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Economic Innovation and Economic Management

David Granick

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ECONOMIC INNOVATION AND ECONOMIC MANAGEMENT

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I. INTRODUCTION

The Analytic Framework

Our analysis of the activity of Soviet managers will be carried out within the neoclassical economic framework. The standard neoclassical treatment of decision making by capitalist firms is to treat the firms as maximizing the enterprise utility function subject to various constraints (e.g., capital availability, market conditions, the strategy of competitors, etc.). In order to simplify the enterprise utility function, it is assumed that this can be expressed as discounted longterm economic profits.

Our counterpart analysis of the activities of managers is that they also maximize under constraints. However, we do not posit the existence of an enterprise utility function, but rather of a separate utility function for each of the individual managers. Paralleling the neoclassical treatment of the enterprise utility function, we assume that the managerial utility function is strictly economic: i.e., it consists of the discounted lifetime monetary earnings of the manager. (For private businessmen in the pre-Revolutionary period, lifetime earnings include the increase in the capital worth of the business.)

The first advantage of this approach is its generality. The activities of Soviet managers over the entire fifty years of the Soviet Union's existence can be analyzed within the same framework. Periodization, and the contrast of managerial activities between periods, depends exclusively on changes in the factors affecting the discounted lifetime earnings and on changes in the constraints under which the managers function.

The second advantage is that the approach is extremely narrow in its definition of the managerial utility function. We posit that the managers are uninfluenced by patriotism, Party spirit, or symbolic rewards such as

medals. The significance of the fact that managerial failure in the late 1930's could be punished with the death penalty, while in the postwar era the highest usual penalty has been demotion, is captured in our model exclusively by a higher risk discount being applied in the late 1930's to prospective future earnings. These, of course, are very strong and unrealistic assumptions. But they allow us to proceed with a fairly well-defined utility function, and to concentrate upon differences between periods which are much easier to treat than would be differences emanating from such amorphous concepts as partiinost'. If this sparse and limited form of a managerial utility function can permit us to generate interesting results concerning historical change, it can be justified on the basis of Occam's Razor.

It should be noted that our treatment of the manager's utility function is quite different from other equally stylized approaches to organizational behavior which might be used. In contrast to the neoclassical maximization of the organization's utility function, which implicitly assumes that the organization's problem of motivating its various levels of hierarchical managers to an identical goal has been solved, this treatment concentrates attention upon the reconciliation of Soviet enterprise managers' private utility functions with the social welfare function as this is expounded by the Planners.

A second alternative stylized approach would be to concentrate upon the managers, but to regard them as Weberian rule-obeying bureaucrats. Such an approach posits a particular environment for the managers (one in which there is no reward/punishment for success/failure in attaining success indicators) which is very far from the Soviet environment as it has existed at any historical period.[1] In contrast to our view of managers (following Alfred

1. D. Granick, Management of the Industrial Firm in the USSR (Columbia Univ. Press, N.Y., 1954), pp. 262-268.

Marshall), Weber's bureaucrats are technicians and organizers but not risk takers.

A third alternative approach would be a stylized description of the Japanese ringi system of management in large companies. Here responsibility, and thus risk, is taken by a group rather than by individuals; moreover, the relevant group includes all managerial personnel at all hierarchical levels within the organization. This approach is a variant of the first alternative discussed above, differing if at all only in that the managerial group as a whole may have a utility function other than the maximization of the well-being of shareholders. What is critical is that, like the first approach, it begs the question as to the reconciliation of the interests of different individual managers both at the same and at varying hierarchical levels. Since there is no reason to define "organization" in the Soviet context as an enterprise -- a ministry, all of industry, or even the entire State sector would make at least as much sense -- the question begged by this approach is a basic one for purposes of this paper. Even defining "organization" narrowly as the individual enterprise, this approach seems particularly inappropriate for an analysis of the Soviet (as opposed to Japanese) enterprise, since for the individual Soviet manager the risk component embodied in potential promotion or demotion frequently involves career movement outside of the given enterprise.

The Definition of Manager

This paper shall use the term "manager" in the sense given the term by Alfred Marshall: as including both independent owner-operators of businesses and executives of joint-stock companies. A natural extension of Marshall's category of executives of joint-stock companies, and Soviet enterprise managers.

In order to limit the scope of this paper, executives in Soviet non-khozraschet administrative units which coordinate and plan the activities of enterprises shall be defined as administrators rather than as managers. There is, of course, a good deal of arbitrariness in this restriction of the term manager. It can be justified not only by the fact that it follows Soviet terminology in creating two subsets of organizations at different hierarchical levels, but also by the fact that non-khozraschet administrative units have usually not been evaluated by means of the types of success-indicators used for enterprises, nor have their administrators been rewarded through a similar type of bonus scheme.

Marshall describes the functions of managers as consisting of the superintendence of labor and of action as middlemen intervening between the manual worker and the consumer. The crux of the latter function is that the speculative element is fundamental to the manager's role. The manager in the joint-stock company (as in the State enterprise) is not the ultimate risk taker, this role being reserved for the shareholder (State). Nevertheless, the executive who takes no risks does not seem to be a manager in Marshall's sense.[2]

Marshall points out that the managers in joint-stock companies need not risk their own private capital; they are not required to bring any capital into the company.[3] In this regard, they are identical with managers of State enterprises. What, then, is their risk? Clearly it is the management of risk for the organization and its ultimate owners, but in what way does this entail personal risk for the managers themselves? I have not been able to find an answer to this question in Marshall, but presumably the proper answer should be the same for the Soviet enterprise manager as for the capitalist joint-stock

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2. Alfred Marshall, Principles of Economics (MacMillan, London, 8th edition, 1920), pp. 293, 297, 302, 613. Marshall includes "business men" as a subset of managers; their reward consists of the "earnings of management" (p. 74).

3. Ibid., p. 302.

manager. Following the approach I have used above, this personal risk consists of the prospective reduction of the manager's actual discounted lifetime monetary earnings from their expected value.

Schumpeter employs a much narrower concept than Marshall's manager: for Schumpeter, an entrepreneur is a Marshallian manager who is carrying out new combinations.[4] The difficulty with Schumpeter's concept for our purposes is that "it is just as rare for anyone always to remain an entrepreneur . . . as it is for a businessman never to have a moment in which he is an entrepreneur, to however modest a degree."[5] Thus Schumpeter's term of entrepreneur identifies a function, not an individual in a job-position.

Just as Schumpeter's definition concentrates on a specific role, so too does Marshall's. But Marshall's manager is not the only economic actor who takes risks; the manual apprentice who invests in his own human capital, in the hope of earning quasi-rents, takes similar risks. It is for this reason that Marshall's definition must include not only risk, but also the roles of superintendence of labor and middleman between the worker and the consumer.

II. PERIODIZATION OF SOVIET MANAGEMENT

The 1920's

The 1920's, and particularly the first half of this decade, appears from secondary sources to be a period in which State enterprises as well as private ones were profit maximizers. This was a period during which there was very little planning or centralized control of the economy, and in which the prime integrating forces at a micro-level were those of the marketplace.

Partly this is shown in the Decree of April 1923 which defined the legal status of industrial trusts, and which gave them independence in their operation

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4. Joseph Schumpeter, The Theory of Economic Development (Oxford Univ. Press, N.Y., 1961), p. 75.

5. Ibid., p. 78.

with the objective of deriving profit.[6] More significantly, it is revealed in the Scissors Crisis of 1923 and in the renewed price increases which began in the middle of 1925.

During the Scissors Crisis, the industrial trusts and syndicates acted as profit-maximizing monopolists operating without a cashflow constraint. The prices of industrial goods sold to the countryside were pushed up sharply, even though this policy required the reduction of the physical flow of industrial goods and the accumulation of finished-goods inventories by the trusts and syndicates. What is most revealing is that Government instructions, moral pressure, and even directives to the trusts as to pricing policy were to no avail. The crisis was resolved only when the Government adopted market mechanisms to force down industrial prices: primarily the restriction of bank credit to industrial and trading organs, thus placing them in a cash bind, but also -- in special cases -- even the importation of industrial goods so as to undercut the syndicate prices.[7] It seems difficult to interpret this crisis, and particularly the nature of the tools used by the Government to deal with it, without hypothesizing that profits constituted management's objective function.

Curiously, it is this first period in Soviet economic history which is most difficult to interpret in terms of managers maximizing their private discounted lifetime earnings under constraint. My personal suspicion is that this difficulty arises more from lack of research, into the relevant aspects of the period than from the nature of the period itself. But alternative explanations suggest themselves.

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6. This was the first decree defining the status of the trusts, and it was not amended until 1927 (Alexander Baykov, The Development of the Soviet Economic System, Cambridge Univ. Press, Cambridge, England, 1947, pp. 110-111).

7. Maurice Dobb, Russian Economic Development Since the Revolution (George Routledge & Sons, London, 1928), pp. 235-71.

During the period of 1923 and thereafter, managerial power in enterprises, trusts and syndicates was shared by Communist Party members (largely Red Directors without much formal education or business training) and pre-Revolutionary engineers, managers and business men. In 1924, 56 of a total of 64 heads of industrial trusts were Party members; half of all these heads were Old Bolsheviks. Half of all factory directors were Party members. Yet, if one adds enterprise directors together with the members of the administrative boards of the enterprises, three-quarters were non-Party experts.[8] Thus we are forced to explain the decisions of such disparate groups as educated Old Bolsheviks, uneducated Red Directors, and non-Party experts.

Non-Party experts may well have believed that their earnings would be higher in very profitable units than in those which were only marginally profitable or were suffering losses, and that their positions would also be more secure to the degree that they demonstrated business acumen (their stock in trade) by achieving the profit goal set forth in the decree defining the trusts' legal status. Thus it is not difficult to explain why profits should have served as the maximand for these experts.

But why should this maximand have been equally accepted by the Party members once the Government had shown itself hostile to high industrial prices? Subject as they were throughout the 1920's to the "Party maximum" of monetary earnings, their current incomes could scarcely have been increased by monopolistic behavior. One would have thought that their security in post and future careers (and therefore their lifetime earnings) would be better advanced by obedience to national Party and Government policy than by following the legislation which was intended formally to guide their trusts' activities. However, the period has been studied too little to be sure of one's ground here.

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8. Jeremy R. Azrael, Managerial Power and Soviet Politics (Harvard Univ. Press, Cambridge, Mass., 1966), pp. 46, 67, and 216.

Two other explanations of the behavior of Party directors during this period, both alternatives to maximization of discounted lifetime earnings, suggest themselves. The first is that the Party directors regarded themselves in economic matters as simple apprentices to the non-Party experts, and thus that they accepted blindly as appropriate to NEP the traditional enterprise goals stemming from the pre-Revolutionary capitalist period. After all, in this they could find support in the April 1923 statute of the trusts. The second complementary explanation is that they were influenced more by the Party Opposition policy toward industrial prices[9] -- an espousal of a form of primitive accumulation at the expense of the peasantry -- than by the official line. Both of these explanations, of course, fall quite outside the domain of the analytic framework I have suggested.

The 1930's

The beginning of the 1930's is the period of the sharpest break in Soviet managerial history which has yet occurred. This was connected primarily with the creation of a system of annual obligatory national plans for production operations, together with a system of materials allocations, all brought down to the enterprise level. A secondary element was the achievement of a virtual monopoly over managerial posts at the executive (as opposed to narrowly technical) level, at least in larger enterprises, by Party members who either had considerable managerial experience or a higher-educational engineering education.

It is these features which fundamentally distinguish the 1930's from the NEP period. But what distinguishes them from latter years? In my view, it is the fact that the 1930's constituted a period of enormous potential for career movement, up or down, for all those involved in industrial management.

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9. Dobb, pp. 254-55.

During this decade, career development must have been the major factor determining the expected discounted lifetime monetary earnings of managers. This seems not to have been the case during any latter period.

During the decade of the 1930's, as in the following two periods, the expected discounted lifetime earnings of managers can be taken as a function of the following three independent variables.[10]

[a] The quality of the resources at the disposal of the manager's production unit, particularly when such quality is difficult to measure and is unlikely to have a significant effect on the level of the plans set for the unit.

Among such resources, the critical one most under the control of the managers is the quality of the labor force attracted and retained by the enterprise. Given the fact that most labor was recruited at the factory gate, was free to move between industrial enterprises until the end of the 1930's, and that in fact there was very high labor turnover, the relative level

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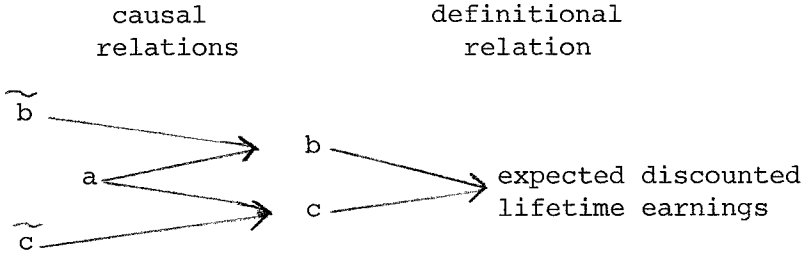
10. The expected discounted lifetime earnings are an explicit function of [b] and [c] below, but only an implicit function of [a] . In the discussion below of variables [b] and [c] , I shall treat only the elements other than [a] which influence their respective magnitudes. The discussion is then of causal elements, as shown in the diagram below which consists partly of causal and partly of definitional relations. Much of the discussion of variables [b] and [c] throughout this paper should more precisely be described as discussion of $[\tilde{b}]$ and $[\tilde{c}]$.



A fourth minor explicit variable consisted, especially after 1936, of the profits earned by the enterprise which served to provision the director's fund. But the relative importance of this variable was so slight that it can be virtually ignored.

of compensation provided to the labor force must have had a major influence on its quality.

[b] Bonuses earned by managers.

[c] Prospects for career movement of managers.

With regard to variable [a], earnings of manual workers were primarily a function of piece-rate earnings and of counterpart bonuses for hourly-paid workers. These, in turn, were functions of the annual plan for the enterprise as to the wage fund per employee, and of the actual plan fulfillment of gross output (valovaia produktsiia) per employee as measured in constant prices or physical units. This last feature made gross output per employee an important intermediate objective of managers. Partly this objective must have been modified in the direction of total gross output since -- in order to attract the relatively plentiful unskilled laborers -- it was not necessary to offer them the same proportion of earnings above their standard wage which was required for skilled labor that was in much shorter supply.

Thus we have here an independent source of incentive to managers for laying emphasis on the goal of valovaia produktsiia. This is an incentive which has continued to this date. But it must have been much less important as an incentive during the 1930's than in the two later periods for two reasons:

First, State Bank control was less effective in preventing overexpenditure of the enterprise wage fund during the 1930's than was the case afterwards. Thus managers in the 1930's had more room for raising manual worker earnings without increasing measured output proportionately.

Second, the expected period in post of a given manager was shorter during the 1930's than it became later.[11] Therefore, since higher or lower relative earnings of his enterprise's labor force would affect the quality of this labor

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11. D. Granick, Managerial Comparisons of Four Developed Countries: France, Britain, United States and Russia (MIT Press, Cambridge, Mass., 1972) pp. 235-40.

force only with a time lag, managers were in a better position during the 1930's than afterwards to ignore this lagged quality effect on the ground that they themselves were likely to be elsewhere when the lagged variation in labor force quality in turn had its effect on the enterprise's performance.

With regard to variable [b], managerial bonuses were in theory linked to total enterprise performance relative to the annual plan without any explicit weighting of the various indicators of such plan fulfillment. In practice, it seems clear that valovaia produktsiia was the indicator given overwhelmingly dominant weight.

It would be incorrect, however, to exaggerate the importance of managerial bonuses during the period of the 1930's. The best indicator which we possess is the ratio of bonuses to total monetary earnings of all managerial and professional employees (ITR) in industry. During the fall of 1934 in heavy industry, this proportion was only 4 per cent. We have no further data until 1940, by which time it had risen to 11 per cent. It was only during the War and immediately afterward that the proportion rose to two and three times the 1940 level, even exceeding the ratios of the first half of the 1970's.[12] These figures suggest that, almost certainly in the early and middle 1930's, and perhaps even until the end of the decade, managerial bonuses were relatively insignificant.

This comparative insignificance suggests that the weight of variable [b] -- with the resulting stress on the plan indicator of valovaia produktsiia -- was relatively minor in the utility function of Soviet managers during the decade under consideration.

Thus it is to variable [c] -- career movement -- that we should turn in searching for the predominant factor in managers' objective function during the 1930's.

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12. Ibid., pp. 277-79.

During 1934 and 1936 in various branches of heavy industry, some 25 to 34 per cent of all enterprise directors had held their post for less than one year, and an additional 40 to 56 per cent for between one and three years. Moreover, even during the pre-Purge period of January 1934 to March 1937, some 39 per cent of those directors in heavy industry who changed their post and whose next position could be traced suffered a demotion.[13] Throughout the decade -- although for very different reasons before and during the purges -- managerial career mobility upward, downward and laterally stood on a peak ridge as measured both by Soviet and by international standards.

But what is it which determined the shape of individual careers? Clearly it can have been only one thing: the judgment by hierarchical superiors (as well as by Party and secret police organs) of the overall success of the managers in their previous and current positions, as well as evaluations of "potential" (both managerial and political). The predominant influence of plan fulfillment as measured by valovaia produktsiia in the shaping of careers was possible only to the degree that superiors were willing to give it pride of place in their subjective evaluations.

To sum up, the 1930's seems to have been a period in which enterprise managers could best maximize their discounted lifetime monetary earnings through attempting to carry out their "plans" by emphasizing those aspects of plan fulfillment which they expected would carry the greatest subjective weight with their superiors at glavk and ministry level and in the Party hierarchy when these reviewed their accomplishments at a latter date. There were other aspects of their reward structure and environment (incorporated in variables [a] and [b]) which bound them to give special attention to the criterion

13. Granick, Management of the Industrial Firm, pp. 290-96.

of valovaia produktsiia -- but such aspects had relatively slight importance during this decade. To the degree that managers did emphasize valovaia produktsiia, and there can be little doubt that this degree was considerable, it was because of its importance in determining their career progress.

The import for innovation within Soviet industry of such subjective evaluation by superiors in the utility function of managers was that, in my opinion, the 1930's constituted a decade of extraordinary innovational accomplishments compared to the bleak record ever since. Designs and equipment radically different from those used earlier in the USSR were imported from abroad and put into reasonably effective operation: this represented a major process of successful implementation of innovations, a process which proved difficult to continue in future years when the designs and equipment were Soviet developed and thus should have been easier, ceteris paribus, to employ successfully. Foreign designs and equipment were quickly copied, with highly successful modification, for the building of "duplicate" plants.[14] It proved feasible for Soviet ministries and glavki to alter radically and quickly the product mix of operating enterprises, a feat which later defeated their best efforts. The machine tool industry, for example, was fairly quickly converted in the middle 1930's from a sector following a policy of large-scale production of a very narrow range of products to one in which expansion of range was given high and successful priority.

Most impressive of all, in view of the later Soviet record, was the fashion in which the mix of Soviet imports changed continuously and dramatically

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14. See the construction of the Kharkov Tractor Plant on the model of the Stalingrad Tractor Plant; the Kharkov plant, using a much higher proportion of Soviet-constructed equipment, had a superior performance record as measured by a series of relevant performance criteria. (D. Granick, Soviet Metal-Fabricating and Economic Development [Univ. of Wisconsin Press, Madison, 1968] pp. 117-19.)

during the course of the first half of the decade. Major imports of a given year would fade into insignificance within a very few years as these products were mastered by domestic industry. Implementation of both product and process innovation, accompanied by significant modification to meet domestic conditions, was one of the decade's major accomplishments which seems to me difficult to deny.

I believe that the chief reason for this success was managerial. To the degree that managers were rewarded in terms of their discounted lifetime monetary earnings for stressing those aspects of their work most important to their superiors, there was no reason that innovation implementation could not be incited just as effectively as could emphasis upon valovaia produktsiia. It became a matter of what glavk and ministerial authorities wanted; never again has the Soviet managerial reward system been structured so as to give authorities above the enterprise level so much freedom to exercise choice of this type.

1940 to 1965

It is this third period in Soviet managerial history which the Western models seem to describe best. These are the years of the complete predominance of the criterion of valovaia produktsiia and of the neglect of other performance criteria.

In formal terms, nothing of significance altered between the second and the third period. The objective function of managers in the third period can be analyzed in terms of the same three variables used for the second period. It is the relative significance of these three variables which changed dramatically.

The most important change was in variable [c]: career development. The great expansion in the number of industrial enterprises to be managed ended with the major structural change of the economy which occurred during the second period. The political purges of the second half of the 1930's brought into office a generation of young executives who were to grow old in their posts, thoroughly clogging the lines of promotion during the entire third period. These two developments could only be taken as "givens" by those Soviet authorities in the third period who shaped policy as to managerial careers. But there was also a third development over which such authorities did have control; the previous practice of widespread and rapid demotion for failure was abandoned, and managers were provided with a degree of job security never granted in large American companies.[15] The managerial insecurity of the 1930's was replaced not only by relative political security, but also by career security. In so far as industrial managers were concerned, the Soviet system had stabilized into comparative ossification. Both the carrot and the stick implicit in career development almost disappeared; from having constituted the prime variable affecting managers' objective function during the years of the 1930's, variable [c] exercised only a minor influence throughout the third period.

Variable [a] -- the quality of the labor force as a lagged function of worker earnings -- must have become of considerably greater significance to managers in the third period than earlier. This is because managers now had a far higher probability of remaining in post long enough to gain or suffer from the lagged effects of these worker earnings. Thus the importance to managers of valovaia produktsiia was bound to rise.

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15. Granick, Managerial Comparisons, pp. 235-40, and Azrael, pp. 230-31. The last source tells us that in 1962 an absolute majority of the directors of the leading enterprises of Leningrad had apparently held their posts for more than fifteen years.

Probably of even greater significance in this regard was the fact that the Soviet economic control system had matured sufficiently by the late 1940's to prevent the huge overexpenditures of wage funds which had characterized the 1930's. The royal route to increasing manual worker earnings as a proportion of base pay now took the form of expanding valovaia produktsiia per worker. The enterprise director of this latter period who slighted this indicator of plan fulfillment to the benefit of other criteria was creating major difficulties for himself with regard to his manual labor force.

Variable [b] (bonuses for managerial and professional employees) continued, as in the 1930's, to be linked primarily to plan fulfillment of valovaia produktsiia. But, in contrast to the earlier years, such bonuses had a major effect on managerial earnings through 1959; even during the 1960-64 period, when they were at a postwar low, their proportion of earnings was double the 1934 level.[16]

To sum up, the 1940-65 period was one in which variable a became more strongly attached to the criterion of plan fulfillment of valovaia produktsiia than had been the case earlier, and in which variable [b] -- always strongly linked to this indicator -- increased enormously in relative importance. At the same time, variable [c] -- the only one relatively independent of valovaia produktsiia -- lost its significance. The result was that, during this quarter of a century, expected discounted lifetime earnings of managers virtually became a function solely of the indicator of plan fulfillment of valovaia produktsiia.

Less certain, but nevertheless probable, is that the "ratchet effect"[17] came to exercise a significant influence on enterprise behavior during these

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16. Ibid., p. 278.

17. See Holland Hunter, "Optimum Tautness in Developmental Planning," Economic Development and Cultural Change, July 1961, Part I, pp. 561-72.

years. This effect expresses the notion that annual plans for enterprises in year (t + 1) are set as a function of their actual production in year (t), and thus that managers are motivated to restrain their degree of above-plan output -- when such output is feasible -- because of the likely effect of such output on the standard against which they will be judged in following years.

It is in these years that Soviet economic literature began seriously to reflect the working of the ratchet effect, although this effect does not find statistical expression in data at the ministry level.[18] (We have no statistical data available at the enterprise level, which is precisely the level at which Soviet complaints have centered.) Of course, this effect was unlikely to be serious for enterprises faced with tight plans in year (t); but there must have been many for which the plans were loose.

There are two reasons why the ratchet effect on plan formation might be assumed to have had less influence on managerial behavior during the 1930's than later. The first is that one would expect it to take some time before enterprise managers became aware of how their enterprises' plans were actually shaped, given the influence on such plans of a host of random factors which would tend to hide the effect of plan fulfillment in the previous year. The second is that during the 1930's the enterprise manager in year (t) had reason to believe that he might well have been moved elsewhere by year (t + 1), and thus would not personally suffer from the use of a higher standard of performance for the enterprise in year (t + 1).

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18. For six years of the first half of the 1950's, the percentage of plan fulfillment of valovaia produktsiia by industrial ministry in year (t + 1) can be regressed against the same percentage achieved in year (t). The ratchet effect, if existing in a major form at the ministerial level, would make the sign of the coefficient negative. In fact, even when dummy variables are introduced for individual years, regression analysis shows that the coefficient was significantly positive. (D. Granick, "Soviet Use of Fixed Prices: Hypothesis of a Right-to-a-Job Constraint," forthcoming.)

The greater influence during 1940-65 of the ratchet effect on managerial behavior had, in its turn, two effects. By far the greater must have been to relax the efforts put forth by enterprise managers once the achievement of their valovaia produktsiia plans were secured. But a second effect must have been to divert their efforts at this stage to other goals than that of valovaia produktsiia. This second effect -- relevant only for those enterprises already assured of as much overfulfillment of the gross output plan as their managers felt to be safe -- reduced the net tendency caused by the development of variables [a], [b] and [c] described earlier. But such reduction appears to have been weak, applying as it did only to the most patriotic or ambitious managers.

Post-1965

The fourth and current period of Soviet managerial history has seen a major effort to overcome the problems emanating from the third period. Three principal goals have been pursued by central authorities: (1) the reduction of the relative importance of the valovaia produktsiia success criteria in managers' utility functions to the benefit of other quantitatively-measured objectives; (2) the reorientation of managerial efforts towards the implementation of product and process innovations; (3) a significant reduction in the debilitating effects of the ratchet system of plan formation. The first of these goals represented an objective which was new in Soviet history since planning to the enterprise level began around 1930. In contrast, the second and third goals should be interpreted -- if I am correct in my understanding of the 1930's -- as an attempt to reinstitute under a new guise the favorable features of the second period of Soviet managerial history.

To return to the three variables affecting managers' lifetime earnings, the one concerning which there is much uncertainty is variable [c] (career development). On the one hand, there is nothing of which I am aware in Soviet writing to indicate that the situation changed in this regard from that which existed during the 1940-65 period; certainly the same negative attitude toward managerial demotions seems to have prevailed.[19] On the other hand, there is the demographic evidence that the bottlenecks to managerial career advancement must have begun to break up as the generation which came to power at the end of the 1930's disappeared from the active scene; men who assumed positions of authority at the end of the 1930's must have been retiring in the middle 1960's. One would expect that such retirements would create a long series of career openings that would reinstate variable [c] as a major factor in managers' utility functions. Unfortunately, for lack of information, I shall have to abandon consideration of variable [c] in this fourth period with these cursory comments. It is a subject well worthy of research.

Variable [a] (the attachment of manual worker earnings to valovaia produktsiia through the mechanism of the wage fund) has continued unaltered as it had been during 1940-65.[20] The policy of change has been concentrated entirely upon variable [c] (bonuses) and upon the ratchet mechanism in plan formation.

After a five year period of low bonuses for industrial managerial and professional personnel during 1960-64, there followed a sharp and steady rise at least until 1973 (no latter data are available to me). Bonuses as a percentage

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19. See V. IAkushev and V. IAkhontov in Literaturnaia Gazeta, September 2, 1970.

20. In 1970, manual workers of industry received some 85 per cent of their total income from the wage fund, of which perhaps only 5 per cent was paid dependent upon enterprise performance other than that measured by valovaia produktsiia. (See E. K. Vasil'ev and L. M. CHistiakova, Effektivnost' oplaty upravlencheskogo truda v promyshlennosti, Moscow, 1972, p. 87.)

of total earnings for this group rose from 8.9 per cent in 1964 to about 27.5 per cent in 1973 -- a figure at the level of 1944 and 1947 and far higher than that of any other recorded year. In 1973, one-third of the upper managers of all enterprises supervised by the Russian Republic office of the State Bank had total earnings which were at least double the base salary set for their post.[21] Whatever may have been happening nationally to the potential for career advancement of managers, Soviet administrators at the highest industrial levels have clearly desired to attach enterprise managers' utility functions closely to the success indicators reflected in the bonus schemes.

Bonus schemes since 1965 have been constructed on a basis which is fundamentally new in Soviet history. For the first time, a number of different success indicators have been used for determining the bonuses to be distributed within any given enterprise -- with the weights of these different indicators being set in advance at least for the current planning year. Although the relevant indicators have changed significantly during the post-1965 period itself, the basic principle of ex ante weighting seems to have remained unchanged.[22] While a close proxy for gross output has remained one of these indicators, others were also included which measured the inputs used and the quality of the products produced.

This new bonus principle in Soviet industry can be interpreted as a system of shadow-pricing -- an awkward system, but the first utilized since the beginning

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21. Ibid., p. 87; Granick, Managerial Comparisons, p. 278. IU. Artemov in Voprosy Ekonomiki, 1975, 8, pp. 40-42; V. Minaev, N. Ksenofontov and V. IUdin in Ekonomicheskaia Gazeta, 1975, 43, p. 10.

22. See D. Granick, "Soviet Research and Development Implementation in Products: a Comparison with the G.D.R." (forthcoming) and U. S. Central Intelligence Agency, "Organization and Management in the Soviet Economy: the Ceaseless Search for Panaceas," ER 77-10769, December 1977.

of planning in the early 1930's. To the degree that the managerial maximand can be taken as consisting of bonuses, a "shadow-price" -- measured in bonus -- is set for each enterprise for actual performance minus planned performance according to each individual indicator. Enterprise managers can use these "shadow-prices" to interpret the appropriate trade-offs among these indicators; superior administrative organs are in a position to guide change in such trade-offs by altering the weights given to each indicator in the bonus scheme of a given enterprise.

It is by this means that central Soviet authorities have attempted to use the managerial bonus scheme to guide enterprise managers to a "desirable" trade-off among centrally-desired and quantitatively-measured objectives. Here is a fundamentally new development in the current period of managerial history.

On the other hand, central pursuit of implementation at the enterprise level of product and process innovations has shown much less novelty. The difficulty here has been that such implementation, despite various efforts, could not be successfully incorporated in quantitative indicators to be integrated into the bonus scheme. The best that has been accomplished is to reduce the costs (measured in bonus) of such implementation of innovation.[23] But this is far from a positive incentive.

One means of observing the degree of implementation of product innovations is by analyzing the composition of Soviet imports from hard currency countries. During the 1930's, as was pointed out earlier, Soviet imports of means of production changed radically from year to year as Soviet industry mastered the output of one product after another. Given the desire of the Soviet regime to import new technology from the West, and the perennial Soviet shortage of

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23. Granick, "Soviet Research and Development Implementation."

foreign exchange to finance such imports, one might have expected a similar variation during the postwar years in the composition of imports of means of production from the West.

One can test the degree of such variation by considering the imports of two relatively homogeneous groups of items (chemical equipment and pipe) as a proportion of all machinery, equipment and pipe imported from the West (Finland excluded).[24] Together these two categories constituted one-third of such imports throughout the twelve-year period of 1965-76; their proportion had increased from 15 per cent during 1955-59, to 40 per cent in 1960-64, and thereafter held stable at 32 per cent. This is a remarkable degree of stability compared to the record of the first half of the 1930's.

Taking each of the two categories individually, and using unweighted annual averages expressed in current prices for homogeneous periods, we find the following:

Homogeneous Periods	Pipe (as a percentage of all machinery, equipment, and pipe imports from the West)	Chemical Equipment (as a percentage of all machinery, equipment, and pipe imports from the West)
1955-58	1.4	4.8
1959-62	22.6	
1963-69	7.9	
1959-68		25.1
1969-76		13.1
1970-76	19.3	

24. Imports from Finland are excluded because of the special trade relations existing between Finland and the USSR (neither of the two selected categories are imported from Finland). Data are taken from Ministerstvo vneshnei torgovli SSR, Vneshniaia torgovlia SSR, annual yearbooks.

Two additional important and relatively homogeneous product categories might have been added into the proportion examined (ships and ship equipment and equipment for the wood and paper industries). However, they have been excluded because of the important role of Finland as an exporter of these products to the USSR. If one were to take unweighted five-year averages of the sum of all four product categories as a proportion of all machinery, equipment and pipe

The changes in the proportion of pipe imports are clearly not responsive to the main factor at work during the 1930's (the mastery of new products), but rather reflect variations in total Soviet demand for oil and gas pipe. Movement in the proportion of chemical equipment imports over the last eighteen years is indeed in the direction expected from extrapolation of the 1930's phenomenon, but the absence of trend over the last eight years is striking.

How can one explain the continued heavy concentration in these two categories? Technical advance in the West in these products has been evolutionary rather than revolutionary, and neither of the categories can be considered relatively heterogeneous. Unless one rejects the assumption that the Soviet government has given considerable weight -- particularly during the 1970's and under tight balance-of-payments constraints -- to the desirability of importing new Western technology, the explanation for the continued predominance of these categories among total Soviet imports of means of production would seem to lie in the incapacity of the Soviet economy -- and of its CMEA allies -- to achieve the sort of new-product mastery which was accomplished during the 1930's.

The third goal of the current period -- a reform of the ratchet system of plan formation -- has been pursued by attempting to develop five year plans which incorporate annual objectives for each of the relevant years. The concept is to leave the standard of evaluation stable throughout the five-year-plan period, thus permitting the ratchet effect on plan formation to be applied only every five years instead of annually. It is hoped that this will

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imported from the West (excluding Finland), we obtain:

1955-59	50.5 per cent
1960-64	65.3 per cent
1965-69	52.0 per cent
1972-76	40.3 per cent

The last nine years (1968-76) show no trend in this proportion, and the sole period of decline which represented other than annual fluctuations was 1967-68.

cause managers to behave, at least during the early years of each five year plan, as though the ratchet system of plan formation did not exist.

Although there are claims that such five year plans have been developed at the level of the individual enterprise, no serious supporting evidence exists. Greater success has been achieved at the ministerial level.[25] But even at this level, regression analysis carried out for 1971-75 has failed to indicate any independent effect whatsoever of the annual control figure within a ministry's five year plan on the annual plan figure of sales (a close proxy for valovaia produktsiia)[26] of that same ministry.

To summarize, the current period of Soviet managerial history has been characterized by the pursuit of three goals. The two which consisted of restoring the virtues of the 1930's period, although by new means, should be judged as constituting failures. The one goal which was indeed achieved was that of fashioning a managerial bonus scheme which could guide enterprise managers to a centrally-desired trade-off among quantitatively-measured objectives linked together in a system of shadow-prices measured in terms of bonus.

III. ANALYSIS OF THE SYSTEMIC CHANGES BETWEEN PERIODS

Alfred Chandler's analysis of changes in the structure of large American firms[27] is frequently referred to in the organizational literature concerning business enterprises; it represents an exploration of a hypothesis which is relevant to our problem. Chandler's hypothesis is that the organizational structure of large American firms has been adapted to changing environments

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25. D. Granick, "Industrial Growth: Hindrances to Labor Productivity and Management Problems" (forthcoming).

26. D. Granick, "Soviet Use of Fixed Prices: Hypothesis of a Right-to-a-Job Constraint."

27. Alfred D. Chandler, Strategy and Structure: Chapters in the History of the Industrial Enterprise (MIT Press, Cambridge, Mass., 1962).

external to the firm in such a fashion as to lead to better group decisions, and more effective actions, than would have otherwise occurred.

A strict application of this hypothesis to Soviet industry would concentrate upon organizational change (i.e., the division of ministries; the creation of ob''edineniia in the 1970's) and upon information flow within the total industrial hierarchy. A variant of this approach is relevant to this paper: have changes in the incentive system for managers, to the degree that such changes have been under the control of hierarchical levels above the enterprise level, represented appropriate adjustments to a changing environment? Have they operated in such a fashion as to improve, or at a minimum to maintain, the appropriateness of managerial decisions (assumed by me to be made throughout according to the criterion of maximizing the discounted lifetime monetary earnings of the manager) to the welfare function of central industrial administrators applied within constraints imposed by an environment which is outside the control of these administrators?

In dealing with this question, we shall be forced to define that portion of the environment which is outside the control of industrial administrators. Here, I shall employ a definition which entails a good deal of arbitrariness but has the virtue of concentrating our attention on the issues of interest in this paper. The purges of the 1930's, and the absence of major purges thereafter in industry, will be considered as external. So too will the shift after the 1930's away from extensive use of the device of managerial demotion for nonpolitical reasons. Also taken as external are such welfare decisions as those affecting the relative expansion of consumer vs. producer goods, and such institutional decisions as central planning, materials allocation, and the setting of most prices through administrative rather than market mechanisms. The reader who is disturbed by the arbitrariness of my definition can state

the problem to himself in an equivalent and perhaps less exceptional way: given decisions of the sort described above as "external" (regardless of who made such decisions), what can be said regarding the appropriateness of the remaining central-administrative decisions affecting managerial incentives?

From the 1920's to the 1930's

The major alteration -- from an unplanned, market economy to an economy planned primarily in physical terms -- is, of course, an external environmental change as I have defined that term above. The decision which requires analysis is the linkage of both bonuses and the wage fund to the criterion of valovaia produktsiia.

For this writer, the explanation of the decision has become clearer since I have recently had the opportunity of observing at close range two of the highest priority sectors of Algerian industry -- sectors growing very rapidly in both capital resources and manpower in the same fashion as did much of Soviet industry during the first half of the 1930's. In my view based on my Algerian experience, it would seem that any Russian ministry which in the first half of the 1930's was able to maintain at central level, and with a time lag of no more than one or two months, data as to the total tonnage of production and the total number of employees within each of its major enterprises had an internal information system worthy of some respect. If it went further, and was capable of assuring the receipt of production information by product groups and then of processing this information through multiplying the production components by fixed prices and thus obtaining a weighted total of valovaia produktsiia, it was doing as fine a job as one might reasonably think possible. Tolerably accurate and prompt information as to materials usage and direct costs, let alone as to profits or capital value, must have been well beyond the realm of the feasible.

Thus it would seem to me that if managerial and white collar earnings were to be linked to any success indicator, and if manual worker piece-rate earnings were to be subject to any limitation whatsoever imposed by levels above that of the enterprise, valovaia produktsiia was the only feasible choice.[28] The true alternative was between having no incentive system in industry (aside from career movement) and the linking of incentives to an indicator which was likely to distort decision making. Hving observed in Algeria the results stemming from having selected the alternative to the choice made by the Soviet leadership, I am impressed with the wisdom of the Soviet decision.

There is a second, somewhat more theoretic approach which might be taken to the reliance on the valovaia produktsiia indicator during the 1930's. This approach abstracts from the problems associated with the lateness, scarcity and poor quality of information, as well as from the problem of determining the product mix of the individual enterprise.

Given the decision to set product prices administratively, and the absence of sufficient central administrative staff to revise relative product prices with any frequency, it was inevitable that the pricing system would be a bad reflection of relative scarcities. Not only was this the case because of the constant development of new bottlenecks, but also because of major changes in the technology, in the scale of output, and in the quality of the labor force involved in the production of different products. Thus monetary costs, ruble profits, or rates of profitability would all have been very poor guides to managerial decisions.[29]

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28. The difficulty of getting reliable data as to even this primitive indicator may help explain why managerial bonuses were kept so restrained as a proportion of total managerial earnings in 1934, and why great reluctance was shown in giving the State Bank operational control over the size of wage payments to be made by the enterprise from the wage fund.

29. Very poor guides, that is, against the standard of a pricing system either established on the marketplace or set administratively during more stable times. With all their faults, it is not obvious that such guides would have been worse than the alternatives actually available.

In principle, the quantity of all inputs were planned (and thus fixed) for each enterprise over the course of a year. Taking all inputs as fixed, the correct statement of the economic problem of the enterprise was to maximize its value of gross output subject to these constraints. Thus, if we ignore the issue of product-mix choices by a single enterprise and pretend that each enterprise produced for sale only a single and homogeneous product, the maximization of valovaia produktsiia by each enterprise was the appropriate enterprise objective according to the standard of efficient operation of the economy as a whole.

Aside from the force of random factors (including the personal influence and connections of the managers of different enterprises), there were two major reasons why input availability at the enterprise level was not equal (or at least proportional as mong enterprises) to the annually planned quantities. The first reason was that the quantity of labor force was not in fact allocated, but was rather determined primarily by the level of quits and of the hirings at the factory gate. Enterprises could and did build the size of their staffs well above the planned level. Thus the size of the labor force must be taken as a variable rather than as a fixed factor.

While this variability of labor inputs at the enterprise level acted in the direction of making valovaia produktsiia an inefficient success indicator from the national economic standpoint, the importance of this phenomenon was relatively minor during the 1930's. In terms of the welfare standard of Soviet leaders, there was great excess labor force in the countryside; additional labor could be brought into existing urban centers without any significant capital investment in overhead facilities (including housing); therefore, the shadow-price of labor was very low.

The second and more significant reason for the variability of inputs at the enterprise level was that the rationed material inputs used for current production (as opposed to capital expansion) depended not only upon planned allocations but also upon the degree of informal priority given to the products of the enterprise. For the very highest-priority enterprises, managers might virtually expect that the only major constraint to the expansion of production was their existing capital stock; for this group, maximization of valovaia produktsiia implied utilization of material inputs as though they were free goods. Thereafter, as we move down the priority listing of products, the enterprises producing such products were increasingly constrained by the quantity of materials they could expect to receive rather than by their fixed-capital capacities -- and their current adjustments of technology were presumably determined accordingly.

It is true that this priority system, when individual enterprises attempted to maximize valovaia produktsiia, made for inefficient development of the composition of national industrial capital resources. But this was a problem of investment allocation, a decision concentrated above the enterprise level. Moreover, at least on a year-by-year basis, this combination of a priority system and of the valovaia produktsiia enterprise objective made for a national production mix -- and a use of intermediate material resources -- which was guided by central decision makers' views as to the relative importance of marginal amounts of different products.

From the 1930's to 1940-65

For the reasons indicated in Section II, the environment changed between the 1930's and 1940-65 in such a fashion as greatly to expand the relative importance of the valovaia produktsiia indicator in enterprise managers'

utility functions. The disadvantages inherent in reliance on this indicator -- particularly the disadvantages related to choice of product mix by the individual enterprise and to implementation of product and process innovations -- accordingly increased in importance.

Moreover, three additional factors of the environment were operating further to worsen the fit of the existing incentive system to the needs of the economy. The first of these factors was that labor was becoming an increasingly scarce factor during the 1950's,[30] and thus the waste of labor implicit in the valovaia produktsiia incentives grew increasingly deleterious. The second was that the priority system of materials allocation began to break down after Stalin's death, at the time that it became increasingly important to the Supreme Soviet leaders to achieve the planned goals for output of agricultural products and of manufactured consumer goods -- even their political survival hanging in the balance. As the priority principle gradually ceased to be the mechanism for reconciling the actual deliveries of intermediate materials with the planned allocations, only random forces, exchange of favors among enterprises, and simple corruption[31] were available as replacements. The third factor was that the international pace of product and process innovation had speeded up considerably above that of the interwar level, and thus the demands for ever-renewed implementation of innovation within a given enterprise became increasingly severe. This was aggravated by the fact that within each administrative

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30. See Murray L. Weitzman, "Soviet Postwar Economic Growth and Capital-Labor Substitution," American Economic Review, LX, 4 (September 1970) and the discussion of his data in Granick, "The Internalizing of Externalities in Socialist Enterprises and in Subunits of Large American Firms," in W. G. Shepherd (ed.), Public Enterprise: Economic Analysis of Theory and Practice (Lexington Books, 1976).

31. Assuming that Gregory Grossman is correct in his belief that a great expansion in the extent of the black market has occurred in the Soviet Union since the death of Stalin (Grossman, "The 'Second Economy' of the USSR," Problems of Communism, XXVI, Sept-Oct. 1977, p. 36), the demise of the priority principle may be a partial explanation of the timing.

grouping and enterprise there were now many more minor products, requiring continuous modification of product and process, than had existed during the 1930's.

The response of industrial administrators to this changing environment was negligible. Their first principal action was an attempt during 1959-65 (apparently, from later Soviet accounts, not very successful) to shift bonus attachment partly to a cost-reduction indicator -- thus placing some emphasis on the reduction of inputs by enterprise managers. The second action was the sharp reduction during 1960-64 in bonuses of managerial and other white-collar personnel as a proportion of their total earnings. This latter move implied some shift from valovaia produktsiia (to which these bonuses were attached) to valovaia produktsiia per member of the labor force (to which the wage fund was attached) in the utility function of enterprise managers, thus encouraging them to economize on the increasingly-scarce factor of labor. Probably more important, by reducing the strength of managerial incentives in general, it may have been hoped that the degree of pressure upon enterprise managers to make bad decisions would be reduced.

Other actions were to have significance in the post-1965 period, but probably not until then. The first of these was the normal improvement one might have expected over time in the information system within industry -- extending both to the physical use of inputs and to financial summary data. The second was ideological: the increased acceptance, both in decision making and in the evaluation of enterprises' financial performance, of one or another form of capital charge and of rent.

Over-all, the weakness of administrative response to a changing environment was striking. In essence, Soviet administrators attempted to live with the same consciously-designed incentive system -- reinforced indeed until 1960

through the larger share of managerial bonuses -- which had functioned with reasonable effectiveness during the 1930's. Small wonder that the first half of the 1960's constituted a low point in Soviet industrial success.

From 1940-65 to Post-1965

After a quarter of a century of stagnation in the design of managerial incentive systems, the most recent period has seen considerable innovation. Much of this has been unsuccessful to date, but genuine change has occurred both in linking managerial (and, indeed, all white collar) bonuses to a broader set of criteria than that of valovaia produktsiia, and in strengthening the relative importance in managers' utility functions of this new type of bonus compared with the valovaia produktsiia per employee criterion to which manual workers' earnings remain tied.

But even abstracting from potential institutional changes which we have defined as outside the control of industrial administrators, reformation of the incentive system has proceeded within narrow bounds. There has been no change in the approach of linking monetary payments to manual workers to group output achievements, and there has indeed been reinforcement of the binding of managerial and other white-collar monetary payments to enterprise achievement as measured by one or another indicator of shortrun success. Soviet administrators have continued to reject the East German approach of providing administrators with considerable discretion in defining enterprise success ex post rather than ex ante, and of linking managerial awards to this ex post definition.[32] Thus the potential "arbitrariness" of administrators has been restricted, and enterprise managers have continued to be given objectives which are reasonably well-defined in a quantitative fashion ex ante. In my view, the price of having maintained these bounds on the incentive system is that little could be achieved in better promoting enterprise implementation of innovations.

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32. See Granick, "Soviet Research and Development Implementation."