizes the effectiveness of the augmentation of the rate of investment as reflected in the growth of national income. To repeat, the increment of national income may be counterbalanced by the adverse repercussions of a reduction of current consumption.

(22) Cf. my *New Economic Patterns in Czechoslovakia*, (New York: 1968), pp. 72–74.
(23) *Ibid.*, pp. 69–71.

The model stresses the objective limits or constraints imposed on the selection of a growth rate, such as labor, organizational, technical, and foreign trade barriers. The relative importance of these constraints depends on the country's endowment with natural resources, on its labor reserve, on the quality and skills of available labor, on the dependence on foreign trade, on the stage of economic development, etc.

It would be unfair to maintain that the implication of the model is merely to call attention to rational decision-making under constraints and to introduce determinism and economic decision-making to what may be loosely termed voluntaristic selections of growth rates. Of course, as in the theory of the firm, attention is called not only to the consequences of overinvestment, but to the selection of the appropriate rate so as to maximize the long-range growth rate, or to take full advantage of the opportunities opened.

It is in view of the crucial role of investment, and of the implication that changes in the non-investment sources would produce statistically insignificant results, that Kalecki stresses the role of investment and foreign trade efficiency. This is not to say that the choices of both an appropriate, or of a more appropriate, growth rate, and of a more effective planning system would not jointly produce better results than by attacking the problems on one front only.

Furthermore, one might propose that the adopted planning and management system cannot be considered in a vacuum but depends, *inter alia*, on the selection of a growth rate. At a time of hypertensions, the introduction of the market is not likely to produce the desired effect, as Professor Kalecki pointed out during the Polish discussion on the model of functioning of the economy.

Kalecki's model assigns a crucial role to technological progress. The question may arise as to what extent the planning system affects technical progress, to what extent it is conducive to the shift of parameters of the production function, and to what extent it lends itself to promoting innovations and to disseminating technical progress. While the centrally planned economy undoubtedly possesses many advantages in promoting technical progress and shifting the parameters of the production function, under the existing institutional arrangements there appear to be obstacles and resistance at the lower echelons of economic activity toward implementing technical progress; and, what is even more important, there seems to be little motivation for innovational activity at the production units, so that there appears to be a loss of the cumulative effect of individual advancements at the enterprise (plant) level.

IV

The importance of improvements in planning is circumscribed by, and its significance can be measured to the extent that, models of functioning influence the utilization of the existing stock of capital. To the extent that improvements in functioning may increase the non-investment source of growth,the role of additional investments as propellers of the engine of economic growth is reduced. As the

efficiency of investments determines the size of the capital-output ratio, and since the role of investment seems to be quantitatively more important than improvements independent of investment activity, the crucial, but not singular, question is the share and composition of investment in national income. Improvements of the efficiency of investments are of paramount importance for they have considerable and immediate effects on the distribution of income between investment and consumption. This is not to say that model changes are *a priori* assumed to be inconsequential, nor that growth should be propelled exclusively by investment. Moreover, Kalecki's growth model shows clearly the likely effects on non-investment factors from fixing excessive growth rates. One could also argue that Kalecki's growth model shows the conditions under which such improvements may assume higher values. It is understandable that, for purposes of exposition and to stress other factors, Kalecki assumes the coefficient of independent improvements, u, as constant. If an excessive growth rate were adopted (for whatever reason), the productive capacity would be bound to be underutilized (to a varied degree). Under such circumstances, model changes (economic reforms) are not likely to produce palpable results. A condition for such an improvement would be a selection of an appropriate rate of growth of national income in a long-range plan. Kalecki assumes a positive coefficient of improvement independent of investment activity in the socialist economy. However, it appears that this coefficient may assume both positive and negative values. For example, some observers have attributed to it a negative value due to the retrogressive effect of the traditional planning system.[24]

The improvement of the system of functioning of the socialist economy is a source of economic growth. It may be a condition for achieving target growth rates as the growth pace of national product depends on the size and efficiency of investment and the degree of utilization of existing capacities, or more generally, on the effectiveness of the entire productive system. But since the efficiency of investment does not depend only on the appropriate choice of the investment project at the central echelon (or its extension), but on its implementation, the system of functioning of the economy assumes a paramount role.

It is a truism that growth performance does not depend only on the model of functioning, and that the actual functioning of the model does not depend only on its virtues or logic, but also on growth strategy, on plan construction, and on its contents. There is not only a relationship between the model of functioning and growth, but also between growth and the mode of functioning; or rather there is an interdependence between growth and mode of functioning. One cannot be considered in abstraction from the other. Those seem to be some of the broader implications for socialist economies that follow from Professor Kalecki's analytical construct.[25] It must be stressed that some of the necessary conditions for the

(24) Cf. my *New Economic Patterns in Czechoslovakia*, pp. 61–81.

(25) Cf. M. Kalecki *Z zagadnien gospodarczo-spolecznych Polski Ludowej* (Economic and Social Questions of Polish People's Republic) (Warsow: 1964).

implementation of the reforms of the mechanism of socialist planning are the relaxation of hypertensions the assumption of a realistic growth rates and preperation of realistic and balanced plans.

V

One hardly needs to add that by explicitly singling out major growth determinants in his equation Kalecki neither implies that other variables which are not specified are inconsequential, nor does his fundamental growth equation impute the relative quantitative weights or the nature of the quantitative relationships between the parameters and output. In the real world, the ascertainment of weights and relevant coefficients and functional relationships must rest on empirical research and on analysis of economic trends and economic environment, as applied, for example, to the construction of the Polish prospective plan (1961–75).

To recapitulate, Kalecki's fundamental growth equation reduces to fundamental relationships the effects on the growth rate of GNP of its key determinants: the rate of change of GNP yielded by gross capital formation equals the rate of gross productive investments in gross national product (i) multiplied by the output-investment ratio $(1/m)$, i.e., $r_I = (1/m) \cdot i$. The rate of change of GNP is attributed to the product of investment rate times the "coefficient of effectiveness of investment" or investment efficiency (the output effect of investment). The behavior coefficient of "effectiveness of investment" depends chiefly on the nature and prevailing type of technical and organizational progress, the state of labor supply, endowment of natural resources, impact of foreign trade and stage of economic development. Moreover, such an approach to growth processes stresses the strategic role of determining a realistic i and focuses on the ensuing costs of various rates in terms of "short-run" consumption. Logically, the emphasis is on the ensuing cardinal importance of the investment and foreign trade efficiency analysis, as *ceteris paribus* changes in the growth rate (r) are traceable to changes in the investment rate (i) and/or the impact of capital formation in terms of increase (change) of national product. Incessant increases in the investment rate must encounter various barriers and ceilings which will, *inter alia*, prolong the period of gestation and fruition, thus reducing the efficiency of investment. The adverse effects that would beset an economy if an inordinately high share of investment in national income were set are traced to its source.

2) Concentrating on the rate of reduction of gross national product attributable to the annual replacement of worn-out fixed capital goods $(r_a = a)$ that is due to actual capacity curtailment (disinvestment) owing to the rate of retirement of plant and equipment.

3) Denoting the rate of change, treated as positive in Kalecki's equation, of gross national product attributable to the non-investment growth factor $(r_u = u)$,[26]

(26) In a disaggregated form, u may result from factors of growth and retrogression where the sum total would depend on the algebraic signs and weights of the components.

chiefly imporovements in the use of productive capacities and economy of materials. Within the growth content, the stress is here on the improvements in plan implementation as a source of growth (or alleviation of system-made impediments to follow utilization of capacities, etc.). Kalecki,s model contains the non-investment variable and may be applied to situations where the variation in this variable (or in its further disaggregated from) plays a crucial role as an empirically quantitatively significant source of growth. Viewed from the perspective of its growth setting, Kalecki's model circumscribes the likely impact of non-investment sources of growth and eradication or mitigation of system-made impediments. By implication, if such larger sources could be found and sustained, then the role of investment sources of growth would be relatively diminished.

Hence,

$$r = r_I - r_a + r_u$$

$$r = \frac{1}{m} \cdot i - a + u$$

True, with given appropriate assumptions as to the behavior of the non-investment variable and the rate of retirement of plant and equipment, the equation illuminates the streategic role of capital formation as the controlling factor and determinant of growth dynamics as, *ceteris paribus*,[27] changes in output are caused by variation of investment and its efficiency ($\Delta Y/Y = 1/m \cdot I/Y$). But this is only *one* interpretation or use to which this equation may be put. The interpretation that the last two terms in Kalecki's growth equation (a and u) are merely some sort of correctives, which could be omitted without much loss, seems to rest on a misunderstanding.[28] Granted the contention that the coefficients a and u are "extremely difficult to ascertain by econometric methods,"[29] they do focus attention on crucial growth-propelling factors, even if potential sources of growth.

There seem to be sufficient grounds to suppose that correction of some of the flagrant system-made inefficiencies would constitute a significant source of economic growth.[30] But there may not be sufficient grounds to reduce this statement

(27) *Inter alia*, given full utilization of existing capacities, similarly as in the case of the acceleration principle.

(28) Cf. J. Pajestka, *Employment and Investment*, Warsaw: 1961 p, 33. For a contrary view, see Lissowski, The Question of Determination," *Gospodarka planowa*, No. 2, 1958, p. 11.

(29) Pajestka, p. 33.

(30) See my *Economics of a Socialist Enterprise*. (N.Y.: 1965). Academicain L.V. Kantorovich, for example, reported that it was estimated that the fluctuations in the volume of output in the USSR account for a loss of about 25 per cent of output, and that eradication of the major planning failures would produce within a short time an increase of output by 30–50 per cent through more efficient use of resources. *The Best Use of Economic Resources*, translated from the Russian (Oxford: 1966), p. 23. The subject is pursued in greater detail in my *Soviet Quest for Economic Efficiency*. (N.Y.: 1966). The Czechoslovak claims about the retrogressive effect of traditional planning are analyzed in my *New Economic Patterns in Czechoslovakia*. (N.Y.: 1968).

to quantitative terms on tenable assumptions. Even if we cannot satisfactorily measure the effects, it does not mean that we should disregard them. It should be borne in mind that even one percentage point rise in u—resulting from a better utilization of, say, underemployed capacity in the machine-buidling and construction industry—would produce one percentage point increase in r—not an altogether inconsequential effect.

With $m(k)$, a, and u constant, the consequence stemming from the growth equation is that, under the assumed conditions, the share of gross investment in GNP wholly determines the growth pace of GNP. The higher the ratio $I{:}Y$ (i), the more rapid will the growth pace be. With other things being unchanged, increasing I/Y, national product increases by $I \cdot 1/m$. Consequently, in the short-run, consumption would be depressed, but over a sufficiently long extension of the plan horizon the reduction in the share of consumption ($C{:}Y$) should be compensated for by the rising aggregate output (Y), i.e., the base becomes larger. The benefit is likely to be greater, the more extended the time interval for the duration of the dynamic process that we take into consideration. The long-term benefits are inversely related to the size of $m(k)$, as the higher (lower) is the m, the larger (smaller) the ensuing increment of national product ($I \cdot 1/m$), compatible with a given increase in the share of I/Y.

Assuming the constancy of m, a, and u, the size of r would vary directly with i. In addition, if constancy of i would be postulated, the size of r would be steady over time. The stability of i means that investment increases in the same proportion as Y. The same rate of growth of investment as that of national income is a vehicle for a steady growth of Y. The rate of increase of investment is the same as of national product. By implication, the rate of growth of investment does not need to outpace the growth of national product in order to maintain steady growth. Growth of investment at the same pace as of national product is sufficient to ensure a steady growth tempo. Moreover, since, in the state of nonincreasing or decreasing share of investment and of constancy of other parameters, the share of consumption in national product remains invariable over time ($1 - i$ is also constant), consumption also increases in this case at the same steady rate, r, as the national product. *Ceteris paribus*, growth rates could be accelerated only by increasing i, or decelerated by reducing i. If the aim is growth acceleration, i.e., to raise the target growth rate of national product, *ceteris paribus*, i must rise ($1 - i$ must fall) and, consequently, the share of accumulation in national product must rise faster than Y and, *ipso facto*, consumption, whose share in national product will decline (will grow more slowly than Y). The higher is the steady tempo of growth, r, the higher the magnitude of i, and, *ipso facto*, the lower the rate of consumption ($C{:}Y$ or $1 - i$). The adoption of a higher growth rate as a desideratum ($r_1 > r$) is tantamount, *ceteris paribus*, to the reduction in the share of current consumption. This is one of the constraints imposed on the planners in the choice of (or maximization of) the growth rate.

Kalecki discusses the questions of choice of a growth rate by concentrating

and identifying key states of labor supply as factors circumscribing planners' maneuverability. The question is: How should growth be accelerated if labor supply is not a limiting factor. With essentially exhausted labor reserves, growth can be speeded up only by raising productivity. Productivity may be increased by means of changing one (or a combination of) parameter(s) in the growth equation. In proceeding further from a simpler to a more complex analysis, it is necessary to relax the assumed parameteric scaffolding and to examine the impact of variability of the hitherto constant parameters.

The sources of additional labor are not inexhaustible, and labor barriers eventually emerge. After exhaustaing the sources of additional manpower (increasing the labor participation rate of women and encouraging the exit from agriculture), the tempo of growth, *ceteris paribus*, is constrained by the rate of growth of productivity, viewed as a function of technological progress and organizational know-how, and by the natural rate of growth of the labor force. Under such conditions, it would be undesirable to raise the share of investment in national income as it would result merely, *ceteris paribus*, in an undertutilization of productive capacity due to a shortage of labor to man the equipment. If, at the postulated growth rate, labor barriers are likely to occur, in order to overcome this obstacle it might be necessary to increase the share of investment so as to favor mechanization as a substitution for labor. This again would raise the share of investment in national income.

In other words, the state of the labor reservoir limits only the growth pace of national product under the assumption of invariable capital-output ratio. But there are various ways of killing a cat or preparing an omelet, and usually there is a choice of techniques to produce a given output. Within a certain range, labor and capital (investments) are substitutable inputs. Indeed, application of more mechanized production processes saves on labor by substituting capital; i.e., varied quantities of investment, depending on the shape or movement along the isoquant, compensate for a reduction of a unit of labor without affecting the volume of output produced. But even though it overcomes a labor shortage (or shortage of labor of a given kind), such a substitution necessarily entails additional investment per unit of national product. Or, to put it differently, it is achieved at the cost of *raising* the capital-output ratio. A labor shortage does not arrest or inhibit acceleration of the growth rate of national product, but necessitates an increase of the share of investment in national product indispensable to the achievement of the adopted *higher* growth rate target.

It is a controversial matter whether the prevailing trend of technical progress supports the contention that there is a tendency to raise the index of quantity of capital inputs to labor employed,[31] or the tendency to raise the index of constant

(31) Cf. Kalecki, "The Dynamics of Investment and National Income in a Socialist Economy," *Ekonomista*, No. 5, 1956, pp. 61–70; Joan Robinson, "Marx and Keynes, "*Collected Economic Papers*, I (New York: 1951), 143–44; and A. Erlich, "Notes on Marxian Model of Capital Accumulation," *American Economic Review*, May 1967, pp. 599–615.

to variable capital.[32] Be that as it may, the pattern of behavior of the relationship between capital and output depends on the *type* of technical progress.

Assuming, to borrow Kalecki's example, that two workers are manning two machines: As a result of the dynamic forces of technological progress,[33] new ways of combining inputs are introduced. These two machines are replaced by one, with one worker operating it to produce the same quantity of putput as was produced before by both machines. Obviously, the output per worker has doubled. The cost of the new machine (ruling out index number problems) is in all probability higher than that of one of the machines used before, so that the index of the quantity of capital input per worker (capital-labor ratio) has also increased. Must the cost of the new machinery be necessarily higher than that of the two machines employed before, so that the quantum of capital employed per unit of output (capital-output ratio) also rises? This cannot be established *a priori*, for the answer depends on the nature and type of technical progress. (As a result of progress in techniques, isoquants move toward origin. The result depends on the nature of the shift or displacement, i.e., on the position and shape, or curvature, of new isoquants.)

It is possible that the innovation may consist merely of a substitution of labor by machine (labor-saving), without affecting output, and, therefore, the capital-output ratio would necessarily rise. While such a case is possible, it is not necessarily the prevailing type. For instance, in case of automation, machines not only replace workers, but also speed up production processes. Kalecki is noncommittal on the kind of prevailing technical progress,[34] but analyzes the con-

(32) Joan Robinson argued that the Marxian distinction between variable and constant capital belongs to the metaphysical level of Marx's thought. When Marx refers to the organic composition of capital, he means "the relation of past labour time embodied in the stock of capital goods to labour time currently employed." This relationship has both physical and financial dimensions; the former refers to a description of production techniques, the latter to the value of capital interpreted in terms of purchasing power over goods, per men employed. Marx concluded that, as a historical process of the movement of the capitalist system, the organic composition of capital tends to rise as time goes by, meaning "that capital in terms of labour time per unit of capital labour employed tends to rise. This corresponds to saying that technical progress has a capital-using bias, so that, when the rate of profit is constant, the share of profit in value of output tends to rise." It is clearly not the case that all types of technical progress increase capital per unit of labor employed. Whether there is a predominant tendency for accumulation to have a capital-using bias is a question "of historical fact, not of logical necessity. So far as the evidence goes, it does not seem to suggest that in developed industrial economies there is any clear and continuous bias of accumulation to the capital-using side." Joan Robinson, *An Essay on Marxian Economics*, pp. xii–xiii.

(33) Cf. J. A. Schumpter, *The Theory of Economic Development* (New York: 1961), p. 68; W. E. G. Salter, *Productivity and Technical Change* (Cambridge: 1969), pp. 1–32; and Joan Robinoson, *Essays in the Theory of Economic Growth*, pp. 88 ff.

(34) "... it is impossible to tell what the predominant type of invention will be in the future. Certainly many capital-saving inventions (such as wireless in place of cables) have been made in recent times ... " Joan Robison, "Marx and Keynes," *Collected Economic Papers*, I (New York: 1951), 143–44. "About technological progress we know remarkably little, even if always eager to learn and not only for the sake of capital coefficients." Domar, in D. C. Hague (ed.), *The Theory of Capital* (London: 1963), p. 117. Cf. S. Kuznets, *Modern Economic Growth* (New Haven: 1966).

sequences of three possible types: capital-saving, labor-saving, and neutral; stressing that it is the type property of technical progress that is decisive for the relative growth pace of investment and national product. For example, growth at a steady rate (uniform rate) does not require, *ceteris paribus*, that growth of investment outpace that of national income.[35]

Another constraint limiting the acceleration of the growth rate can be found in the difficulties of equilibrating the balance of payments. Those barriers are higher the higher the rate of growth.

During the process of economic development, import requirements (especially of raw materials and semifabricates) are accelerated. Simultaneously, in the absence of credit financing, exports must rise to pay for the growing imports. The higher the rate of growth, the more rapidly must exports be accelerated, and the greater are the problems of securing foreign markets for effective exchange. A higher rate of growth would require greater export or anti-import undertakings and efforts. A larger physical volume could probably be sold only at reduced prices. The export drive will be accompanied by price markdowns for particular products on some markets, forcing exports to markets offering less advantageous terms, continuously forcing exports of products whose exchange becomes increasinly less effective (pre-empting goods for domestic advancement or consumption). The inputs required to secure the growing volume of imports would rise either because they would be imported at the sacrifice of larger than heretofore physical volume of exports, or a changed product mix of exports, requiring more inputs; or because the inputs required to produce import substitutes would be larger than those for manufacturing goods for exports exchanged for the required imports.

The difficulties in equilibrating the balance of payments are not confined to the limited ability to sell products abroad at the prevailing terms of trade and to the deterioration of the efficiency of foreign trade, which accompanies sharp increases in the volume of trade (especially under conditions of overheating, where bottlenecks endangering plan fulfillment in priority industries must be widened with little regard for the costs of the remedial actions). Another difficulty is encountered when, as a result of overexpansion, the growth rate, the rate of output of of a number of industries, especially materials, trails behind—partiuclarly due to technical and organizational barriers. As a result of the growing deficiencies

(35) It is the *differencia specifica* of the steady state of growth case of the general theory of growth that all variables grow at the same identical rate over time. The rate of growth of national product, r, is the same as the rate of growth of investment and consumption; there is no reshuffling in the allocation or divergence of output to capital formation, rather than for consumption. The increment of national income is distributed at the same ratio as the "principal." The distributive shares of investment and consumption move at the same pace. As a result of a larger income (growing base or exponential growth), while the respective or percentage shares of investment and consumption in national income remain unaltered, and both investment and consumption grow at the same rate—the *absolute* size of the *increment* must also grow; i.e., the successive volumes of investment (consumption) must be larger. Indeed, they grow at the same rate as national product.

of materials, the necessity to meet the shortages by imports adds to the balance of payments difficulties (alternatively, the export potential is diminished). The growing balance of payments disequilibrium requires measures to increase exports or contract imports which, in turn, limits or reduces the rate of growth.

The technical and organizational barriers that limit the tempo of growth include: 1) limited natural resources, and 2) experience shows that exceeding a particular rate of development of a given industry is accompanied by insurmountable difficulties, indluding inordinate scattering, extension of the gestation period, and freezing of capital resources. A larger volume of investments (overinvestment) and extension of the protracted time of construction contribute to the scattering of unfinished construction (with a given rate of capital formation in a particular industry, the number of projects under construction is proportionate to the construction period). The existing technical and managerial personnel are incapable of handling effectively the manifold and expanding projects. There occurs a bottleneck of sufficiently qualified personnel to cope with the problem. An incessant increase in investment activity must encounter technical and organizational "ceilings" which will overly prolong the period of gestation and fruition, thus *reducing* investment efficiency.

As a result of foreign trade difficulties, the rate of growth cannot exceed a certain level. In fact, at a certain growth rate, attempts to balance imports with exports do not produce effective results. Further reduction of export prices is pointless if the result of increased physical volume produces no increments to revenue, as the additional revenue from an additional quantity sold is smaller than the loss resulting from the reduction of price on goods previously sold. Difficulties in equilibrating foreign trade cause a rise in capital and labor inputs to produce a given increment of national income.

The preference function assumed in Kalecki's model of the socialist economy is diametrically opposite that of his famous model analyzing the dynamics of the capitalist economy.[36] The primary aim of a socialist economy is, or should be, consumption. The stress is on the adverse effects on consumption of fixing a precipitous growth rate. The fundamental problems of the socialist economy are production, productivity, and production techniques; shares and composition of investment in national income; foreign trade, etc. There are also *limits* imposed on the reshuffling of resources in favor of investments, at the cost of current consumption, accompanied by a resistance to cuts in current consumption, or to a postponement of its rise.

The University of Tennessee

(36) Cf. M. Kalecki *Theory of Economic Dynamics* London: 1954, 1965.