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## SCARCE CAPITAL AND SOVIET DOCTRINE

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The contest between doctrine and expediency among the "sources of Soviet conduct" awaits its judicious historian. The problem is as intricate as it is engaging, for expediency can wear the mask of ideology, while dogmatism may be transmuted into pragmatism by the felicitous touch of success. No doubt it will be in the major events of our time that the student will seek, and possibly find, his evidence. Yet, now and then, the true nature of things is tested in small matters as well as in large; especially if the matter, though minor in historical perspective, lies close to the core of socio-economic doctrine and at the same time bears directly on the actions of practical men. The episode in Soviet intellectual history to be presently described is of this sort. It remains to be seen whether the future historian of the mainsprings of Soviet behavior will find it of any relevance to his inquiry. In the meantime, the economist will recognize it as a fragment of *Dogmengeschichte* with regard to the theory of resource allocation in the Soviet Union.

### I. THE PROBLEM AND ITS SETTING

The conflict examined here is that between the Marxian conception of value and the logic of the allocation of scarce resources to

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achieve posited goals; more precisely, between the absence of a value attached to capital *as such*, and the necessity for Soviet planners to husband their very scarce capital resources. Some comment on this specific problem has already appeared in western literature.<sup>1</sup>

It will be recalled that in the Marxian scheme of things exchange value is created by socially necessary labor alone. No other value-creating factors of production are recognized. It follows that no factor except labor is entitled to a functional remuneration, although (the theory holds) non-labor income does exist under capitalism thanks to the specific social relations making it possible. True, Marx recognized that under capitalism the tendency for profit rates to be equalized causes "prices of production" to deviate from "values" according to the relative amounts of capital invested, but there is no clear indication that he favored a similar deviation of prices from "values" in a socialist society. In any case, the Soviet authorities apparently understood him to mean that interest on capital is to have no important place in the cost structure of a socialist economy.

This interpretation found concrete legislative expression. After private enterprise was virtually eliminated and comprehensive planning installed, financial relationships and institutions were redefined by a series of laws issued during the years 1930 through 1932, collectively known as the Credit Reform.<sup>2</sup> The laws, amplified by executive orders, provided that a state-owned enterprise (the dominant type outside of agriculture) was to be endowed by the state with fixed and with much of working capital free of charge, although the enterprise remained responsible for the safeguarding of the principal value of the investment. A part of the working capital continues to be financed by short-term bank credit, but the interest charges are low and are levied chiefly for administrative reasons. Thus, with the exception of these relatively small charges, interest does not appear as a cost of

1. See especially: Holland Hunter, "The Planning of Investments in the Soviet Union," *Review of Economics and Statistics*, XXXI (Feb. 1949), 54-62; J. M., "Some Recent Developments in Soviet Economic Thought: Economic Choice Between Technological Alternatives," *Soviet Studies* (Glasgow), I (Oct. 1949), 119-27; A. Zauberman, "The Prospects for Soviet Investigations into Capital Efficiency," *ibid.*, I (Apr. 1950), 328-33; Charles Bettelheim, "The Discussion on the Problem of Alternative Investment Projects," *ibid.*, II (July 1950), 22-42; Maurice Dobb, "A Note on the Discussion of the Problem of Choice Between Alternative Investment Projects," *ibid.*, II (Jan. 1951), 289-95; and Norman Kaplan, "Investment Alternatives in Soviet Economic Theory," *Journal of Political Economy*, LX (Apr. 1952), 133-44.

2. A discussion of the Credit Reform in English may be found in Arthur Z. Arnold, *Banks, Credit, and Money in Soviet Russia* (New York, 1937), chaps. XII and XV.

production on the books of a Soviet state-owned enterprise, and no interest (with negligible exceptions, to be exact) is paid for the use of fixed capital.

These changes were accompanied by authoritative attacks in the literature against "bourgeois fetishism in science and technology" and the use of "capitalist methods of solving technical problems." The dominant attitude was perhaps summarized by an author writing in an engineering journal: "'Interest charges' . . . artificially diminish the effectiveness of utilization of natural resources and capital investments. 'Interest charges' . . . retard the rise in the organic composition of 'fixed capital' and go counter to the technological policy of the party and the government."<sup>3</sup>

But although capital as such may appear as a free good to the Soviet accountant, it is hardly that to the Soviet economy. On the contrary, it is, and has constantly been, scarce in relation to the high production goals of the regime. Being scarce, its relative efficiency in alternative employments must be considered if maximum economic benefit is to be derived from a given amount of investible resources. Moreover, since an important range of investment decisions is actually made in a decentralized fashion — on this more presently — rational allocation of capital requires that a scarcity price, i.e., a rate of interest, be communicated to each decision-maker and he be required to abide by it. According to well-known maximization conditions, the rate of interest should be uniform throughout the economy and such as to equate the demand with the exogenous (i.e., politically determined) supply of investment funds.<sup>4</sup>

Very little is known about exactly how the *major* planning decisions are being made. But it is probably quite safe to assume that for the longer-range (say, five-year) plans, such crucial questions as the part of the national product to be devoted to investment over the prospective plan period, and the bill of final and key intermediate goods in its main outline, are resolved on the highest levels of the regime and are political decisions in the full sense of the phrase. The breakdown of total investment by ministries (roughly corresponding

3. L. M. Lezinov, "K voprosy o tekhniko-ekonomicheskikh raschetakh pri proektirovanii gidroelektrostantsii" ("On Technical-Economic Calculations in the Designing of Hydroelectric Stations"), *Gidrotekhnicheskoe stroitel'stvo (Hydro-technical Construction)*, 1935, No. 8, pp. 4-5; quotes in the original.

4. The uniformity condition presupposes that the other price parameters facing the decision-makers are meaningful for the purpose of maximization. Insofar as this is not the case, departures from a uniform interest rate may be warranted.

to branches of the economy) and their subdivisions, and the more detailed specification of the bill of final goods,<sup>5</sup> are probably also essentially political decisions and the results of intragovernmental bargaining. The composition of the prospective bill of final *consumers'* goods may be affected by consumers' preferences, as they are vaguely transmitted to the central authorities, although a regimen of consumer sovereignty cannot be said to exist. Needless to say, even the highest political decisions are constrained by technological and economic considerations, but not uniquely determined by them. Moreover, there must be a certain reasonable, but again not unique, connection between the investment resources provided to a ministry and its production targets.

The ministry having received its longer-range production targets and having been informed of the approximate amount of investment funds at its future disposal, the actual production units necessary to realize these targets must be designed. This is the job of the highly specialized "project-making organizations" (*proektnye organizatsii*), of which there are usually several to an economic ministry. In time sequence, project-making falls between the preparation of the longer-range plan and the compilation of the annual plan. The project-maker, an engineer, is given the rough location of the future production unit, the desired annual output of the specific product or products, target dates for completion, and possibly a series of economic constraints (availability of material and equipment, labor problems) and noneconomic (strategic, sanitary, etc.) minimum requirements. On the basis of these data, and with the aid of the existing cost-price parameters, he is to transform the assignment into a set of blueprints for actual construction *plus* estimates of the cost of construction and the cost of operation of the plant. Note that the project-maker has no say as to whether the plant is to be built at all. However, he is typically faced with a number of *technological variants* (as the Russians put it), such as greater or lesser automaticity of equipment, alternative production systems, substitute materials and fuels, and so forth. Moreover, if the annual output of the production unit is expected to reach full capacity only after a number of years, e.g., traffic on a railroad, he may also have the choice of postponing a part of the capital outlays. In economic language, he must select the proper degree of *capital-intensity* of the project. But from the standpoint of the economy, the joint action of all project-makers, dis-

5. The term "final goods" should be understood to include those "key" intermediate goods, for which the output targets are subject to determination at high political levels. Coal, steel, petroleum, and other basic *materials* of similar importance probably belong in this group.

persed over the economy, has the effect of allocating a scarce means, currently investible capital, to achieve posited ends: the set of the "politically" determined production targets (and associated non-economic desiderata) at their lowest (i.e., most detailed) level. Analogously, from the standpoint of the smallest unit of "political" decision (in this sense), such as a ministry or subdivision thereof, the problem is one of rational allocation of investment funds within its own jurisdiction.

## II. *Exeunt* ECONOMISTS — ENTER ENGINEERS

As indicated above, by the early thirties the ideological climate became hostile to any use of the concept of interest, and it was virtually "decreed out" of the Soviet cost structure. Nevertheless, one would search in vain in the Soviet *economic* literature after 1931, and until 1945, for any attempt to substitute new, "Marxian," principles of the allocation of capital among competing projects, from which a set of new criteria of capital-intensity of individual projects could be derived.<sup>6</sup> This silence, it must be remembered, coincided with the acceleration of economic expansion to unprecedented rates, extreme shortage of capital, and a leap from an obsolescent technology to a most modern one. Yet this silence was something entirely new in itself, for only a few years earlier, from 1927 through 1930, the then vibrant and often brilliant Soviet economic literature abounded with essays on this very range of problems.

The polemic over what then became known as the problem of the "effectiveness of capital investment" was a logical offshoot of the so-called industrialization debate, the great controversy of the twenties over the direction and speed of Russia's impending economic race with the capitalist world.<sup>7</sup> All of the participants ostensibly proceeded from Marxian premises and concepts, but their positions varied

6. To be sure, the literature of these years paid attention to the problem of balanced ("proportionate") development of the planned economy. But this refers to the question of what to produce and in what quantities, and not to precisely how much capital to devote to each line of production.

7. This debate, one of the great debates in the history of economics, has received little attention from western economists. Most of the original literature is unfortunately not available in English or other western languages. For some recent analyses in English see: Maurice Dobb, *Soviet Economic Development Since 1917* (New York, 1948), chap. 8; Alexander Erlich, "Preobrazhenskii and the Economics of Soviet Industrialization," this *Journal*, LXIV (Feb. 1950), 57-88; *idem*, "The Soviet Industrialization Controversy," 1953, an unpublished dissertation on deposit with the New School for Social Research, New York, and the Russian Research Center, Harvard University; Adam Kaufman, "The Origin of the 'Political Economy of Socialism,'" *Soviet Studies* (Glasgow) IV (Jan. 1953), 243-72.

widely. Some of them, at one extreme, readily placed their trust in the normative role of profitability and the rate of return on capital, though frequently qualified with regard to the development of "key" branches of the economy.<sup>8</sup> At the other extreme, even the very "commensurability" of capital outlays and current costs was denied, and decision was relegated entirely to the planner's arbitrary and eclectic judgment.<sup>9</sup> The product/capital ratio received much attention at that time as a measure of the "effectiveness of capital investment," frequently in a naive way, but sometimes with considerable sophistication.<sup>1</sup> The literature of this period is vast and varied; one cannot justly do more than mention it in this context.

The discussion ceased abruptly and without resolution of the differences. A plausible explanation of this sudden end is that the economic literature disappeared with the economists themselves. The years 1930 and 1931 saw a thorough purge of the economic staffs of government departments, especially those engaged in planning. Many, probably most, of the names vanished from the pages of economic journals forever. Both those who survived, physically or professionally, and newcomers refrained from disturbing a subject so eminently popular with their hapless colleagues. Economic literature turned from relatively free discussion of policy matters and their theoretical justifications to treatment of less controversial topics. The subject of investment choice was a chief victim.

But while the Soviet economist could, and for these or other reasons did, avoid raising the problem of the capital-intensity of a production process, the project-making engineer was forced by the very nature of his everyday work to take a stand on the issue. It is hardly surprising that under the institutional and ideological conditions already mentioned most Soviet project-makers from the early

8. See N. N. Shaposhnikov, "Ob osnovnykh printsipakh industrializatsii" ("On the Fundamental Principles of Industrialization"), *Ekonomicheskoe obozrenie (Economic Review)*, 1927, No. 1, pp. 42-53; A. I. Segal', "K voprosu ob effektivnosti kapital'nykh vlozhenii" ("On the Effectiveness of Capital Investment"), *Planovoe khoziaistvo (Planned Economy)*, 1927, No. 12, pp. 118-26; A. M. Ginzburg, "Nekotorye predposylki promyshlennoi piatiletki" ("Certain Premises of the Five-Year Plan for Industry"), *Ekonomicheskoe obozrenie*, 1927, No. 4, p. 29.

9. M. Barun, "Ob effektivnosti kapital'nogo stroitel'stva promyshlennosti" ("On the Effectiveness of Industrial Capital Construction"), *Puti industrializatsii (Ways of Industrialization)*, 1929, No. 3, p. 25.

1. E.g., the use of the Cobb-Douglas function by R. Gol'dberg in "O metodakh ischisleniia effektivnosti kapital'nykh vlozhenii" ("On the Methods of Computing the Effectiveness of Capital Investment"), *ibid.*, 1929, No. 11, pp. 10-24.

thirties on have apparently been omitting capital charges<sup>2</sup> in their calculations. That is, faced with a set of technological alternatives with which to produce a given bill of goods, they chose, as a rule, that variant which showed the lowest prospective operating cost, *excluding* interest on capital. In other words, they used an effective rate of zero and tended to select variants of correspondingly "high" capital-intensity.<sup>3</sup> Some engineers<sup>4</sup> approved of this procedure because it militated in favor of the relatively more "advanced" technical solutions — an important notion in the folklore of Soviet industrialization. However, since investment resources were clearly not so abundant in any sector of the economy as to warrant a zero rate, it must be inferred that the capital requirements of most projects were at some point curtailed by administrative decision.

But certain Soviet engineers, including some very outstanding ones, were soon to register disapproval of the omission of capital charges in the design of projects. They proceeded to develop various theories to justify the use of capital charges and to explain their nature, and frequently succeeded in incorporating these "heretical" methods in the official instructions of individual project-making organizations. What motivated these engineers to swim against the ideological and institutional tide of their day?<sup>5</sup>

There seem to have been two main considerations. (1) The

2. The term "capital charge" here refers to an interest rate or any other device having the effect of assigning a price to capital as such. It is not to be understood to include a depreciation allowance, which is not a fee for the use of *capital as such*, but the cost of using up a specific *capital good*.

3. A qualification must be entered here. There are scattered indications that some time *before* the Credit Reform, the Gosplan either directed or proposed that project-makers use a 6 per cent rate in their calculations. The rate was occasionally mentioned in the early thirties as though still in effect, but it is doubtful that it was much used after the Credit Reform. I do not know when the ruling was revoked; indeed, its very existence has been questioned by an opponent of the practice. (See my *Capital-Intensity* . . . , pp. 119 and 167.)

4. See, *e.g.*, the quotation on p. 313.

5. It must be stressed for the sake of correct appreciation of the history of the problem that these were engineers and *not* economists. It is unfortunate that Kaplan (*op. cit.*) lumps them with the economists who have entered the picture since 1945 under the common designation of "economists." Zauberman is perhaps closer to the mark when he speaks of "industrial' economists" (*op. cit.*, p. 328). Of the authors discussed by Kaplan, Aivazian, Gubin, Lur'e, Vedeneev, as well as others, are (or were) engineers by virtue of their primary training and occupation. Khachaturov is a borderline case: though a well-known transportation economist, and a corresponding-member of the Academy of Sciences of the USSR in this capacity, he has been apparently very close to the technical side of the industry. For instance, he has served as director of the All-Union Scientific Research Institute for Railroad Transportation, and as editor of the journal, *Tekhnika zheleznnykh dorog* (*Railroad Engineering*).

project-maker was prompted to develop criteria for the allocation of scarce capital among projects within the purview of his administrative unit (e.g., ministry), which would have a more rational basis than mere administrative fiat. For example, this seems to have been a compelling consideration in the railroad industry, which recognized it in an official document (the "TUM") as early as 1931.<sup>6</sup>

In this regard, the engineer was challenged by two special and immediate difficulties. One arose from the possibility of continuous variation in important technical (engineering) parameters, frequently leading to the existence of a continuous substitution function between capital outlays and current operating expenses. Thus, for example, the grades on railroads and highways can be varied almost continuously (within limits) by the designing engineer, and the lower the gradient, the lower will be the future operating expenses, though at the cost of higher initial outlay (i.e., higher capital-intensity). Similar possibilities of continuous variation arise with respect to the radius of curvature of roads and railways, location of tunnels, cross-section of flumes and canals at hydroelectric stations, diameter of transmission wire, and so forth. In the absence of discrete alternatives there are no "obvious" choices on which administrative decision can rest, and the Soviet project-maker very soon found himself in search of criteria for optimum capital-intensity in cases of this nature.<sup>7</sup>

The other challenge arose in connection with those projects where a part of the capital outlay is postponable, though at the disadvantage of incurring a larger nominal outlay in the future.

6. G. I. Chernomordik, "K konferentsii po peresmotru Tekhnicheskikh uslovii proektirovaniia zheleznykh dorog" ("Conference to Revise the Technical Specifications for Designing Railroads"), *Transportnoe stroitel'stvo (Transport Construction)*, 1931, No. 6, p. 18; and *idem*, "O metodologii sravneniia variantov zhel. dorog" ("On the Methodology of Comparing Railroad Variants"), *ibid.*, 1932, No. 7, p. 19. "TUM" is abbreviation of the Russian equivalent of "technical specifications for the designing of mainline railroads"; the document itself was not available to me.

7. This type of problem has been of particular concern to Soviet electrical engineers. A controversy with regard to the optimum cross-section and gradient of canals at hydraulic stations began in 1933 and continued on the pages of *Gidrotekhnicheskoe stroitel'stvo* through most of the thirties. By 1940, Kukel'-Kraevskii gave a generalized solution with the aid of a capital charge (*Elektrichestvo [Electricity]*, 1940, No. 8, pp. 30-40), which was soon substantially incorporated in an official instruction (see *Gidr. str.*, 1941, No. 1, pp. 4-8); but the instruction avoided Kukel's error of linking the capital charge to the durability of the equipment. In 1950, a controversy flared up on the pages of *Elektrichestvo* with regard to the applicability of interest to the determination of the optimum diameter of transmission wire, although the problem is identical in essence.

Clearly, a time-coefficient, such as an interest rate in the capitalist world, is indispensable for rational choice, unless one subscribes to the patently nonsensical position (particularly so under Soviet conditions of rapid accumulation) that, *ceteris paribus*, any nominally lower capital expense is to be preferred to a higher one *regardless* of time reference.<sup>8</sup> The classical example is perhaps the choice between building a double-track railroad initially, or double-tracking later at higher cost when the volume of traffic rises to require it.

(2) There was a desire to avoid absurdly capital-intensive solutions, such as might be brought about by a zero rate of interest in some cases. For instance, in railroad construction, unusually low grades, wide curves, long tunnels, and heavy bridges become appropriate if capital is free. In the power industry, where this reaction was particularly marked, every hydraulic plant becomes preferable to every thermal one, and of the former, the most grandiose projects become worthwhile.<sup>9</sup> To be sure, *a priori*, there is nothing absurd about such capital-intensive solutions, though they would have been unnecessarily capital-using under the specific Soviet conditions. The reaction which they provoked on the part of the Soviet engineers must be attributed to their doing violence to the common sense of the experienced professional man.

These considerations were buoyed by the strong current of enthusiasm for rationality which flowed through the professional literature of the time. Now that the old "chaotic" society had been superseded by a scientifically planned economy, decisions such as the choice between technological alternatives were to rest not on blind preferences but on conscious and rational calculation.

It must be emphasized that the engineers (and the economists who later joined them) were concerned with developing criteria of choice between technological alternatives of producing a given future output stream. They explicitly and clearly distinguished this problem from the determination of the *bill of goods* of the economy, and stressed that they were not concerned with the latter.<sup>1</sup> Where not

8. Conceptually, the "postponability" problem is identical with the problem of optimum capital-intensity; the essence of either case is choice between two or more time-patterns of outlays (on capital and current account). However, Soviet writers draw a sharp distinction between them; see, for example, Khachaturov's exposition as summarized by Hunter, *loc. cit.*

9. For these reasons, I. G. Aleksandrov, the author of the Dnieper hydroelectric project and an outstanding Soviet engineer of the time, came out squarely for interest charges. His unusual formula is discussed below (p. 324). See "Novyi transport" ("The New Transport"), *Sotsialisticheskaia rekonstruktsiia i nauka* (*Socialist Reconstruction and Science*), 1933, No. 7, pp. 59-60.

1. For instance, see the distinction drawn by A. L. Lur'e in "Metody sopostavleniia eksploatatsionnykh raskhodov i kapitalovlozhenii pri ekonomii

explicitly stated, the restriction is evident from the treatment itself. The problem was also frequently posed as one of commensuring capital outlays and current costs. In effect, the criteria advanced were those of the capital-intensity of individual production units. Insofar as some form of return to capital was proposed as a guide to investment, it was only the return on incremental amounts of capital, realized as annual cost savings in the production of a *fixed* output. The test of the profitability of an enterprise as a whole was not invoked. Much less was return on capital advocated as a guide to the composition of the bill of goods (except in the trivial sense that any criterion of capital-intensity must perforce affect the demand for the output of preceding stages of production). One cannot agree with the conclusions drawn by Kaplan that "adoption of the proposals advanced [by some of the advocates of the use of capital charges] would serve to reverse the historical emphasis in Soviet investment policy" on producers' goods rather than consumers' goods,<sup>2</sup> or even that "the Soviet literature on investment choice . . . suggests, or perhaps forecasts, the possibility of wide disagreement over the future *course* of Soviet economic development."<sup>3</sup> While the authors in question might well have been harboring sentiments of doubt and opposition to the prevailing policy — one cannot tell — they were at least cautious enough not to advertise them.

### III. THE ENGINEERS' THEORIES

As might be expected from what has been said so far, the theories advanced by the engineers varied greatly. With regard to the *rationale* for the use of capital charges in project-making at least three main lines of reasoning can be discerned.

(1) Reference to a more or less developed concept of opportunity cost was especially marked among those engineers who were seeking a rational method of allocating scarce investment funds. The railroad industry provides the best example. There, as we have seen, basic principles were officially expressed as early as 1931 in the "TUM," though the concept of opportunity *at the margin* took some time to develop. An approach toward marginalism was made by

cheskoi otsenke tekhnicheskikh meropriiati" ("Methods of Collating Operating Costs and Capital Investment in Connection with Economic Appraisal of Technical Measures"), in E. D. Khanukov and V. I. Chernyshev, *Voprosy ekonomiki zheleznodorozhnogo transporta (Problems of the Economics of Railroad Transportation)* (Moscow, 1948), pp. 5 ff.

2. *Op. cit.*, p. 143.

3. *Ibid.*: my italics.

M. M. Protod'iakonov in 1934.<sup>4</sup> The attempt apparently provoked no significant criticism on doctrinal grounds at the time, although marginalism always has been a serious ideological transgression. It was only in the forties that the theory of investment choice was pushed close to its logical limits by Lur'e.<sup>5</sup>

Like his predecessors, Lur'e based the need for a capital charge in project-making — he spoke outright of *protsentirovanie*, i.e., the use of interest rates — on the ability of increments of capital to substitute for future operating costs, and called the ratio of such future annual savings to the incremental application of capital — the “relative effectiveness of capital investment.” Assuming a fixed bill of goods and a definite investment fund for the economy as a whole, he argued on grounds familiar to western economists that capital should be allocated between lines of production so as to equalize its marginal relative effectiveness in all uses. The resulting equilibrium rate, the “norm of relative effectiveness” or  $\Delta$ , should be assigned as a parameter to every project-maker, and should serve as the criterion of the capital-intensity of each project.<sup>6</sup> In this manner, future current costs of production for the whole economy would be minimized, given the production targets and the size of the investment fund. This was the purpose of Lur'e's model.

Lur'e stressed the desirability of a uniform capital charge ( $\Delta$ ) over the whole economy, but lacking this, he accepted a single rate for the railroad industry alone.<sup>7</sup> This concession, plus his failure to be concerned with the meaningfulness of the rest of the Soviet price-cost structure, underscore the essential orientation of the whole engineering literature on the subject: to achieve the best allocation of appropriated capital funds within the limited purview of the individual administrative unit.

It is interesting to note that Khachaturov, who (as we have

4. *Izyskaniia i proektirovanie zheleznykh dorog (Surveying and Designing Railroads)* (Moscow, 1934), p. 127; the work was not available to me, and is here cited after Lur'e, *op. cit.*, p. 52. See also V. N. Orlov and V. V. Povorozhenko, *Tekhniko-ekonomicheskie raschety po organizatsii zheleznodorozhnykh perezovok (Technical-Economic Calculations in Railroad Traffic Management)* (Moscow, 1943), p. 16; and T. S. Khachaturov, *Osnovy ekonomiki zheleznodorozhnogo transporta (Economic Principles of Railroad Transportation)* (Moscow, 1946), I, 111.

5. *Op. cit.* His dissertation for the degree of *kandidat* of engineering science, in which the theory was first developed (see Khachaturov, *op. cit.*, p. 103), was not available to me.

6. The relevant algebraic relationships are summarized by Kaplan, *op. cit.*, p. 134. Note that  $\Delta$  is the marginal rate of substitution between current costs and capital outlay for the isoquant representing the planned fixed bill of goods.

7. *Op. cit.*, p. 43.

seen)<sup>8</sup> straddles the borderline between the economic and engineering disciplines, espoused the theory and methodology of investment choice developed by the engineers, but firmly rejected the marginalist excursions.<sup>9</sup> Was his restraint derived from Marxian convictions or was it merely a step of prudence?

The continual search for a theory (or methodology) of capital allocation based on an opportunity cost concept in the railroad industry and elsewhere<sup>1</sup> went in numerous directions, thus underscoring the dispersed and *ad hoc* nature of the attempts, and the lack of theoretical economic background on the part of the authors. False leads were often persistently followed. For instance, in highway construction it became the usual and officially recommended method to accept that variant of a road improvement project which promises the *highest* ratio of annual savings in the cost of traffic and maintenance (as compared with costs on the unimproved road) to the one-time cost of improvement, rather than to push capital outlay until the marginal "return" on investment reaches a predetermined minimum admissible value.<sup>2</sup>

It has been usual in Soviet engineering literature on investment choice to define opportunity cost in terms of the *savings in current operating cost* which a certain amount of capital can achieve in alternative employment. The underlying assumption is one of a fixed and preassigned output program. In only a few known cases was opportunity cost visualized in terms of the *additional product* which the particular amount of capital might bring about if applied elsewhere.<sup>3</sup> Among them should be noted the unique contribution by N. M. Abramovich,<sup>4</sup> a production engineer, which is of some anti-

8. Note 5, p. 317.

9. *Op. cit.*, chap. III, esp. pp. 108-12; see also his debate with Lur'e and others summarized in *Tekhnika zheleznykh dorog*, 1947, No. 5, p. 29; as well as the discussion by Hunter (*op. cit.*) and Kaplan (*op. cit.*, p. 135).

1. E.g., in highway construction, electric power, machine shop operation, machine building, waterworks, industrial transport.

2. The literature in this field is fairly extensive. E.g., see A. I. Anokhin (ed.), *Dorozhnoe delo (Roads)* (Moscow, 1935), pp. 48, 57, 209; *Spravochnik dorozhnika. Izyskaniia, proektirovanie, stroitel'-stvo, sodержanie i remont dorog (Manual for Highway Personnel. Surveying, Designing, Construction, Maintenance, and Repair of Roads)* (Kiev, 1949), pp. 17 ff.

3. One such exception was the elaborate approach — more ingenious than successful — developed by V. G. Aivaz'ian in "Osnovnye polozheniia energo-ekonomicheskikh raschetov pri proektirovanii gidrostantsii" ("Basic Principles of Power-Economic Calculations in the Designing of Hydroelectric Stations"), *Gidr. str.*, 1945, Nos. 1-2, pp. 8-12; see also Kaplan, *loc. cit.*, and my *Capital-Intensity . . .*, pp. 250-53.

4. "Normirovanie razmerov nezavershennogo proizvodstva v mashinostroenii" ("Determining the Proper Amount of Goods in Process in Machine-

quarian interest to western economists because of its striking formal similarities to the period analysis of the Keynesian models. His problem was to choose among production methods with varying requirements of goods in process, i.e., varying capital-intensities. Lacking a measure of capital scarcity, Abramovich proceeded to find one in the additional annual output foregone by virtue of the tying-down of one ruble's worth of capital in a specific use. In brief, he traced the capital needs at his and preceding stages of production, summed the convergent series in "multiplier" fashion to obtain a capital coefficient, and used the reciprocal of the coefficient (Domar's "sigma"! ) as a rate of interest. Whatever the inherent merits of the method, Abramovich's attempt illustrates well the pains taken by some Soviet engineers to fill a void in their economic tool-box, a void which they sensed had to be filled if they were to proceed rationally.

(2) Another and fairly large group of engineers justified the use of interest and other capital charges on the basis of the economy's need to accumulate capital for new net investment. This approach, in one form or another, has been typical of the arguments advanced by Soviet power engineers in defense of the use of capital charges in project-making since at least the late twenties.<sup>5</sup> It has been advanced by engineers in other industries as well. The authors do not explain why capital has to bear a charge justified and determined on this basis; they present it as a self-evident proposition. Actually, of course, net investment can be just as well financed from other sources such as taxes, and in Soviet experience it has been in fact financed predominantly from indirect taxes. One gets the impression that the proposition is advanced not as a result of careful a priori reasoning, but as a rationalization of the "heretical" practice of employing interest in project-making, while the practice, in its turn, is followed in order to avoid "absurdly" capital-intensive solutions. The rationalization may, however, be reinforced by a misplaced analogy with capitalism, where the return on capital is at the same time (at least in Marxian conception) the financial source of new investment.

Building"), *Organizatsiia upravleniia (The Organization of Management)*, 1935, No. 2, pp. 27-55.

5. E.g., see A. A. Gorev, "K voprosu o tom, chto takoe 'ekonomicheski naivygodneishee sooruzhenie'" ("What is the Economically Optimum Structure?"), *Planovoe khoziaistvo (Planned Economy)*, 1929, No. 7, pp. 199-224; the views of Zakharov and Aivaz'ian as summarized in *Gidr. str.*, 1935, No. 1, p. 8; Vedeneev, Aivaz'ian, and Gubin in *Gidr. str.*, 1945, Nos. 1-2, pp. 5-16; F. F. Gubin, *Gidroelektricheskie stantsii (Hydroelectric Stations)* (Moscow-Leningrad, 1949), chap. 14. The last-named author would even burden capital with a charge for financing general government expenditures (pp. 661, 705).

The level of the interest rate in this case is usually equated with the annual rate of growth of some aggregative series, such as the fixed and variable capital of the economy, all industry or a specific industry, or the national product. Aleksandrov's formula falls into this category, and may be cited as a *curiosum*, also because of the importance and prestige of its author. Aleksandrov regarded the level of the interest rate as a function of the supply of capital and of the rate of growth of the economy. He therefore proposed that it be determined according to the following formula:<sup>6</sup>

$$\text{rate of interest} = r \left( \frac{n_0 - n}{n_0} \right)^2,$$

where  $r$  = annual rate of growth of output of the economy,  
 $n_0$  = capital per person, in rubles, corresponding to the level of "sufficient saturation,"  
 $n$  = capital per person, in rubles, at the existing level.

No proof was given. Clearly, Aleksandrov was misguided in his belief that the appropriate rate of interest, i.e., the marginal opportunity cost of capital for any planning period, can be expressed by a simple mechanistic relationship. The proposal seems to have found virtually no response among Soviet engineers.

(3) A considerable number of Soviet engineers in several fields have advanced the criterion of the minimum sum of capital and current costs over an arbitrary period ( $T$  years).<sup>7</sup> Not infrequently this consideration is combined with the requirement of earning a return on capital for the purpose of financing new investment (see (2), *supra* p. 323).<sup>8</sup> The reasoning behind this approach is not entirely clear, but it seems to be a compromise between the need to take formal account of the size of capital investment, dictated by common sense considerations, and a reluctance to do so by means of explicit interest charges for reasons of doctrine or prudence. One might also mention the possible normative implications (in a Marxian

6. Aleksandrov, *loc. cit.* The equation in the original has  $n$  in the denominator; this is implausible, and the author's numerical example supports the formulation given above.

7. For instance, in electric power — the articles by Kukel'-Kraevskii, Vedeneev, Aivaz'ian, and Gubin, cited above; in general construction — S. V. Bashinskii, "Metod sravnitel'noi tekhniko-ekonomicheskoi otsenki stroitel'nykh konstrukttsii" ("A Method of Comparative Technical-Economic Appraisal of Structures"), *Stroitel'naiia promyshlennost' (The Construction Industry)*, 1947, No. 1, pp. 18-20; in coal mining — L. D. Sheviakov, *Osnovy teorii proektirovaniia ugol'nykh shakht (Fundamentals of the Theory of Coal Mine Design)* (Moscow, 1950), pp. 296 ff.; in flood control — I. A. Lifanov, *Organizatsiia chashi vodokhranilishcha (Preparing the Reservoir Basin)* (Moscow-Leningrad), 1946, p. 183.

8. E.g., the articles in the field of electric power just cited.

framework) of minimum labor outlay, here represented by the sum of capital and current costs. However, the last explanation is weakened by the usual practice of taking current cost *inclusive of* depreciation allowances or actual replacement outlays. Thus, the labor on capital account is counted twice — once for depreciation or replacement, and once again as the initial capital outlay, i.e., in effect as a capital charge.

It can be easily discovered by dividing the sum in question by  $T$  (and assuming a uniform stream of annual current operating costs) that this procedure in effect is equivalent to applying an interest charge of  $\frac{100}{T}$  per cent to the initial capital outlay. Its weakness

lies in the arbitrary nature of  $T$ . In many instances the authors attempted to avoid arbitrariness by equating or otherwise relating  $T$  to the useful life of the equipment. Needless to say, such a procedure is fallacious, since the useful life of the capital good has no direct bearing on the scarcity of capital as such.<sup>9</sup>

The terminology and formal presentation of capital charges by their advocates underwent some change. Various aliases and euphemisms for the term "interest" (*protsenty*) appeared quite early. For instance, the railroad engineers associated with the "TUM" of 1931 spoke of the "effectiveness of investment," and represented its "norm" by the neutral symbol "Δ." Since the middle thirties, the term "interest" has been infrequently used, and such phrases as "the coefficient (or 'norm') of relative effectiveness of capital investment" have become current. Another favorite form, especially outside the railroads, has been the reciprocal of "relative effectiveness of capital investment" — the number of years in which the return on the additional investment (realized as savings in annual costs) is expected to attain the value of the initial capital outlay. This has been called the "period of recoupment" (*srok okupaemosti*), and is essentially the American businessman's "pay-off period." A maximum admissible pay-off period, instead of its reciprocal, the minimum admissible value of "relative effectiveness," then serves as a criterion of capital-intensity.<sup>1</sup> But the pay-off period is a clumsy device for most computations and its reciprocal, the interest rate (by this or any other name, or none), is sooner or later reverted to by nearly every author.

The engineers were careful to dissociate the capital charges advanced by them from the capitalist category of interest, even to

9. E.g., Kukul'-Kraevskii, *op. cit.*, pp. 33-34; Vedenev, *op. cit.*, pp. 5-6; Bashinskii, *op. cit.*, p. 19; Sheviakov, *op. cit.*, p. 296.

1. See Kaplan, *op. cit.*, p. 134, for a summary of the algebraic relationships.

the extent of asserting that there is nothing in common between the two. The distinction was said to lie in the fact that the proposed capital charges are mere calculating devices, and are not a price paid for the use of capital or a form of personal income, as they are under capitalist conditions.<sup>2</sup> The case is not without a grain of validity, though greatly (and understandably) overstated. Like "capitalist" interest, the various devices proposed by the engineers aim at limiting or postponing the demand for capital in individual projects. (Whether a "price" for capital is established thereby is a question of semantics.) Some authors saw in these devices a means of approximating an optimum allocation of investment funds; others merely sought to avoid absurd solutions. Here the analogy ceases, for the capital charges are to have no other function commonly exercised by their "capitalist" counterpart. Indeed, their champions have been so modest in claiming a rightful place for capital charges as to fall into error. The engineers have in all cases (that is, since the early thirties) failed to require that the proposed "interest" enter into the accounting cost of the project, and thus become a price-forming element. Thus they remained true to Soviet *accounting* practice, at the expense of contradicting the logic of their own position. For if prices of intermediate goods do not incorporate the "cost" of capital, decisions with regard to capital-intensity at the subsequent stages of production are not independent of the degree of vertical integration in the industry.<sup>3</sup>

Strange as it may seem, a number of engineers were later criticized on doctrinal grounds for resorting to *compound* interest, that is, for merely employing a certain mathematical technique. Actually, compounding was resorted to very little, thanks to the usual assumption of instantaneous capital outlays and uniform annual operating costs. Where the central problem was the postponability of outlays, compounding was more difficult to avoid, though still attempted.<sup>4</sup>

2. See Orlov and Povorozhenko, *op. cit.*, p. 16; Khachaturov, *op. cit.*, pp. 104, 112; Gubin, *Hydroelectric Stations*, p. 705.

3. However, the project-maker was often cautioned, and sometimes ordered, to take note of the induced capital requirements elsewhere in the economy on a more or less *ad hoc* basis.

4. I. A. Romanenko, "Tekhniko-ekonomicheskoe proektirovanie dorozhnykh pokrytii" ("Technical-Economic Design of Highway Pavement"), *Stroitel'stvo dorog* (Road Building), XII (1945), 2-4; and A. V. Gorinov, *Proektirovanie zheleznykh dorog* (Designing Railroads) (3d ed.; Moscow, 1948), II, 392 ff. An interesting case of disguising the use of compound interest appears in Bashinskii's article (*op. cit.*, p. 19), where a "durability coefficient" was introduced to compensate for differences in durability between two competing project variants. The nature of the concept was not explained, but a table of such coefficients was given. At first sight, the values appear arbitrary, and the author was indeed criticized

It must be remembered that these discussions on the propriety of capital charges under Soviet conditions went on in the darker corners of the all-encompassing ideological edifice, out of the direct line of vision of the guardians of doctrinal purity. The questions were debated by professional project-makers and other engineers, within the confines of drafting rooms or on the pages of narrowly specialized journals, in reference to specific constructional problems, and under the protective covering of mathematical symbols and esoteric terminology. These facts may explain why the "general" Soviet economist showed no signs of awareness of the engineering literature on investment choice until as late as the middle forties.

Even so, Marxian precepts were occasionally appealed to by the engineers, especially by the opponents of the use of capital charges.<sup>5</sup> The substitution of other terms for "interest"; the frequent resort to its reciprocal form, the "recoupment period"; and occasional heroic attempts to devise formal methods of allowing for the scarcity of capital without resort to any mathematical variant of the interest rate<sup>6</sup> — they all point to self-consciousness on the part of the advocates of capital charges in treading a path so uncomfortably near the abyss of ideological heresy.

#### IV. RETURN OF THE ECONOMISTS

Not until 1946, after a decade and a half of silence, did Soviet economists return to the question of investment choice on the project-making level with the publication of two notable, though very dissimilar, articles by V. V. Novozhilov and S. G. Strumilin, respectively. Novozhilov's 1946 article<sup>7</sup> was actually the second of three. The first,<sup>8</sup> which appeared in 1939, confined itself to exploring the comparability of output streams and is not significant for this study, except insofar as it presented some of the author's fundamental

in Soviet literature on this score. Upon scrutiny, it appeared that the values are ratios of annuities (at a certain rate of interest, suggested by the author). This, of course, requires compounding.

5. See the summary of divergent views in the hydroelectric field reported in *Gidr. str.*, 1935, No. 1, pp. 7-18.

6. *E.g.*, see the two sources cited above, p. 326, note 4.

7. "Metody nakhozhdeniia minimuma zatrat v sotsialisticheskom khoziaistve" ("Methods of Finding the Input Minimum in a Socialist Economy"), *Leningradskii politekhnicheskii institut imeni M. I. Kalinina-Trudy* (*The Leningrad Kalinin Polytechnic Institute — Papers*), 1946, No. 1, pp. 322-27.

8. "Metody soizmereniia narodnokhoziaistvennoi effektivnosti planovykh i proektnykh variantov" ("Methods of Commensuring the Economic Effectiveness of Variants in Planning and Project-making"), *Trudy Leningradskogo industrial'nogo instituta* (*Papers of the Leningrad Industrial Institute*), 1939, No. 4.

postulates. The third article,<sup>9</sup> not available to me, apparently only expanded on the theory previously developed, with special emphasis on capital allocation.

Novozhilov seeks to determine the principles of allocating the available "means of production" so as to minimize the total labor input during the period, assuming a *fixed* bill of *final* goods<sup>1</sup> and a fixed amount of investment during the period. The *numéraire* is labor-time, and the investment fund is expressed in the same unit. His solution is closely analogous to the general equilibrium systems of Walras, Barone, Cassel, and other western economists, allowing for the two assumptions just mentioned. He resorts, in effect, to equilibrium prices for intermediate goods, scarcity rents, a rate of interest on capital as such — that is, precisely to those allocational devices which allegedly differentiate a capitalist market economy from the Soviet order. And yet, Novozhilov claims to proceed from the labor theory of value and to remain within the Soviet institutional framework! How does he accomplish the synthesis of Marx and Walras, if at all?

One must credit Novozhilov with a measure of success in his improbable task, a success based on an appropriate axiomatic premise and a clever use of concepts. The condition of a fixed and pre-determined bill of final goods is the key premise. It eliminates the problem of maximizing output (or utility), and therefore of imputing the relative prices of intermediate goods from the values of final goods. (Such imputation would, of course, be inconsistent with the labor theory of value.) But in the absence of a maximand, the system must at least have a minimand for a problem of optimum allocation to exist. By choosing labor input to be the minimand, Novozhilov determines the *numéraire* of his model, which must be, by the logic of imputation, the unit in which the minimand is expressed.<sup>2</sup> Thus Novozhilov is able to operate with values of "means of production" expressed in labor-time units throughout, and to achieve a formal

9. "Sposoby nakhozhdeniia maksimuma efekta kapitalovlozhenii v sotsialisticheskom khoziaistve" ("Methods of Finding the Maximum Effect of Capital Investments in a Socialist Economy"), *Trudy Leningradskogo finansovo-ekonomicheskogo instituta (Papers of the Leningrad Financial and Economic Institute)*, Vol. III (1947). Critically reviewed by Mstislavskii in the first two articles cited in note 2, p. 333.

1. Final goods are defined as goods for individual and collective consumption and for investment.

2. Another way of looking at Novozhilov's model is that he seeks to *maximize leisure*. Since leisure is measured in the same units as labor input, the *numéraire* must be a unit of labor-time. Of course, he could have also measured labor input in "wage rubles," but did not choose to do so.

consistency with the labor theory of value. Note that this would have been impossible had he posed the aim of minimizing any input but labor, or of maximizing any final "product" but leisure.

Novozhilov attempts to justify his basic condition of a fixed bill of final goods by arguing that alternative collections of final goods are not commensurable, because they differ in their noneconomic effects (social, cultural, strategic) as well as in product composition. It follows (he holds) that the total effect of production cannot be quantified. Hence, also, products and inputs are incommensurable. But inputs, being in the last analysis always labor, are commensurable between themselves, and the minimization procedure is therefore feasible.<sup>3</sup> The argument is well devised to support Novozhilov's case, but is vulnerable with reference to actual Soviet conditions. For instance, it may be surmised (although it cannot be proved) that the task of the Soviet planning apparatus for a concrete planning period is essentially to maximize output (along some centrally established scale of values) rather than to minimize labor input.

Having thus expressed his system in labor-time units, Novozhilov proceeds to reconcile (what in effect are) scarcity rents and an interest rate with the labor value doctrine. He introduces the concept of "inverse relation" (*obratnaia sviaz'*) — the phenomenon that the *lower* (labor-time) costs achieved with the aid of "better"<sup>4</sup> means of production are necessarily accompanied by *higher* costs in those processes to which the "better" means of production are denied because of their scarcity. The additional labor input required in a certain process because a unit of a certain "better" means of production is *not* allocated to it, is called by Novozhilov an "inversely related input" (*zatrata obratnoi sviazi*), here abbreviated as i.r.i. An i.r.i. may be thought of as an opportunity cost of a unit of the means of production, although in terms of additional costs incurred rather than of output sacrificed. Novozhilov argues that investible capital *per se*, though not a "means of production" in the Marxian sense, also has its i.r.i.'s, because failure to apply it usually entails higher total (labor) cost in the given process.

Now, for each resource (means of production or capital), the i.r.i.'s corresponding to all its possible uses can be ranked in descending order and checked off until the supply of that resource is exhausted. The next highest i.r.i. of any resource (in western terminology, the first extra-marginal value when the whole supply of the given resource

3. "Methods of Commensuring the Economic Effectiveness . . .," pp. 3-5.

4. *I.e.*, more productive per unit of their straight labor-time cost than alternative ("worse") means of production.

has been allocated) is its "norm" of i.r.i. Novozhilov demonstrates algebraically that his minimization objective is attained if, for each final good, that technical production variant is adopted which has the lowest sum of actual labor-time inputs *plus* resource inputs valued at their respective "norms" of i.r.i. These "norms" are, of course, actually the interest rate on capital and the scarcity rents of physical resources. But by drawing attention not to the price which a resource could command in a competitive market, but to the extra (labor) costs entailed in foregoing a marginal employment of the resource (which would indeed determine its price in a competitive economy), Novozhilov is able to resolve all value of intermediate goods to labor.

Strumilin's essay, "The Time Factor in Investment Projects,"<sup>5</sup> has attracted more attention abroad than any other Soviet contribution to the theory of "capital effectiveness." This fact may be attributed to the author's novel (if not always tenable) approach, to his remaining true to Marxian concepts and categories, and possibly to the good fortune of the article's having appeared in a readily accessible journal. The work is rich in glittering veins awaiting the theoretician's careful assay, but only the more pertinent aspects of Strumilin's contribution can be commented upon here. For a fuller appreciation the reader is referred to the article itself and to the subsequent literature.<sup>6</sup>

Unlike Novozhilov, Strumilin did not develop a single and internally consistent method of variant selection, but merely advanced some principles for the project-maker's guidance, and mentioned a large number of criteria of investment choice. His inquiry was apparently provoked by the practice of some engineers (as discussed above) of resorting to interest rates, pay-off periods, and similar devices in choosing between technological alternatives — devices

5. "Faktor vremeni v proektirovках kapital'nykh vlozhenii," *Izvestiia Akademii nauk SSSR: Otdelenie ekonomiki i prava (Bulletin of the Academy of Sciences of the USSR: Division of Economics and Law)*, 1946, No. 3, pp. 195-216; English translation in *International Economic Papers*, 1951, No. 1; English summary in the article by J. M. (*loc. cit.*). Academician Strumilin is one of the best known of present-day Soviet economists, and co-author and editor of the First Five-Year Plan and other early economic plans.

6. For comments in western literature see A. Zauberman, "Economic Thought in the Soviet Union: I. Economic Law and the Theory of Value," *Review of Economic Studies*, XVI, 7-10; *idem.*, "The Prospects for Soviet Investigations into Capital Efficiency," *Soviet Studies*, I (Apr. 1950), 328-33; Warren W. Eason, "On Strumilin's Model," *ibid.*, 334-42; Charles Bettelheim, "The Discussion on the Problem of Alternative Investment Projects," *ibid.*, II (July 1950), 22-42; Maurice Dobb, "A Note on the Discussion of the Problem of Choice Between Alternative Investment Projects," *ibid.*, II (Jan. 1951), 289-95; Kaplan, *op. cit.*, pp. 139-40. Also, my *Capital-Intensity: . . .*, chap. 11, sec. B.

which he considered without normative significance in the Soviet economy. But because of either a meager acquaintance with the engineering literature on the subject, or a failure to grasp its meaning, Strumilin's criticisms on this score are almost entirely irrelevant.

Strumilin also operates with a labor *numéraire*, but his Marxian orthodoxy goes further. For instance, he shuns marginalism (with some lapses); regards accumulation to be proportional to the input of living labor, though he actually deviates from this principle, as Eason<sup>7</sup> has shown; and avoids considerations of opportunity cost. It is the last doctrinal obstacle, above all, which keeps Strumilin from reaching a definite and cogent solution. He mentions at least eight widely different criteria of choice between technological variants,<sup>8</sup> such as, for example: the ratio of accumulation to value added, in any year; physical output per unit of direct labor input over the whole life of the equipment; and the ratio of cost to average value of a unit of product in the economy. The last is described as a "best measure," but none seems to be clearly preferred. No rationale is offered for any of the criteria; their normative qualities are taken to be immanent and self-evident. With one exception, they do not even take explicit account of the relative investments in the competing variants, much less the opportunity cost of capital in general.

It must be borne in mind that the economic categories which underlie the criteria are Marxian in definition, and it is in his attempt to refine them that Strumilin makes the more substantial contribution. There is no need to dwell long on his proposal that economic calculations take account of the "full labor input" in production, that is, as measured not merely by the actual remuneration of labor, but by this *plus* the "accumulation" (surplus product) created by labor. Marxian doctrine at once sanctions this refinement and deprives it of operational significance, since surplus product is assumed to bear a constant ratio to labor input throughout the economy, and labor cost is the only cost recognized in the final analysis. Thus, Strumilin's proposal would only cause all cost calculations to be multiplied by a constant factor, with no effect on the relative merits of alternative projects.

Much more significant is Strumilin's concept of "devaluation," which aims to take account of the prospective increase in labor productivity.<sup>9</sup> This problem is undoubtedly central to his conception

7. *Loc. cit.*

8. *Op. cit.*, pp. 206, 210, and 213.

9. Aivaz'ian (*op. cit.*, pp. 10 ff.) briefly anticipated Strumilin in taking the rise in labor productivity into account. See also Bashinskii, *loc. cit.*, for a somewhat different approach to the same problem.

of the impact of the "time factor" on economic calculations. He maintains that, in accordance with the labor theory of value, a rise in labor productivity causes a physical unit of a product, including existing capital goods, to be "devalued" proportionately. Thus he writes  $C_t = C_0/(1 + p)^t$ , where  $C$  is the value of a material good,  $p$  is the annual rate of growth of labor productivity over the whole economy, and the subscripts refer to the initial and the  $t$ -th years.

Strumilin employs the principle of "devaluation" in two ways. (a) He causes current production cost of a particular enterprise to fall over time because of the progressive devaluation of material inputs. (Labor costs remain constant, however, because labor-time is the *numéraire*.) (b) He includes in annual cost the value "lost" by fixed capital during the year, that is, about  $p$  per cent of its value at the beginning of the year. No rationale of this procedure is indicated. The amount so "written off" goes into a "compensation fund" to become a source of financing new investment. The charging of  $p$  per cent of capital value to current cost bears a formal resemblance to interest cost, but, as will be presently shown, there is no close analogy in substance.

He is partly correct with regard to (a), and in error with regard to (b). On (a): It is proper, of course, to allow for future changes in price-cost relationships, insofar as these can be foreseen. However, the estimates of prospective increases in labor productivity (i.e., declines in the prices of material inputs) should be specific to the production process. An economy-wide average is applicable only for want of more detailed data. With respect to (b): It is not clear why "the loss of . . . value of past labor embodied in our capital goods must be fully compensated for during the period of their operation" (p. 202), i.e., charged to current production expenses. This loss is not a real cost to the economy, directly or indirectly. (From the point of view of the individual firm aiming to preserve the real worth of its capital, only a "devaluation" of its own investment *in excess* of the average —  $p$  per cent — should be charged to current cost, while a lower than average "devaluation" would be a gain in real terms for the firm. But then Strumilin recognizes only an average rate of "devaluation.") Nor is it clear how the amounts so written off are available to finance new investment.

Thus, Strumilin's  $p$  is not an interest rate in any usual sense, though some authors have so identified it.<sup>1</sup> Rather, it is an annual rate of change in "value"; that is, say, in the price index with wages held stable. True, Strumilin does include it in current cost of pro-

1. E.g., Bettelheim, *op. cit.*, p. 29, and Kaplan *op. cit.*, pp. 139, 144.

duction, but erroneously so, as has been just shown. Indeed  $p$  may move inversely with a capital charge based on the opportunity cost principle (such as that advocated by Lur'e or Novozhilov). For instance, should the annual amount of investment be increased, the former would rise with the impetus to labor productivity, while the latter would fall, reflecting the lower marginal rate of substitution between capital and labor.

## V. THE ECONOMISTS' ATTACK AND ITS AFTERMATH

Strumilin's critique of the use of capital charges in project-making was relatively mild compared with the attack against the practice launched a few years later, chiefly by "general" economists. The most outspoken critic has been P. S. Mstislavskii, a member of the editorial staff of *Voprosy ekonomiki* (*Problems of Economics*), the official organ of the Institute of Economics of the USSR Academy of Sciences.<sup>2</sup> As might be expected, the main targets of the attack have been Lur'e and Novozhilov. The strictures may be grouped under three headings: (1) contravention of Marxian doctrine and of Soviet planning principles; (2) harmful political implications and vicious intent; (3) errors in reasoning.

(1) Perhaps the most serious doctrinal failing attributed to the

2. The main works in this group are: P. Mstislavskii, "O trudakh Leningradskogo finansovo-ekonomicheskogo instituta" ("On the Papers of the Leningrad Financial and Economic Institute"), *Voprosy ekonomiki*, 1948, No. 7, pp. 131-35; *idem*, "O metodologicheskikh oshibkakh v literature promyshlennosti i transporta" ("On Methodological Errors in the Literature on Industry and Transportation"), *ibid.*, 1948, No. 10, pp. 34-48; *idem*, "Nekotorye voprosy effektivnosti kapitalovlozhenii v sovetskom khoziaistve" ("Certain Questions of the Effectiveness of Capital Investment in the Soviet Economy"), *ibid.*, 1949, No. 6, pp. 96-115 (condensed English translation in *Current Digest of the Soviet Press*, Mar. 4, 1950, and in *Soviet Studies*, I (Apr. 1950), 363-76); P. Milovanov and P. Petrov, "Vrednaia stateika v ekonomicheskom sbornike" ("A Harmful Article in an Economic Symposium"), *Gudok*, Mar. 25, 1949; P. Krylov, "Protiv burzhuaiznoi metodologii v voprosakh ekonomiki transporta" ("Against Bourgeois Methodology in Transportation Economics"), *Planovoe khoziaistvo*, 1949, No. 4, pp. 85-91; D. I. Chernomordik, "Effektivnost' kapital'nykh vlozhenii i teoriia vosпроизводства" ("The Effectiveness of Capital Investment and the Theory of Reproduction"), *Voprosy ekonomiki*, 1949, No. 6, pp. 78-95 (condensed English translation in *Current Digest of the Soviet Press*, Feb. 18, 1950, and *Soviet Studies*, I (Apr. 1950), 359-63); G. Levin, "Voprosy opredeleniia ekonomicheskoi tselesoobraznosti proektnykh reshenii" ("Problems of Determining the Economic Rationale of Project Solutions"), *Voprosy ekonomiki*, 1950, No. 4, pp. 72-85.

Milovanov and Petrov sign as engineers; Levin's status is not known; the rest are "general" economists. Chernomordik (not to be confused with his namesake cited in note 6, p. 318, an engineer and a staunch advocate of capital charges) was, however, not unsympathetic to capital charges earlier (*Zheleznodorozhnyi transport* [*Railroad Transport*], 1946, Nos. 11-12, pp. 87-93), when he reviewed Khachaturov's book (*op. cit.*).

advocates of capital charges was that their method would subject the composition of the bill of goods to the test of profitability, contrary to Soviet planning principles. For instance, it would cause light industry to expand faster than heavy industry, thus reversing prevailing policy. It has already been pointed out (p. 319) that this criticism misrepresents the position of the proponents of capital charges, who were not at all concerned with the determination of the bill of goods, and invariably accepted it as a datum for their purposes.

The list of ideological transgressions further included: being under the influence of bourgeois theories; resort to the bourgeois concepts of scarcity and the economic margin; "idealism" (*i.e.*, reliance on formal, especially mathematical, methodology allegedly divorced from the laws and realities of the Soviet economy); and acceptance of the "anti-scientific principle" of attaining the maximum effect with minimum input. (The last principle is allegedly too narrow a conception of the economic objectives of the Soviet state.) Another critique on doctrinal grounds referred to the use of *compound* interest — a procedure that disregards Marx's view that compound interest is (in the words of the Soviet critic) "an absurdity, mystification, and nonsense."<sup>3</sup>

(2) The violence of the attack is evinced in the readiness with which political opposition was inferred from methodological and theoretical tenets. Thus, Novozhilov was accused of questioning the state's distribution of investment, and Lur'e's faith in the planned order was challenged.<sup>4</sup> The chief basis for these serious accusations was the same false charge that it was intended to subject the determination of the bill of goods to the criterion of profitability.

(3) The errors in reasoning charged to the "heretics" need not be examined here in detail. These objections stem chiefly from inability or unwillingness on the part of the critics to grasp the logic of opportunity cost. For instance, compounding was attacked also on the ground that savings in current cost need not be wholly reinvested, but may be consumed, etc., and therefore there need not actually be a geometric series. A similar argument was brought to bear against the requirement of a uniform capital charge over the whole economy.<sup>5</sup>

Having risen to the defense of ideological purity and political loyalty, some of the critics felt moved to advance positive alternatives along theoretically acceptable lines. Strumilin's proposals were

3. Mstislavskii, "On Methodological Errors . . .," *op. cit.*, p. 41; reference is to the sarcastic remarks on compound interest in Vol. III, chap. 24, of *Capital*.

4. *Ibid.*, pp. 40, 42.

5. *Ibid.*, p. 39.

too vague and dubious to fill the void. With one exception, to be taken up presently, the few positive solutions proffered by the economists were weak, and of little theoretical interest or practical import. Notably, there was no mention whatever of the rich economic literature on "the effectiveness of investment" of the late twenties.<sup>6</sup> The reader was given no hint that this was not exactly virgin ground in Soviet economic thought.

The exception is one of Mstislavskii's solutions, his "first case."<sup>7</sup> The striking (if not ironic) thing about it is that although its author has been the most outspoken critic of the use of capital charges, his solution in effect rests on the rate of substitution between capital and labor. Thus, without apparent awareness, he comes close to reproducing, though in a different and distinctive formal structure, the solutions of his arch-opponents, Lur'e and Novozhilov. Nor is there anything more "Marxian" about his model; if anything, he pays less respect than Novozhilov to the labor theory of value.

Mstislavskii's criterion of choice between technological alternatives is minimum total *capital* requirements, traced back through *all* stages of production. Capital requirements in the last analysis consist of capital outlays proper *plus* the "capitalized" equivalent of labor costs, the only ultimate current costs in his schema. The "capitalization" of labor costs is clearly the crux of the solution. Mstislavskii accomplishes it by arguing that, in the absence of unemployment, new enterprises can obtain the necessary labor only insofar as the rise in productivity in existing enterprises permits the latter to release workers.<sup>8</sup> Thus, the capital equivalent ("capital-intensity" in his terminology) of labor is the additional investment, per annual wage ruble, required to raise productivity in existing enterprises,

6. This circumstance can hardly be accounted for by the fact that none of the economists was familiar with it. First, it was too prominent a feature of the economics of its day; secondly, Strumilin himself participated ("K probleme effektivnosti kapital'nykh zatrat" ("On the Problem of the Effectiveness of Capital Outlays"), *Planovoe khoziaistvo*, 1929, No. 8, pp. 59-74); and thirdly, they were reminded of it by Lur'e (*op. cit.*, pp. 45 ff.).

7. "Certain Questions of the Effectiveness . . .," *op. cit.*, pp. 106-13. The interested reader is referred to the economists' other positive contributions: Mstislavskii's second case, *ibid.*, pp. 113-15; D. I. Chernomordik, *loc. cit.*; A. Emel'ianov, "O metodakh opredeleniia ekonomicheskoi effektivnosti primeneniia mashin v sovetskom khoziaistve" ("On the Methods of Determining the Economic Effectiveness of the Use of Machinery in the Soviet Economy"), *Voprosy ekonomiki*, 1949, No. 11, pp. 104-14 (English summary in *Soviet Studies*, I (Apr. 1950), 376-82). For analysis and interpretation of these contributions see Kaplan, *loc. cit.*

8. He overlooks the natural accretion to the labor force, and seems to be thinking of intra-industry transfers, rather than rural-urban migration; the cost of urbanization is ignored.

*plus* the additional expenses of retraining and preparing labor for its new employment. He stresses that the relevant relationship is an *incremental* and not an average one. Thus, in effect, he converts current cost to capital cost by multiplying it by the marginal (incremental) rate of substitution of capital for labor. This coefficient (say,  $k$ ) is closely akin in economic nature to the reciprocal of Lur'e's  $\Delta$ , or of Novozhilov's "norm" of the i.r.i. of capital. The method is also very similar to the common "bourgeois" procedure of selecting the alternative with minimum capitalized cost.

However, Mstislavskii's coefficient (unlike Lur'e's and Novozhilov's) is not defined as an equilibrium magnitude, though one may well argue that a consistent application of the method in practice would tend to produce just that. Secondly, Mstislavskii operates with a "wider" margin than do his two antagonists, that is, with a "zone" representing the annual increments in a rapidly expanding economy. Thirdly, he does not assign scarcity rents to resources other than capital, while Novozhilov does (though Lur'e does not). But the distinction is not so significant as may appear at first glance. Novozhilov, it will be recalled, is concerned with the simultaneous allocation of *all* resources in the economy, both marginal and intra-marginal. Hence, he properly assigns rents to intra-marginal resources. Mstislavskii, however, is concerned only with the allocation of an incremental amount of capital and the reshuffling of other factors at the margin. And although his margin is quite "wide," he is perhaps not much at fault in treating resources implicitly as though they were all marginal, and not assigning rents to them (except the implicit charge on capital).

This solution has been criticized for being laborious in application and impracticable. Surely, it would be beyond the powers of an individual project-maker to determine the aggregate capital requirements of each input through several stages of production. The author tries to meet this objection by suggesting that the central statistical and planning authorities compute and establish parameter values of "capital-intensity" for each input. These would in effect constitute a list of values equal to current production costs within the marginal "zone" (including a capital charge of  $1/k$  per annum), multiplied throughout by  $k$ . The capital charge coefficient would thus vanish into unity; all current input costs would be "capitalized" by the implicit interest rate of  $1/k$ . But a simpler procedure is available. One might just as well eschew "capitalizing," and operate more conveniently and conventionally with current prices-costs,

including the interest rate of  $1/k$  per annum. Thus Novozhilov's price system would be nearly reproduced in form as well as in essence. Apparently Mstislavskii was not aware of this close similarity. In any case, the "capitalization" procedure afforded a means of avoiding any formal resort to the interest rate.

Since the end of 1949, the controversy has remained smoldering, flaring up occasionally in isolated sectors, producing recantations and reaffirmations, rejoinders and retreats. At the time of this writing, the air is still full of uncertainty, with no discernible signs of resolution either by intellectual agreement or by authoritative dispensation. Lur'e and Novozhilov, the two extreme proponents of capital charges and outright marginalism, have not replied in print, to my knowledge. The grave allegations of political opposition and ideological deviation, based on false strictures as they were, remain unanswered. True, *Voprosy ekonomiki* did invite a full discussion of "capital effectiveness," but the consequences were meager and one-sided. The journal was chided for its failure on this score (among others) by an authoritative publication of the Central Committee of the Communist Party;<sup>9</sup> while Khachaturov publicly accused it of rejecting articles the content of which ran counter to the likes of individual members of the editorial staff (e.g., Mstislavskii?).

Khachaturov's own reactions serve to emphasize the prevailing ambivalence. His first response to criticism, if we can trust an unsympathetic secondary source,<sup>1</sup> was to recant fully. But his next article<sup>2</sup> is equivocal. Here he starts out by conceding that the criticisms of the use of capital charges in project-making have been "basically" justified; the "coefficient of effectiveness" has been "mechanistically" applied in disregard of the economic plan; it is not sufficiently confirmed on theoretical grounds. Moreover, experience has shown (he claims) that it is incorrect to apply a uniform coefficient (capital charge) over the whole economy, for it may lead to *technologically* inferior solutions in the case of highly durable structures.<sup>3</sup> And finally, compounding is rejected as "unjustified and incorrect." But when he turns to consider the guidelines for a new

9. *Kul'tura i zhizn'* (*Culture and Life*), Oct. 12, 1950.

1. P. Orlov and I. Romanov, "K voprosu o metodologii sravneniia variantov proektiruemogo stroitel'stva" ("On the Methodology of Comparing Variants of Construction Projects"), *Voprosy ekonomiki*, 1951, No. 1, p. 104.

2. "Metody ekonomicheskogo sravneniia variantov kapitalovlozhenii" ("Methods of Economic Comparison of Investment Variants"), *Izvestiia Akademii nauk SSSR: Otdelenie ekonomiki i prava*, 1950, No. 4, pp. 235-52; English summary in *Soviet Studies*, II (Jan. 1951), 317-22.

3. *Ibid.*, p. 238. Needless to say, this argument begs the question of having an economic criterion to choose between technological alternatives

solution, Khachaturov goes through a chain of reasoning very similar to that underlying the usual advocacy of capital charges on the basis of an opportunity cost concept. His former views crop out especially in the discussion of postponable capital outlays, where he now stops just short of rehabilitating compound interest.<sup>4</sup> Following through his argument logically, one can only arrive at capital charges, compounding and all. The impression is inescapable that Khachaturov is torn between the logic of opportunity cost and the demands of doctrinal purity.

Unfortunately, there is no information whether Khachaturov's position (or lack of it!) reflects that of the railroad industry as a whole since 1949. Possibly not. In other areas, the data are somewhat less sparse. In the field of machine-design, where the problem arrived late and advocacy of capital charges reached a peak in 1948, all evidence points to a retreat. Later works by the same authors de-emphasize the usefulness and applicability of "pay-off periods" and similar devices, though they far from eliminate them entirely.<sup>5</sup> In the field of machine shop operation, with a longer history of "heresy," the retreat has been greater and more obvious, with denunciations of "bourgeois" thinking and "errors of bourgeois-objectivist character."<sup>6</sup> An indication of the official view in these two related fields may perhaps be gathered from the fifteenth volume of *Mashinostroenie* (Moscow, 1951), the encyclopedia of machine-building, which went to print in 1949. While containing sections on choice between technological variants, it either confines itself to platitudes or omits reference to capital charges. But curiously, it does cite works advocating their use in the bibliographies. No actual attack on capital charges appears, and again the total impression is one of ambivalence. In the highway construction industry, there are also signs of renunciation of pay-off periods and similar devices. It is not clear, however, whether the use of capital charges has been entirely discontinued in these three fields.

In the power industry, the reaction to criticism seems to have been quite different. It is perhaps significant that the only forceful defense of capital charges to have appeared in an economic journal

4. *Ibid.*, pp. 249-50.

5. See A. S. Konson, *Ekonomicheskie voprosy proektirovaniia mashin (Economic Problems in Machine Design)* (Moscow-Leningrad, 1951).

6. *E.g.*, G. V. Teplov in *Pravda*, Feb. 10, 1951; and T. D. Saksaganskii, "O kachestve literatury po ekonomike i organizatsii proizvodstva" ("On the Quality of the Literature on the Economics and Organization of Production"), *Vestnik mashinostroeniia (Herald of Machine-Building)*, 1951, No. 7, pp. 76, 81.

since 1948 was by an electrical engineer.<sup>7</sup> A vigorous debate on the applicability of interest for the choice of the optimum cross-section of transmission wire started in 1950, as has already been mentioned.<sup>8</sup> The technical literature still (through 1952) contains references to, and even defense of, pay-off periods and similar devices, and sometimes operates with concepts of cost *inclusive* of interest on capital, while the engineer's facility with differential calculus unwittingly pulls him down into the morass of marginalism.<sup>9</sup>

A recurring note in recent engineering literature has been the dissatisfaction with the ambiguous state of affairs with regard to the economic principles of investment choice, turning into an impatience for its resolution by competent bodies. The Institute of Economics, the economic journals, and the State Planning Commission are urged to hasten the solution. But theoretical solution or no, the engineers must design and build, and the following opinions are perhaps indicative of their mood.

'Since there is no theoretically grounded and generally accepted method of calculation [of capital-intensity] as yet, while calculations must take place, one is forced to look for an *arbitrary* method, *uniform* for all the computations.'<sup>1</sup>

'The discussion . . . conducted during 1949-1950 on the pages of . . . [economic journals] failed to give a satisfactory answer to the question at hand. Apparently it is necessary to turn to the solution of special problems peculiar to the various branches of industry, independent of the solution of the general problem [of investment choice].'<sup>2</sup>

To be sure, the Institute of Economics has carried the "problem of the effectiveness of capital investment" in its research plan since at least 1949, but no evidence of even partial progress has come forth. In fact, the opposite has been officially admitted, despite the problem's "great significance for the development of economic science as well as for the actual construction of communism."<sup>3</sup> The Institute's

7. A. I. Baumgol'ts, "K voprosu ob effektivnosti kapitalovlozhenii" ("On the Effectiveness of Capital Investment"), *Izvestiia Akademii nauk SSSR; Otdelenie ekonomiki i prava*, 1950, No. 6, pp. 440-52.

8. Note 7, p. 318.

9. E.g., T. L. Zolotarev, *Gidroenergetika (Hydraulic Power Engineering): Part I, Osnovy ispol'zovaniia gidravlicheskoi energii (Fundamentals of Utilization of Hydraulic Power)* (Moscow-Leningrad, 1950), pp. 105-16. Incidentally, Zolotarev, a chief *opponent* of interest in the debate of the thirties, gradually shifted his position to the other side.

1. *Ibid.*, p. 113; italics in the original.

2. L. E. Zubrilov, "O primenenii analiticheskogo metoda v gornom dele" ("On the Application of the Analytic Method in Mining"), *Gornyi zhurnal (Mining Journal)*, 1952, No. 2, pp. 7-9.

3. *Izvestiia Akademii nauk: Otdelenie ekonomiki i prava*, 1952, No. 2, p. 119.

position is an unenviable one. Some of its specific difficulties will be touched upon in the next section. It has apparently not proved easy to find a solution which would meet the practical needs of the project-making engineer, and at the same time satisfy the scrupulous standards of ideological conformity. The concept of opportunity cost and the principle of demand-supply equilibrium are hard to refute, but they savor too much of "idealism," "formalism," marginalism, and other tabus. Furthermore, it does not seem likely that Soviet economists will find clear ideological guidance in Stalin's last theoretical work, "Economic Problems of Socialism in the USSR."<sup>4</sup> The passages on the operation of economic laws under socialism<sup>5</sup> are too vague to give unequivocal inspiration. True, he speaks of "paying-off" investment, but in a financial rather than an economic context, and not in a normative sense.<sup>6</sup> On the other hand, opponents of capital charges could point to his rejection of the test of profitability,<sup>7</sup> in support of their chief (and, as we have seen, irrelevant) objection. Nor are his remarks on the use of machinery in the USSR<sup>8</sup> likely to advance serious inquiry into problems of investment choice.

## VI. CONCLUSION

The damage sustained by the Soviet economy due to the absence of an appropriate capital charge should not be exaggerated. On the one hand, even a uniform interest rate, faithfully expressing the marginal rate of substitution between capital and other factors, would be of questionable benefit while the rest of the Soviet price structure remained of doubtful meaningfulness for allocational purposes. It may be noted that Soviet project-making engineers have been not unaware of this consideration, and have occasionally introduced various "coefficients of deficitness," along with "norms of capital effectiveness," to correct for unduly low prices of rationed material inputs. And, as indicated above, Novozhilov's purpose was precisely to rationalize the *whole* price-cost structure. There is little doubt that the Soviet price system remains inefficient, in the strict allocational sense. Whether it is more so with reference to the ends posited by central authorities, than the price system of any other major

4. "Ekonomicheskie problemy sotsializma v SSSR," *Bol'shevik*, 1952, No. 18, pp. 1-50; also *Pravda*, Oct. 3 and 4, 1952. Reprinted and translated in *Current Digest of the Soviet Press*, Oct. 18, 1952, *Special Supplement*. Subsequent references are to *Bol'shevik*.

5. Pp. 1-5, 10-13, 20-22.

6. P. 48.

7. Pp. 12-13.

8. P. 23.

economy with reference to *its* ends, is a debatable issue, but perhaps not really pertinent here. It may be only noted in passing that an order claiming a monopoly of rationality in the economic sphere stands particularly vulnerable to failure on this score.

On the other hand, allocational inefficiency is overshadowed by the dominant and compelling characteristic of the Soviet economy — its rapid and determined growth. And yet, the two are not necessarily concomitant, even if frequently associated in argument as well as in fact. What has been recently said in relation to economic restrictionism in other societies may perhaps be applicable in the present context too:

“ . . . economic growth and development are coming to figure in popular thinking as universal solvents or universal masks, dissolving and concealing the economic costs of other economic policies, however erroneous. The effects [of these mistaken policies] . . . float away and vanish down the stream of economic development, leaving no impress outside the diagrams and equations of static economics. Growth, for restrictionists, is like the earth for Molière’s doctors of medicine. It covers their failures, while the sun shines on their successes.”<sup>9</sup>

The mills and the dams stand in their glory, the more capital-intensive, the more impressive, but what might have been is not to be seen. One may venture the guess, and it cannot be more than that, that the penalties of inefficiency in the Soviet case are neither enormous nor negligible. Even if minor compared to the whole national product, they may loom large in relation to a particular sector to which the fruits of a better utilization of resources could conceivably be applied.

In the task of removing this inefficiency, Soviet economics, as a discipline, faces some serious obstacles. The chief of these is the axiom represented by the labor theory of value. Whatever its advantages for other purposes, and there may be such, the labor theory of value is a barrier to the development of a meaningful and cogent theory of resource allocation, and especially of the allocation of capital. Its fatal flaw is that it measures output in terms of input, and of only a certain kind of input at that. But the logic of rational allocation requires that alternative combinations of resources be measured in terms of the unit of the maximand (or minimand). Thus, inputs must usually be measured in output units. Only in the special case of labor input minimization (leisure maximization) with a *fixed* bill of goods, where the unit of the minimand happens to be a unit of labor-time, is rational resource allocation formally not

9. M. Bronfenbrenner, “The High Cost of Economic Development” (I), *Doshisha Daigaku Keizaigaku Ronso* (*Doshisha University Economic Review*) (Kyoto), IV, (Feb. 1953), 1-2.

inconsistent with the labor theory of value. This, of course, is the case so ingeniously presented by Novozhilov, and its practical limitations have been noted.<sup>1</sup>

Further, and also because of this, Soviet economics is today largely devoid of the concept of *economic* scarcity, and its corollary, the concept of opportunity cost, as well as of the principle of demand and supply equilibrium.<sup>2</sup> True, it must recognize that resources are limited in quantity, but it does so primarily in a physical sense, rather than in terms of the relationship between the productivity of resources and their cost. Similarly, the notion of equilibrium seems to be understood chiefly in an "arithmetic" sense. It is remarkable that, with the exception of Novozhilov (who stands apart in many respects), none of the Soviet "general" economists writing after 1931 premised their solutions to the problem of capital-intensity on the concept of opportunity cost. Almost invariably they have sought the key to the "effectiveness" of capital within the given process in which capital was to be invested, and not in its alternative uses. Strumilin's contribution is especially rich in examples illustrating this notion of an immanent effectiveness. Perhaps even more remarkable is the lack of concern (again, Novozhilov excepted) with the elementary precaution that the demand for capital, as determined by the proposed criteria of capital-intensity, equal its exogenous supply.<sup>3</sup>

Thus, the theoretical economist in the USSR finds himself in an anomalous position. He cannot question the ends of economic activity or the minutest policy of the regime. The domain left to his investigation is that of means to predetermined ends, and not even the full range of means. But stepping into this domain, he finds himself deprived by the prevailing ideology of some of the most powerful theoretical tools. Lacking them, he cannot construct a solution which will withstand logical scrutiny. If he reaches out for one beyond the bounds of established orthodoxy, as did Novozhilov, he is not only reprimanded for his audacity, but runs the grave danger of having ideological transgressions and political opposition imputed to him. The quality of present-day Soviet economic literature fully reflects this excruciating dilemma.

And yet the Institute of Economics is committed to search for

1. *Supra*, pp. 328, 329.

2. The existence of these gaps in the mental baggage of Soviet economists has also been confirmed by western economists through personal contact. See the interesting report of one such recent contact in P. Wiles, "Soviet Economics," *Soviet Studies*, IV (Oct. 1952), esp. 133-35.

3. Note the difficulty besetting Dobb in his interpretation of Strumilin's model ("A Note on the Discussion . . .," *op. cit.*, pp. 294-95).

a solution to the problem of investment choice. It reached out to eradicate a heretical growth, but instead has grasped a nettle which it cannot quite let go. Zauberman's evaluation is probably in a sense correct: "The real issue in this discussion has not been: 'Is this or that Norm or index an adequate criterion of capital efficiency on the basis of Marxian teaching?' but: 'Is the economist to be allowed to offer any criterion at all to the Master Planner?'"<sup>4</sup> Perhaps the latter question ought to be repeated with the specific Soviet context in mind. That is, not only in relation to the conflict of ideology *versus* the logic of expediency, but also in the context of the struggles of institutions for recognition and authority, of the fates of individuals, and of manoeuvres of organizations and groups within the body of the regime. Having put forth a claim to authority in the matter, can the Institute, representing the profession, and the individual economists afford to have their claim challenged and overthrown? What constructive function will be left to the Soviet economist if this chance to re-establish competence in a pre-eminently economic matter is allowed to vanish? Such are perhaps the considerations which have kept the topic alive in the absence of a definitive ruling by high political authority, and which have so far stood in the way of a satisfactory solution.

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4. "The Prospects for Soviet Investigations into Capital Efficiency," *op. cit.*, p. 332.