ECONOMIC PLANNING AND Adolph LowE's ECONOMIC PERSPECTIVE

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Introduction

Two pioneering articles written during the 1950s by Adolph Lowe (1952) refer to the need, for the "practical purpose of planning" (1955, p. 581), for a medium-level of disaggregation between the macro-planning models of the Harrod-Domar-Kalecki type and the inter-industry analysis of Leontief. It is too difficult to trace out the growth path of a large number of variables when each is simultaneously exposed to several stimuli. He proposed a creative development of Marx's expanded reproduction analysis with a division into Department Ia (machines to produce machines), Department Iib (machinery to produce consumer goods, such as textile looms) and Department II (final consumer goods) (1952, pp. 133-55 and 1976, Part I). We will later illustrate the practical importance of this approach by showing how it helps us to understand some problems in the recent development of China.

Lowe held that the problem elucidated in his structural model of production would arise in both individualist and collectivist economic organizations (Lowe, 1955, p. 582), since the specificity of the technical structure of the given stock of real capital creates key planning problems for both systems because it affects the adjustment process through which capital formation occurs - the links between successive stages of growth (1955, p. 585).

Planning must take the indivisibilities of the capital stock into account since the approach emphasizes that key variables such as "investment" or "consumption" must not be looked at solely as value aggregates "to the exclusion of the technical-physical properties which attach to them in an industrial system" (1952, p. 137).

Lowe focused attention on the machine-tools sector, as an example of the category "capital goods for producing more capital goods", in contrast with capital goods targeted directly for the consumer goods sector (like textile looms). The "machine tools" sector has the peculiar ability to initiate and sustain a circular production process of its own (1952, p. 158; also see Lenin, 1955, p. 100, Dobb, 1954) and thus not to be determined by the previously existing structural relations (Lowe, 1952, p. 155 and Dobb, 1960, Ch. IV). However, Lowe reminds us (1952, p. 146-55, 1955, pp. 587-90) that this sector is dependent on inputs of intermediate goods which could slow its rates of growth over a period of time. Imports to supplement the domestic output of capital goods could, however, relieve such bottlenecks, at least for a time (1955, p. 592, Sachs and Laski, 1971).

Besides these suggestions for a simple, but powerful, theory of the structural aspects of economic change, Lowe provides as a complementary part of his analysis, a systematic account of how economic agents behave (1965). Taken together these provide a picture of the structural economic interdependence of a growing economy, whether

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capitalist or socialist, which experiences investment cycles. It is Lowe's argument that the marginalist or general equilibrium variety of economic theory imposes unnecessary limitations on the study of economic behaviour and structural interdependence. In relation to capitalism, Lowe questioned, as early as the 1970s, the then current economic crisis theories and reaffirmed the viability and usefulness of the Robert Tugan and Luxemburg tradition (Kuznets 1954). He developed his own approach on this basis recognizing the difficulties of practical planning in the context of longer term cycles (Lowe 1978, 1955). He stressed the need to avoid the kind of general equilibrium-based planning theory now common (Sail 1975, Lowe 1976) as inadequate for understanding and cyclical fluctuations.

Planning under Socialism also requires what Lowe calls "instrumental analysis", combining a structural account of economic change with understanding of the behaviour of economic agents. There must be propositions about the meaning and not just the ends of economic action: "social relations of production" in the shape of interaction of planners, consumers, managers, project-makers, rural cadres all must be fed in to transform "models of production". In this, motivation and human action are the essence of the theory of planning in a Lowe perspective (Lowe, 1965).

Mao Tse Tung seems to have understood this, as he explained in his Ten Great Dialectical Principles of Mao (1941) and On the Correct Handling of Contradictions Among the People (Mao 1957). His attempt is to get people mobilized by appeals to moral incentives (Whelan and McArthur, 1978). His promotion of the worker's innovation movement, his stress on the need to motivate the myriad of decision-makers to work for China's economic growth ("jump to promote production") and his calls to "fight self-interest" all indicate the practical importance of what Lowe called behavioral or "force" analysis. The kind of motivation recently desired by China's leaders may have changed, but the need for motivation has not, as shown by the new wage incentive schemes in industry and the tolerance of the mass -scales movement back to small peasant proprietorship in the rural areas.

Moreover, the issues of investment planning - the rate, composition and nature of capital accumulation - are not mere "technocratic" questions for specialist planners. If they were, Kalsecki, in advising socialist governments, would not have had to bring his "government decision curve" into the analysis. This traces a locus of points of compromise between investment plans and the public's willingness to accept restrictions on their living standards. In sum, it represents a sharp contrast with the outcome of the interaction of the economic actions of people versus government, peasants versus workers, planners versus consumers (Kalsecki, 1969, Ch. 5-6, etc.), embodying both behavioral and institutional relations. We shall see the usefulness of this in understanding Chinese problems, especially when the decision curve itself is reinterpreted according to structural analysis.

Lowe's Model Compared to Other Structural Models

Lowe's neat and incisive discussion of how the circular motion of the output of Departments Ia, Ib, and II fits together (Lowe 1952, pp. 195-204; Lowe 1956, pp. 594-596 and 825-826) has a two aspects. Theory of capital investment between the three sectors affects the overall growth rate, and then there is the "productivity of investment" (or the reciprocal of the marginal capital-output ratio) which determines employment and output by interacting with the stipulated investment allocation to the capital goods sector as a whole. One implication to be drawn from Lowe's analysis for socialist or planned economies is that an investment program is too heavily concentrated in Department "Ia", then, instead of bringing forth future increases in consumption goods, the plan can end up delaying the increase in consumption unneccessarily. For example, looms cannot be built without looms, but textiles cannot be produced without looms. A balance must be struck: Department "Ib" must not squeeze out Department "Ib". We shall now trace out the development of these ideas in recent writings on planning.

The family of structural growth models to which Lowe's analysis belongs stretches back to Marx, Tugan, Robersont and Rosa Luxemburg and is a forerunner of much interesting work on planning for structural change. The underlying force at work here is the recognition that the extraction of surplus under economic planning is carried out under constraints. The aim of this family of structural models from Luxemburg through Lowe to Feldman, Dobb and Birkicawa, has been to find the required and potential growth rates, taking into account the impacts of initial conditions and the relationship between the strategic sectors while incorporating behavioral norms of the production and management units in industry and agriculture.

The models of Feldman (1929) Mehalansobis (1953, 1955) Dobb (1955, 1960) and Birkicawa (1967) are perhaps closest in spirit to Lowe. Mehalansobis and Feldman (see Dobb, 1955, ch. 9) identify the economy's capacity to supply fixed capital embodying modern technology as their major constraint. Dobb, however, allows a break in the circular flows between departments Ia, Ib, and II by assuming capital goods last forever. Birkicawa (1967) introduces the demand for fixed capital and the supply of wage goods as limiting factors on growth, but his model is a mixture of neo-classical theory and a Lowe-type model, in which aggregate production functions of the sectors incorporate the technical-physical properties of the system, while inter-sectoral output balances are held rigid.

His analysis brought Lowe closer to the theory of economic growth produced for the Soviet plan by G.A. Feldman in the 1920s (Kuznets, 1957, Ch. 9) Feldman's model looked at the trade-off between the increased output of Department II and the net output of Department I, i.e. 

Lowe's "I a" and "Ib". Capital supply was assumed to be the only constraint on the Soviet economy. Production was independent of consumption, so that consumption levels did not affect the productivity of workers. Feldman assumed no existing equipment can be transferred from Department I to Department II due to the specificity of equipment, so an increase in consumption depends on prior investment in Lowe's "Ia" and "Ib". Then, as Domar shows (1977) using incremental capital-output ratios and a choice variable (which is the share of Department I going to section I base), the rate of growth of consumption depends on the past allocation of investment to Department I. Feldman's rigid assumptions (capital equipment cannot be moved between sectors etc.) rule out declines in the future level of consumption, which Kalsecki subsequently showed (1969, Ch. 8) to be incorrect, as they underestimated the consumer sacrifices needed with increased mechanization.

S.G. Strumilin, a leading Soviet planner and one time associate of Feldman produced models close to those of Feldman and Lowe (Strumilin, 1954, pp. 72-75), while his main context was that the improvement of the system of "balanced" used in Soviet planning and the use of Marx's two departments with a Lowe-type connection between them, he purported to show that to enable the output of consumer goods to grow annually by 10 per cent over the base year, the output of capital goods had to increase by as much as 17.8 per cent annually over the base years. The magnitudes used in the table were close to the "concrete structure of Soviet industry in 1950s". Like Lowe (1952, p. 142), Birchard (1954, p. 528) and Norton (1961, Ch. 31-38), Strumilin insisted on relaxing Marx's assumption that "constant" (fixed and circulating capital) is turned over or used-
up annually, so that columns 1 and 2 of Strumilin’s tables represent constant capital as a stock and a flow respectively. Strumilin also had the growth rate of consumption dependent on the previous investment in Department I as compared to new investment in the consumer-goods industry. However, he failed to point out that both in equal (as between Department I and Department III) and a constant (over time) rate of growth can be maintained, provided the surplus of capital goods over replacement needs is positive and there is no change in the capital:net output ratio. In addition, Strumilin’s results rested on a very special assumption that increased “basic material funds” for Department I come from outside the system, while the same does not apply to Department III. Finally, due to arithmetical error, Strumilin overstated the necessary increase in the net output of Department II. Calculation of his figures allows the growth rates of the two departments to become equal after a year, although it remained true that to raise the growth rate of consumption, Department I must expand more rapidly than Department II, given the assumptions of the “structural model”.

A survey of early experience in Indian planning (Mahalanobis, 1955; Pant, 1959) also reveals an intense interest in the “engineering” rather than “more economic” side of planning. In lower “technical-physical aspects of production”, as well as the structural representation of production. This is especially clear in Professor Mahalanobis’ planning model for India (Mahalanobis, 1955, 1959), and also in Haldane’s model. Haldane’s adaption of Mahalanobis aimed to bring in such objectives as cheap food and drugs to increase labour efficiency and the need not to push too fast towards development of Department I in the early stages of a planned economy. Mahalanobis divided the economic structure into four sectors (for the purposes of the Second Indian 5-year Plan): the investment-goods sector, the factory consumer-goods sector, the household industries (agriculture) sector, and the services sector. The last three constitute Department II, and the first Department I. A “productivity of investment” reciprocal of capital-output ratio and a capital-labour ratio were worked out for each sector. The allocation of investment patterns desired by the Plan was then determined by the initial conditions (the level of real income and the rate of savings in the initial years) and certain planning goals, such as the number of additional workers to be absorbed and the annual growth rate of real income.

The only problem with Mahalanobis’ very practical model was the treatment of the investment goods sector, which was not distinguished in its composition from a completely integrated sector. Output of the investment goods sector was treated as equivalent to total net investment, equal to total saving, and was not easily translated into a simple input-output “circulation-flow” model of the kind used by Marx and Lowe, which had the advantage of bringing out the multi-dimensional structure of an economy where a sector also receives its rationale from the differentiating characteristics of its outputs. It will be recalled here that Lowen and Buchholtz had insisted on a combined circular and vertical model, the latter aspect including the flow of inputs, although the specifically ‘Austrian’ treatment of this was not adopted.

Comparison of Dobb and Lowe

Dobb’s model of economic growth (1955a, 1955b, 1960) seems to have been largely based on Lowen’s approach in particular it reflects the proposition that employment in the investment-goods industries is determined by the surplus in the consumption sector divided by the rate of consumption per capita. But the latter, in Lowen’s framework, is a variable while for Dobb it is a parameter. There are some other differences between the two, as will be indicated. Both, however, relying in the institutional character of the system and both see specific problems for a planned socialist system, such as avoiding excess capacity in the machine-tools sector. So Dobb’s model (1955, 1960) can usefully be compared to Lowen’s.

In his work, Dobb assesses the rate of growth of total output and hence the rate of growth of output of a fallout in a point out that both end by the current investment is allocated to the capital goods sector (Marx’s ‘Department IV’) and to the consumer-goods sector (Marx’s ‘Department IV’). In mathematical notation, the growth rate of total income is governed by the formula $A / G$ where $Q$ is the proportion of investment devoted to capital goods industries, $G$ is the proportion of capital equipment to output in those industries, and $A$ is the average capital/output ratio (Dobb, 1955).

Dobb argued that increased employment and output in sector I is governed by the output of tractor in investment goods (given by employment there and the productivity of workers). Abstracting from problems of replacing capital goods, and on the simplifying assumption of a fixed ratio of one man/machine, he constructs a model to yield two relationships sufficient to determine the path of growth by their interaction. Assuming $L_1$ and $L_2$ represent labor employed in the respective sectors, $P_1$ and $P_2$ represent productivity per worker per period measured in corn and tractors respectively, while $W$ represents the wage rate in corn per period, and $S$ is the surplus per worker. These two relationships are:

1. $L_1 = \frac{A}{G} (P_2 - W)$
2. $L_2 = \frac{W}{P_2}$

Thus, the first relationship states that employment in the tractor industry depends on employment in corn, times the difference between the productivity of the worker and his wage or ‘surplus’.

If $A$ is regarded as measuring the rate of investment, and increases in $L_2$ in each period measure the rate of growth, the main factor limiting growth is the surplus of wage-goods corn. Thus, Dobb believed, corresponds to the conditions of underdeveloped countries, where the economic limits on construction work are given by the shortage of wage-goods with which to employ more workers.

The crucial question that Dobb put to his model was: suppose the choice of machines involves different degrees of capital intensity and different capital/output ratios in industries, what should determine the choice of techniques? His answer is that, if the aim is to maximize the rate of growth, a country should choose the technique which maximizes $L_2/GW$. This implies choosing the technique that maximizes surplus product in the corn sector. Dobb believes this is likely to involve a more mechanized technique than that dictated by the orthodox theory of factory proportions. This is not to say that the "corn" sector can be mechanized indefinitely, since wages rise and reduce the surplus, but it means that mechanization can be carried to the point where $P_2 - W$ is maximized.

Dobb’s approach appears to have two main advantages. First, it concentrates attention on the effects of techniques (via their effect on labour-productivity) on investment-potentials, and hence on the growth potential of the economy. If the productivity of labour can be raised in the corn sector, there can be a surplus to devote to investment, and this surplus may be worth paying for in the cost of current labour-effort. This puts a premium on land reform, the removal of exploitation in agriculture, and the need for more tractor, irrigation, fertilizer and seed inputs. This point is elementary, but it tends to be overlooked in Western growth models, which assume that the ratio of investment and the capital-output ratio are independent, or that they are linked, in Keynesian fashion, through the savings ratio.

Secondly, Dobb’s model concentrates attention on the structural relationships between different sectors, rather than on the income-expenditure balance which is the
preoccupation of the Keynesian growth models. In this sense, it approaches Marx's two department schemes, outlined in the theory of "expanded reproduction" in Volume 2 of Capital. Clearly this is the right focus on attention in a planned economy. The more industrialized a country becomes, the more its pandemic growth rate will tend to be limited, not by the size of the subsistence fund, but by the productive capacity of the capital-goods sector. It then follows that to devote a large share of investment to enlarging the capacity of the capital-goods sector will contribute more to growth than the same investment in the consumer-goods sector. But unlike Lowe, Dobb does not subdivide the capital goods sector, so he cannot effectively analyze the change from one growth rate to another.

Like Lowe, Dobb's model provides a challenge to models that treat investment and growth as resulting from and being limited by a pre-existing savings fund—a tradition which also has conservative implications for policy. If the rate of investment must be kept within the "propensity to save" of the community, this is a limiting factor from which the only escape is to employ the structurally unemployed, using labour-intensive methods of production to increase capital without prior savings. Such a conclusion is parallel to that of the "factor proportions" or traditional approach of marginalism, which Dobb, like Lowe, is criticizing.

Dobb denies that the "saving fund" is the key barrier to growth, since it can evidently be increased by raising productivity, and thereby enlarging the gap between output and subsistence. The interference of cycles and the shortage of agricultural surplus are key problems in a socialist context.

Yet, Dobb's 1960 work, "An Essay on Economic Growth and Planning" has been criticized on two grounds. First, the model presents too great a degree of simplification and rigidity. The distribution of labour among employment sectors is rigidly governed by the capacity of the consumer industry to furnish real wages at a pre-established rate per man employed while the sharp distinction between 'consumer' and 'investment' industries is a particular form of sector aggregation which throws up peculiar features that the interdependencies of the real world might obliterate. For example, it was suggested that the incorporation of raw-material or fuel-branches (linked with other sectors by simple ties of proportionality) would confer on Dobb's 'non-correlation' sectors a role quite similar to that which was made the exclusive preserve of the consumer industry. By contrast, Lowe's model promotes a wider scope to show the relations between different parts of the capital-goods sector. Second, Dobb did not draw out in any of his price relations implicit in his model, or treat the matter of relative prices in an underdeveloped country seriously enough. What he dealt with was a maze of apologetic (investment effectiveness coefficient) and turnover taxes. If he had adopted the Lange-Lerner analysis of socialism he would, it is suggested, have seen the intrinsic importance of competition-mimicking price ratios. By contrast, in "The Path of Economic Growth", Lowe examines the working of prices, and argues that they will either not help, or tend to destabilize an economy shifting from one path of growth to another.

A New Type of Structural Model

Ishikawa's (1967), Chapter 1 achieves a half-way house between a Lowe-Feldman-Mahalanobis type of structural model and the use of marginalist analysis. The analysis is geared to planning under conditions similar to those of Mahalanobis: a modern sector ('X) and a traditional (A) sector are assumed to exist. Cottage industry, however, is considered to be negligible, while permanent durability is assumed for the stocks of capital in the investment-goods subsector and the consumer-goods subsector as in Dobb.

The assumption is that made (which Japanese experience supports) that the modern sector must carry on trade with the traditional sector and that there is a differential in living standards which induces labour to move from the traditional sector to find work in the modern sector.

Now the modern sector is treated, as having fixed proportions of capital to labour and of capital to output. Technological change is minimal. Ishikawa analyses the traditional sector by using the marginal productivity of labour in agriculture and the marginal productivity of labour in basic investments. The supply curve of labour is assumed to depend on its productivity and also on factors affecting such, as the incentives of the working peasants (Ishikawa, 1967, p. 331), the land tenure system, the appropriate government disbursement of rural subsidies and the willingness of people to co-operate with the government. Here Ishikawa achieves what Lowe considers desirable; i.e., a mixture of structural conditions for overall economic growth and a favorable approach to motivation and behaviour by economic agents.

In Ishikawa's model the demand for fixed capital in both sectors (including the infrastructure for the traditional sector), and the supply of wages-goods (partly for those leaving the traditional sector for the modern) provide upper limits on potential growth. But the actual growth path is determined by resource flows between the two sectors, which in turn depend on the marginal productivity of labour in basic investments and the marginal productivity of labour in current production in the traditional sector. But as in Lowe, the outputs of the investment goods sector and the consumer goods sector are determined by the stocks of capital and the capital coefficients, with increments in output largely proportional to the amount of newly allocated investment goods.

Lowe Compared to Neo-Clasical Planning Theory

It has not always been fully appreciated that Lowe's work can apply to both capitalism and socialism - to the investment cycles of Western industrial societies and to the planning and also investment cycles of China, the USSR or Eastern Europe.

In relation to "dynamics" in this field, two points stand out even in Lowe's very early analysis. The first is a defence of rigorous theory to explain structural crises, against the empiricism of some business cycle theories (Lowe, 1925, quoted by Mitchell, 1966). Lowe's instrumental analysis made explicit something that empiricism and positivist economics hides: "it is theory which provides the principles by which the irreducible fulness of reality can be said in terms of reality. It is the theory which formulates the question which the facts must answer" (Lowe, 1976, p. 367 in Mitchell 1972, p. 59).

The second point relates to the kind of theory that is to be used for cycles, growth paths etc. Where Mitchell reported on "Dr. A. Lowe's elaborate argument that the position of cyclical fluctuations cannot be treated by the "variation method" of pure economics and calls for a dynamic theory in which the concept of equilibrium will be replaced by the concept of cyclical oscillations" (Mitchell, 1925, p. 452).

General equilibrium planning theory has advanced somewhat since 1925, and dynamic issues are now taken seriously. Yet one has only to compare Lowe's works in the area of "economic growth and planning" with the Theory of Economic Planning by G. Heal (1973) to see the enormous gap between a methodology rooted in Radberbus and Luxembourg and one wholly informed by neo-clasical orthodoxy.
In Heal's work, for example, the stated aim is to examine, in an analytically manageable framework, the advantages and disadvantages of alternative patterns of communication between actors in an economic system" (Heal, 1973, p. viii). It is accepted almost without discussion that decentralized planning will be superior to central plans, but ideological neutrality is assured by the intention to "examine certain formal logical problems that are connected with the idea of a planned economy (Heal, 1973, p. 11). Economic planning is seen to experience the problems of internal planning in large corporations (Heal, 1973, p. 2). In theory and practice, planning is characterized by detailed attention to the productive side of the economy, whilst the requirements and preferences of consumers are assumed to be reflected in the objective function.

As a neo-classicist, Heal, like Arrow and Hurwicz finds this unsatisfactory, and like Fellner and S. Friedman he wants prices and the flow of divisible factors of production to determine the structure of production by a competitive process. A "matonnement - like process" which was used only for plan implementation in the productive side of the economy would allow the prices announced by the centre to be bookkeeping prices, but a central planning board would, in representing consumers at the auction, have to consider their preferences between construction work and other amounts of labour individuals would be expected to supply would be identified. But this would only achieve an equality of the economy to produce investment goods, let us now turn briefly to a case study; that of explaining investment cycles in China in the last two decades.

Dobb (1951, p. 38), one very typical in a planned economy, does not get treatments: there is no room for the presence of large indivisible units such as steel furnaces, coke production and steel works, containing a complex network of joint-demand and joint-supply relationships. The normal order of things, on the other hand, makes contributions of a kind that could rarely come from a Heal-Arrow-Hurwicz type of analysis specifically:

(i) a stress of the indivisibility and specificity of capital equipment;
(ii) a three-sector "snapshot" of the economy and a study of dynamic flow between the sectors;
(iii) the strategic importance of the machine-building industry a key part of Department I in the planning process, and in the path of growth.

Like the Feldman model, Dobb's model produces a perspective and a conclusion that is antithetical to the "factor proportions" analytical backbone of orthodox economic theory: it conceives of the major constraint to growth in the physical-technical properties of the system and the capability of the economy to produce investment goods, let us now turn briefly to a case study; that of explaining investment cycles in China in the last two decades.

Structural Imbalance and Investment Cycles in Social Economies: The Chinese Case

Dobb's stress on indivisibility and getation lags (1952, pp. 152-53; 1955, p. 605-9) suggests the possibility of investment cycles, even in a planned socialist economy, because periods of acceleration of the capital goods sector will lead to tensions in the vertical flows involving material supply.

In relation to Dobb's Departments I, II and III, China's planning record is briefly as follows: Department I increased its weight in total industry, going from 11.4 per cent in 1952 to 17.3 per cent in 1965 and 27.7 per cent at the death of Mao (Shihkawa, 1982). After a period of confusion, earthquake reconstruction, and uncontrolled development of the construction sector and Department I during 1976-80, a new course was announced in late 1978, under which heavy industry expansion was cut back. If one looks at the Chinese statistics for this period they indicate:

(a) A drop in the growth rate of heavy industry from 7.7% in 1979 to 1.4% in 1980;
(b) An increase in the growth rate of light industry from 9.6% in 1979 to 18.4% in 1980;
(c) Investment covered by the national budget was 28,100 million yuan, a decrease of 24.9% compared with 1979. Of the total investment, the proportion for costs of non-productive assets rose to nearly 70%, of which the investment in housing construction went up from 16.8% in 1979 to 20% while that in light commodities increase from 6.4% in 1979 to 9.1%.

According to Chinese statistics, economic readjustment is not only the major task for the Three-Year Programme of Readjustment, but will be the central task of the Sixth Five-Year Plan (1981-85). What was the major cause of the new allocation policy in China between Departments I and II? Recall Dobb's warning that failure to keep the...
departments in step will cause output fluctuations. This suggests that China, with its notorious imbalances between sectors, and swings in investment rates, has experienced investment cycles of the Lowe type. When applied to socialist political economy the essence of a Lowe-based analysis is that an investment programme should not be too heavily concentrated in the machine-tools sector, for instead of the expected increases in consumption goods, the plan can end up delaying consumption.

Behind this are a number of key points about the structure of production which are highly relevant to China's last decades. As Lowe reminds us the technical specificity of production of a given stock of capital represents a key planning problem, because it affects the adjustment processes through which capital formation occurs - the links between successive stages of growth. Lowe also hinted that a combination of indivisibilities, "over-shoot" with regard to the annual rates of capital accumulation, and drastic steps might produce investment cycles in both socialist and capitalist economies, again due to the technical-physical properties of the industrial system.

What has been the course of the Chinese experience? The appended Tables 1–3 suggest that a socialist investment cycle rooted in production structure, but overlaid with a political trade cycle, has been operating in China over the last thirty years. Eastern European experience, notably Yugoslavia (Bauer, 1978; Pope 1976) suggests that the following can be responsible for such cycles: (a) spurs and starts in the volume of new, incomplete and finished construction; (b) the response of the government decision curves in the investment rate because the trade-off between accumulation and consumption has become too severe, followed by new political decisions to go for higher economic growth involving higher investment rates.

This is a kind of political trade cycle in a socialist context. Both (a) and (b) are a result of optimism usually following a good harvest or trade surplus and lack of coordination in investment planning. The first is also due to the fact that uneven finishing rates in consumption causes later "bunching" as projects may come on stream together. This allows a drop in the necessary accumulation rate but eventually this is again accelerated by top decision-makers and the cycle starts again.

It would seem that both types of causation have operated in China over the last two decades. Xu Dixin (1992) has stated that China suffered both from a rash of non-effective "political" investment projects and from lack of analysis of investment involved in construction lags, gestation delays etc. He referred as well to the dangers of constructing a plan just after a successful harvest, as leading to the danger of a political investment boom being set in train. The years 1979 and 1989 were particularly difficult for China's wage increases and bonuses exceeded the plan, budget deficits were increasing and yet investment in basic construction work was not cut back. Yet Lowe-type structural distortions were in evidence even earlier. The relative weight of machine-building industrial activity in total industrial output had risen from 11.4 per cent in 1952, to 17.3% in 1965 and 27.7% in 1975 - among the highest ratios of all the developing countries (Shiikawa, 1982).

These changes appear to reflect the impact of Soviet technology and its diffusion. This set off waves of construction as the Chinese copied and modified Soviet industrial technologies of 1960s and 1960 vintages. More waves of technology imports in 1962–65 and 1973–76 also played a role, and may have raised the level of the cycle once embodied in new plant (Shiikawa, 1992).

Political events such as the "Leap Forward" and the "Cultural Revolution", plus the objective structural constraints posed by overshoot of some sorts of construction (not necessarily all), for example, labor-power campaigns for rural infrastructure may have been highly effective) explain the wide fluctuations shown in Table 1, distorting the two cycles set off by construction. These factors caused two significant troughs in 1965–66 and 1976–79. Moreover, the restraints imposed by problems of adjustment of Departments Ia, Ib and II in the Chinese case were, in the past, only partly overcome by imports which had only a limited effect in the key Chinese economic sectors. Foodstuffs in 1959 had been almost a zero percentage of imports, but rose to 31% in 1961, 39% in 1964 and stayed at about 20% in 1969–75. To pay for this, investment effort was increasingly shifted to the export of oil. One can see that the political cycle, superimposed on the factors mentioned above, and the limited "escape from pressure" via imports will explain the severity of the Chinese cycle.

What Kind of Cycle

What happened in the Chinese cycles portrayed in Figure 1 can be explained by a building cycle, a Kuznetsov wave or a Lowe-type mechanism. The building cycle is a fifteen to eighteen years cycle linked to housing and construction activity changes (Mitchell, 1926). Peaks of building activity in American cycles antedated by a few years the depresions of the 1870s, 1890 and 1930s. It is, like a Juglar, a "major" cycle which embodies investment trends in buildings, roads, railways and some non-building construction work. Speithoff blamed the lack of capital occasioned by previous over-expansion of residential buildings and public utilities with long gestation periods for the

**FIGURE 1**

**THE CHINESE INVESTMENT AND OUTPUT CYCLE 1950–1980**

Source: Shiikawa, 1982, (In Japanese)
trade cycle itself. The Kuznets cycle (Kuznets 1930) originally arose from a recognition of similar 20-year cycles, which includes transport, six building-transport cycles have been identified (Board, 1962) in recent LSS, economic history as being linked to population/immigration changes, canal construction, railway expansion and, finally, highway construction for the automobile age.

What would be the advantage of using a Lowe-mode? Theorists who have explained the building cycle, like A.F. Burns and Wesley Mitchell have said little about incentives. Yet a capitalist construction cycle will clearly be different from a socialistic one: the former will depend on fluctuations in rents and banking finance and the time it takes to recruit builders and skilled workers. The latter depends on planners and politicians’ preferences and resistance by workers and peasants to the threat to their consumption posed by very high rates of state construction.

Lowe (1926) gave reasons for rejecting explanations of cycles based mainly on lags of one group of indicators. To assume varying time-spans for the reaction of separate categories of agents in the accumulation and production process simply destroys general interdependence. If such variation in reaction time really creates costly cycles, Why didn’t they learn to coordinate their reactions better? This sort of analysis is not able to integrate motivation and interaction of economic agents.

Lowe’s discussion emphasized the shifting of resources between the sectors, and this can help to explain the fluctuations. Economists associated with the Yugoslav Federal Planning Institute (Stojanovic and Gacic, 1964) with Czechoslovakian economic plans (Goldman, 1964) and with Hungarian planning (Bauer, 1978) all linked investment cycles to: (i) fluctuations occasioned by the bunching of replacement needs for indivisible and specific industrial plants; (ii) gestation lags of a capital stock of uneven age profile; (iii) political decisions affecting the shape of the “government decision curve” (Kaliesch, 1969, p. 49). Yet behind these general causes of socialist investment cycles were aspects of the circular flow between departments and the vertical input flows within departments highlighted by Lowe’s move of the “government decision curve” as a shift of resources from Department I to Departments II and III. Chinese investment cycles continued throughout the 1960s and 1970s despite a moderation of economic growth targets, so that the cycles were not mere corrections to forced-draft industrialization. This is new thought to be a result of simultaneous starting of new physical projects rather than investments “flowing on stream” at some times and not others (itself a factor in cycles noted by Lowe), or with an acceleration of output in Department I. This may have been reinforced by some pressure of an accelerated rhythm of output in Department I on the material input supplies (Bauer, 1978, p. 250). In the ways shown by Lowe (1952, p. 146, 1955) economic branches producing “input” products can expand more easily than raw materials sectors located in II and III.

Consulting Remarks

The kind of work done by Lowe as early as the late 1920s should really have been forthcoming in the USSR in the period 1930-1934 as this corpus of ideas corresponds to what we now know to be the behaviour of key variables and the dynamic sectors of production. It is a fact that had been made by Bobo, Kouvalevsky, Feldman and Ormen. (Kouvalevsky 1935; Miller 1934-35; Jarry 1972 Ch. 3, 4, 7, and 10). It was interpreted by Stalin’s view that “our Soviet plans are not playing with funny figures - they are instructions”. Action to remove the Mnesheviks, (Gorresen and Bazareov) and the non-Mnesheviks, (Kouvalevsky and Feldman) followers, and “structural models of production” were halted.

While critical of economic determinism to the detriment of social and individual behaviour in the political superstructure (perhaps a result of observing the Nazi Party), Lowe’s writings are part of a family of Marxist-inspired growth models. One important qualification to this bold statement is that Lowe examined how networks of input-output and circular flows between sectors are generated. His emphasis is not only on the properties of his networks, but on the evolutionary theory linking the feedback processes to human and social systems. Chapter II of "On Economic Knowledge" (1965) reflects Lowe’s view of the problem. Industrial technology poses the need for a "Political Economy" which can use "instrumental analysis" linking ends with the postulated required means. Equilibrium will partly be the result of the transformation of inputs into a suitable net of outputs which agree with some postulated basket of consumer goods (Lowe, 1965, p. 257) but dynamic equilibrium involves more than a bipartite sectoral division of the system and a distribution of inputs over the three sectors so as to assure a constant output of capital goods and consumer goods over time. It involves a time profile of change, different paths and what Lowe (1965, p. 259, 273, 293) calls "forced," "forced analysis" study behaviour and motivations when dominated by "social relations". This seems to imply that relations between product prices, wage-rates, surplus product and its distribution depend on "forces" including in particular the motivation of economic agents. Lowe stressed that structural change and technical change-over must be introduced not as dummies but as real life sectors, so that technological determinism is avoided.

The place of Lowe in the line of economic thought dating back to the Tableau Economique is perhaps a final question. My hypothesis is that two lines of development have occurred; first, there is the Quennan — Marx — Lowe — Laxenian tradition, which emphasizes certain problems of structural growth of a disaggregated kind. A second line of development is the Quennan — Ricardo — Marx — Dumbold — Smitha tradition which emphasizes the distribution of surplus by means of a uniform rate of profit with the use of an average or standard industry. When Lowe discusses input flows he comes close to this group (Nellis Appendix to Lowe, 1976).

Both of these “lines of economic thought” and Adolph Lowe’s work undermine the role of general equilibrium analysis in economic planning. A comparison between Lowe (1976) and GM. Heal (1973) reveals a world apart. In the latter, alternative plans are examined as “ideologically neutral” logical problems of general equilibrium. Lowe, on the other hand, utilizes a series of insights that have proven their relevance and usefulness to develop a theory which is designed to guide practice.
### TABLE 1

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<tr>
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<tbody>
<tr>
<td>National Income (YMN)</td>
<td>= Billion yen in 1955 prices</td>
<td>55.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total value of industrial production = same</td>
<td>27.6</td>
<td>44.9</td>
<td>85.2</td>
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<td>Of which, heavy industry production = same</td>
<td>9.8</td>
<td>34.0</td>
<td>52.9</td>
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<tr>
<td>Of which, light industry production = same</td>
<td>19.8</td>
<td>10.9</td>
<td>32.3</td>
</tr>
<tr>
<td>Total value of agricultural production = same</td>
<td>64.6</td>
<td>41.1</td>
<td>131.7</td>
</tr>
<tr>
<td>Amount of food grain production unprocessed, million tons</td>
<td>135.9</td>
<td>213.5</td>
<td>223.0</td>
</tr>
<tr>
<td>Population/year average million persons</td>
<td>204.2</td>
<td>422.5</td>
<td>996.7</td>
</tr>
<tr>
<td>Per capita national income = yen in 1970 prices</td>
<td>115.0</td>
<td>205.3</td>
<td>345.2</td>
</tr>
<tr>
<td>Per capita food grain consumption, kg</td>
<td>280</td>
<td>280</td>
<td>280</td>
</tr>
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Remarks: Annual rate of growth is derived as a compound annual rate of growth between the years at both ends of the phase indicated. That in the bracket is derived as the annual growth rate estimated by the least square method.

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TOWARDS A DYNAMIC ANALYSIS OF THE "TRAVANCE*

Maria Amendola

1. The "Travance" and Analysis of the Innovation Process

Adolph Lowe's extensive study of the "travance", has remained rather isolated from the mainstream of economic literature (1976). Much the same fate has befallen John Hicks's highly controversial "Neo-Austrian theory" which purports to be a helpful new way of dealing with fixed capital in the analysis of the transition from one steady-growth path to another. (1970, 1971)

The analysis of the "travance", even in the sketchy and limited way pursued up to now, is one of the most genuine pieces of dynamic analysis produced so far. In particular, it has provided the most adequate theoretical framework for treating the process of innovation, which is the process through which technical progress reveals its truly dynamic nature. Modern growth theory and the comparative dynamic analysis derived from it, has not proved capable of dealing properly with the phenomenon of changing technology (conceived of as the shift of a given production function) as a basis for competing alternative equilibrium positions. That is why Hicks and Lowe, each in his own way and quite independently from the other, have followed alternative routes in their respective analysis of the "travance", with the objective of shedding light on the way in which technical progress actually widens its way through the economy.

Similarity of interests and perspective, and dissimilarity of basic assumptions and proposed models, are an instructive framework in which problems and solutions can be compared and contrasted. A comparison between the two contributions, certainly the most important in the field, will single out the relevant issues (i.e., what is really meant by technical progress, how should the process of production be represented) while also focusing methodological and analytical problems. From this perspective, the two models appear as logically successive steps along the way to a better understanding of the process of change of the economy.

Moving from an orthodox sectoral framework, Lowe fixes attention on time sequence rather than on the horizontal structure of production. Not yet freed from the traditional approach, his representation of technical progress and the underlying process of production does not permit analysis of the transition process which takes place in time.

Hicks achieves a complete break with the traditional theoretical apparatus, thus going in the whole way in the direction anticipated by Lowe. Sequential analysis of a process of change requires a process of production conceived as a sequence in real time; this is exactly what Neo-Austrian theory does. In this new approach, the relevant

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