Socialist planning after the collapse of the Soviet Union

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1993

Abstract

It must seem to many people that the collapse of the Soviet Union (and the planned economies of Eastern Europe) effectively ends the socialist calculation debate, with a decisive verdict in favour of the market. We argue that this conclusion is unwarranted. Soviet socialism presented a specific form of planning with definite shortcomings of its own, and its collapse need not rule out alternative socialist planning mechanisms. We point out some of the particular limitations of the Soviet model, and offer some justification for the view that there exist alternative planning methods that are both technically feasible and potentially efficient and fair.

1 Introduction

The current state of the socialist calculation debate seems theoretically unsatisfactory. Following a rather long period in which the debate lay dormant, so to speak, a number of important contributions were made in the mid-1980s. In these contributions, the conventional wisdom of the early postwar period—according to which Lange and others had effectively shown how a socialist economy could mimic the resource allocation of a competitive market system—was sharply challenged. Lavoie (1985), in particular, argued at length that the Austrian case for the impossibility of rational economic calculation under socialism had been misunderstood, and hence not really addressed, by the neoclassical writers responsible for the earlier assessment.[1] From a somewhat different angle, Nove's *Economics of Feasible Socialism* (1983) presented a more pragmatic case for the impossibility of effective central planning. While Nove's argument did not rely on Mises or Hayek—and unlike the Austrians he argued in favour of a variant of market socialism—nonetheless his criticisms of central planning and those of the neo-Austrians were mutually reinforcing. And then, of course, not long after these argument had been made, we witnessed the abandonment of central planning in the former Soviet Union and Eastern Europe.

*Prepared for conference on The Socialist Calculation Debate After the Upheavals in Eastern Europe, Centre d'études interdisciplinaires Walras–Pareto, Université de Lausanne, December 11–12, 1992. Published in *Revue européene des sciences sociales*, tome XXXI, no. 96, 1993, 167–185.

[1] See also Murrell (1983), Temkin (1989).

It seems to be rather widely taken for granted nowadays that the latter events validate the anti-planning arguments that preceded them. But this is a fallacy akin to post hoc ergo propter hoc: it is rather as if, following the Hindenberg disaster, someone had said, "You see, I told you that it is impossible to build a safe machine for transporting large numbers of people through the air." It may be that in the case of central planning the impossibility argument is correct (though we argue it is not), but this needs to be established on theoretical grounds. And from this point of view we suggest that the anti-planning arguments have not yet been properly tested in debate.

It is not surprising that neoclassical economists are content to follow the march of history as it appears today—that is, that they have lost all interest in the socialist calculation debate as such, and have switched their attention to the problems of transition to a market system in the formerly socialist states. One might, however, have expected that socialist economists would have wished to defend the planning that was for long at the core of their arguments, or at any rate to probe the arguments of the critics of socialism more deeply before conceding defeat. But there has been very little work along these lines: the case seems almost to have gone by default. Scanning the last few years' issues of journals such as *Socialist Review*, *Rethinking Marxism*, *Socialism and Democracy*, *New Left Review*, *Economy and Society* and the *Socialist Register*, one finds that the only writer offering a defence of socialist planning—apart from the present authors (Cockshott and Cottrell, 1989)—is Ernest Mandel, in his (1986, 1988) rejoinders to Alec Nove and his (1991) piece on the Soviet Union. In the latter, Mandel argues, like ourselves, that the downfall of Soviet planning does not indicate the failure of socialist planning in general. But his grounds are rather different from ours. In particular, we are uncomfortable with his claims that "socialism never existed in the USSR" (1991: 194); and that "the specific forms of Soviet central planning had [the extension of the dimensions, power and privileges of the Stalinist bureaucracy] as their main social purpose" (197). Such claims seem to preserve socialism's theoretical virginity, so to speak, at the cost of severing socialist ideas from historical reality. Better, in our view, to admit that the USSR was socialist, but to argue that it did not represent the only possible model of socialism.

Not only have there been very few attempts to defend planning in the socialist journals of late, there has been very little substantive discussion of economic planning at all. The few remarks that one does find amount to little more than uncritical repetition of the conclusions of Nove and the neo-Austrians, along with the occasional wistful comment on 'democratic planning'. Kenworthy (1990), for instance, when discussing 'bureaucratic centrally-planned socialism' talks in standard fashion about "the impossibility for those in the center to collect sufficient accurate and up-to-date information from the base to design a coherent, well-coordinated plan which allocates resources efficiently" (p. 110). He then has one paragraph on 'democratic centrally-planned socialism', which is said to be "the model most commonly advocated by Marxists", but offers no comment on how the democratic element could overcome the informational issue raised in relation to bureaucratic planning.

The same goes for recent books arguing for socialism; for the most part, economic planning is either not mentioned at all (e.g. Bronner, 1990), or is quickly passed over with a perfunctory counter-argument (Levine, 1984). One exception is Devine (1988), who attempts to chart a middle way between market socialism (of which he produces

a pertinent critique) and central planning, via his concept of 'negotiated coordination'. Devine's arguments are interesting, but it seems to us that his negotiated coordination, while applicable to some issues, is too cumbersome for the regulation of the economy in general.

Przeworski (1989) has commented that "political parties in capitalist society that bear the socialist label have abandoned even the semblance of an alternative": this appears to be true not just of organised political parties, but also, with very few exceptions, of socialist intellectuals.[2] Our aim in this paper is to redress this lack, which involves making two sorts of arguments. First, we sketch the outlines of an adequate planning system and examine its technical feasibility given modern computing technology. Second, we offer an analysis of why Soviet planning 'failed', in terms of the particular ideological, social, and technical factors which prevented the Soviets from developing the sort of system we advocate.[3]

2 Outline of our proposals

First of all, it will be useful to set out the general conditions which are required to operate an effective system of central economic planning, leaving aside for the moment the issue of whether they can actually be realized in any feasible system. Taking an input–output perspective on the economy, effective central planning requires the following three basic elements:

1. A system for arriving at (and periodically revising) a set of targets for final outputs, which incorporates information on both consumers' preferences and the relative cost of producing alternative goods (the appropriate metric for cost being left open for the moment).

2. A method of calculating the implications of any given set of final outputs for the the required gross outputs of each product. At this stage there must also be a means of checking the feasibility of the resulting set of gross output targets, in the light of the constraints posed by labour supply and existing stocks of fixed means of production, before these targets are forwarded to the units of production.

3. A system of monitoring, rewards and sanctions such as will ensure that the dispersed units of production comply with the plan for the most part.

The provision of these elements involves a number of preconditions, notably an adequate system for gathering and processing dispersed economic information and a rational metric for cost of production. We should also note at once the important and

[2] There have been some recent arguments in favour of market socialism (e.g. Miller, 1989; Bardhan and Roemer, 1992), but insofar as such arguments concede the case against central planning they are not counter-examples to our point here. We do not have space to consider these writings at length, but it seems to us that 'market socialism' is a highly fissile by-product of the disintegration of the socialist economies, with a half-life measured in months. The instability of market socialism is argued on theoretical grounds by Scott Arnold (1987).

[3] A third sort of argument is also relevant, namely a point-by-point counter to the Austrian anti-planning arguments. We have offered this elsewhere, in Cottrell and Cockshott (1993a).

entirely valid point stressed by Nove (1977 and 1983): for effective central planning, it is necessary that the planners are able to carry out the above sorts of calculations in full disaggregated detail. In the absence of horizontal market links between enterprises, management at the enterprise level "*cannot* know what it is that society needs unless the centre informs it" (Nove, 1977: 86).[4] Thus if the centre is unable to specify a coherent plan in sufficient detail, the fact that the plan may be 'balanced' in aggregate terms is of little avail. Even with the best will in the world on the part of all concerned, there is no guarantee that the specific output decisions made at the enterprise level will mesh properly.This general point is confirmed by Yun (1988: 55), who states that as of the mid-1980s Gosplan was able to draw up material balances for only 2,000 goods in its annual plans. When the calculations of Gossnab and the industrial ministries are included, the number of products tracked rises to around 200,000, still far short of the 24 million items produced in the Soviet economy at the time. This discrepancy meant that it was "possible for enterprises to fulfill their plans as regards the nomenclature of items they have been directed to produce, failing at the same time to create products immediately needed by specific users".

Our argument below involves grasping this particular nettle: while we agree that "in a basically non-market model the centre must discover what needs doing" (Nove, 1977: 86), and we accept Yun's account of the failure of Gosplan to do so, we dispute Nove's contention that "the centre cannot do this in micro detail" (*ibid.*).

Our basic proposals can be laid out quite simply, although we ask the reader to bear in mind that we do not have space here for the necessary refinements, qualifications and elaborations (these are developed at length in Cockshott and Cottrell, 1993). In schematic form the proposals are as follows.

2.1 Labour time as the basic social unit of account and metric of cost

The allocation of resources to the various spheres of productive activity takes the form of a social labour budget. At the same time the principle of labour-time minimization is adopted as the basic efficiency criterion. That is, we are in agreement with Mises (1935: 116) that rational socialist calculation requires "an objectively recognizable unit of value, which would permit of economic calculation in an economy where neither money nor exchange were present. And only labour can conceivably be considered as such." We disagree, of course, with Mises' subsequent claim that even labour-time cannot, after all, play the role of 'objective unit of value'. We have countered his two arguments to this effect—namely, that labour-time calculation necessarily leads to the undervaluation of non-reproducible natural resources, and that there is no rational way (other than via a system of market-determined wage rates) of reducing labour of differing skill levels to a common denominator—in another publication (Cottrell and Cockshott, 1993a).

[4] With one reservation. If, say, the central plan calls for enterprise A to supply intermediate good x to enterprise B, where it will be used in the production of some further good y, and if the planners apprise A and B of this fact, is there not scope for 'horizontal' discussion between the two enterprises over the precise design specification of x? (That is, even in the absence of market relations between A and B.)

2.2 Labour-token system of distribution

From Marx we take the idea of the payment of labour in 'labour tokens', and the notion that consumers may withdraw from the social fund goods having a labour content equal to their labour contribution (after deduction of taxes to offset the communal uses of labour time: accumulation of means of production, public goods and services, support of those unable to work). We envisage a basically egalitarian pay system; but insofar as departures from egalitarianism are made (i.e. some kinds of work are rewarded at more than, and some at less than, one token per hour), the achievement of macroeconomic balance nonetheless requires that the total current issue of labour tokens equals the total current labour performed. We also suggest that the most suitable system of taxation in such a context is a flat tax per worker—a uniform membership fee for socialist society, so to speak. This tax (net of transfers to non-workers) should, in effect, 'cancel' just enough of the current issue of labour tokens so as to leave consumers with sufficient disposable tokens to purchase the output of consumer goods at par. (This point is further developed below.)

2.3 Democratic decisions on major allocation questions

The allocation of social labour to the broad categories of final use (accumulation of means of production, collective consumption, personal consumption) is suitable material for democratic decision making. This might take various forms: direct voting on specific expenditure categories at suitable intervals (e.g. on whether to increase, reduce or maintain the proportion of social labour devoted to the health care system); voting on a number of pre-balanced plan variants; or electoral competition between 'parties' with distinct platforms as regards planning priorities.

2.4 Consumer goods algorithm

Our proposal on this count might be described as 'Lange plus Strumilin'. From Lange we take up a modified version of the 'trial and error' process, whereby market prices for consumer goods are used to guide the re-allocation of social labour among the various consumer goods; from Strumilin we take the idea that in socialist equilibrium the use-value created in each line of production should be in a common proportion to the social labour time expended.[5] The central idea is this: the plan calls for production of some specific vector of final consumer goods, and these goods are marked with their social labour content. If planned supplies and consumer demands for the individual goods happen to coincide when the goods are priced in accordance with their labour values, the system is already in equilibrium. In a dynamic economy, however, this is unlikely. If supplies and demands are unequal, the 'marketing authority' for consumer goods is charged with adjusting prices, with the aim of achieving (approximate) short-run balance, i.e. prices of goods in short supply are raised while prices are lowered in the case of surpluses.[6] In the next step of the process, the planners examine the ratios

[5] This point—a basic theme of Strumilin's work over half a century—is expressed particularly clearly in his (1977: 136–7).

[6] With market-clearing prices, of course, the goods go to those willing to pay the most. Given an egalitarian distribution of income, we see no objection to this.

of market-clearing price to labour value across the various consumer goods. (Note that both of these magnitudes are denominated in labour-hours; labour content in the one case, and labour tokens in the other). Following Strumilin's conception, these ratios should be equal (and equal to unity) in long-run equilibrium. The consumer goods plan for the next period should therefore call for expanded output of those goods with an above-average price/value ratio, and reduced output for those with a below-average ratio.[7]

In each period, the plan should be balanced, using either input–output methods or an alternative balancing algorithm.[8] That is, the gross outputs needed to support the target vector of final outputs should be calculated in advance. This is in contrast to Lange's (1938) system, in which the very coherence of the plan—and not only its optimality—seems to be left to 'trial and error'. Our scheme, however, does not impose the unreasonable requirement that the pattern of consumer demand be perfectly anticipated *ex ante*; adjustment in this respect is left to an iterative process which takes place in historical time.[9]

The proposed scheme as a whole is set out in synoptic form in Figure 1.

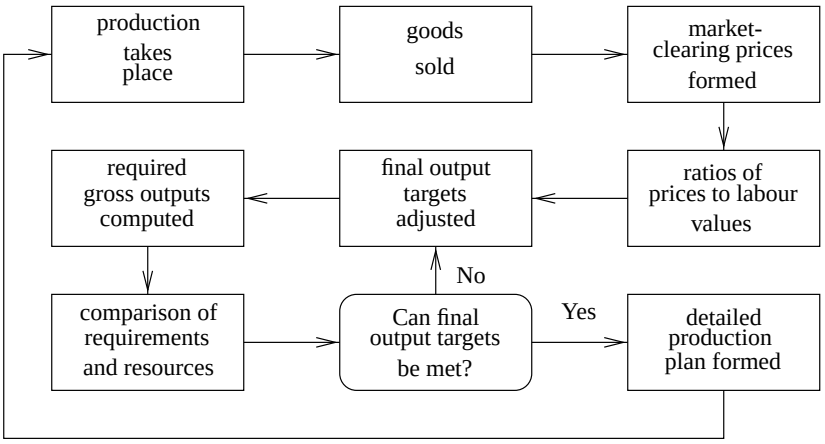

Figure 1: Outline of planning mechanism

This scheme meets the objection of Nove (1983), who argues that labour values cannot provide a basis for planning even if they gave a valid measure of cost of production. Nove's point is that labour content of itself tells us nothing about the use-value of

[7] Naturally, an element of demand forecasting is also called for here: the current ratios provide a useful guide rather than a completely mechanical rule.

[8] An alternative algorithm which makes allowance for given stocks of specific means of production is given in Cockshott (1990).

[9] In his later reflection on the socialist calculation debate, Lange (1967) seems to suggest that an optimal plan can be pre-calculated by computer, without the need for the real-time trial and error he envisaged in 1938. Insofar as this would require that consumer demand functions are all known in advance, this seems to us far-fetched.

different goods. Of course this is true,[10] but it only means that we need an independent measure of consumers' valuations; and the price, in labour tokens, which roughly balances planned supply and consumer demand provides just such a measure. By the same token, we can answer a point made by Mises in his discussion of the problems faced by socialism under dynamic conditions (1951: 196ff). One of the dynamic factors he considers is change in consumer demand, à propos of which he writes: "If economic calculation and therewith even an approximate ascertainment of the costs of production were possible, then within the limits of the total consumption-units assigned to him, each individual citizen could be allowed to demand what he liked…." But, he continues, "since, under socialism, no such calculations are possible, all such questions of demand must necessarily be left to the government". Our proposal allows for precisely the consumer choice that Mises claims is unavailable.

3 Feasibility of calculation

3.1 Calculation of labour values

The proposals above rest on the assumption that it is possible to calculate the labour content of each product in the economy. The problem is in principle solvable since one has n unknown labour values related by a set of n linear production functions. The difficulty is not one of principle but of scale. When the number of products gets up into the millions, the calculation involved is nontrivial.

If we were to represent the problem in classic matrix terms, with an n by $(n+1)$ matrix, where the rows represent products and the columns represent produced inputs plus direct labour, analytic solution of the equations using Gaussian elimination gives a problem requiring n^3 multiplication operations and a slightly larger number of additions and subtractions. Table1 gives the computer requirements for this calculation assuming differing sizes of economy. We assume that the uniprocessor is capable of 10^6 multiplications a second, and that the multiprocessor can perform 10^9 multiplications per second.

Number of products	Multiplications	Time taken in seconds: *Uniprocessor*	*Multiprocessor*
1,000	1,000,000,000	1,000	1.0
100,000	10^{15}	10^9	1,000,000
10,000,000	10^{21}	10^{15}	10^{12}

Table 1: Gaussian solution to labour values

It can be seen that, taking compute time alone into account, even the multiprocessor would take 10^{12} seconds, or over thirty thousand years, to produce a solution for an

[10] As was clearly understood by Marx: "On a given basis of labour productivity the production of a certain quantity of articles in every particular sphere of production requires a definite quantity of social labour-time; although this proportion varies in different spheres of production and has no inner relation to the usefulness of these articles or the special nature of their use-values." (1972: 186-7)

economy of 10 million products. As if this were not enough, the situation would be further complicated by the memory required to store the matrix, which grows as n^2. Since the largest currently feasible memories are of the order of 10^{10} words, this would set a limit on the size of problem that could be handled at about 100,000 products.

If, however, we take into account the sparseness of the matrix (i.e. the high proportion of zero entries, when it is specified in full detail) the problem becomes more tractable. Let us suppose that the number of different types of components that enter directly into the production of any single product is n^k where $0 < k < 1$. If we assume a value of 0.4 for k, which seems fairly conservative,[11] we find that memory requirements now grow as $n^{(1+k)} = n^{1.4}$. If we can further simplify the problem by using iterative numerical techniques (Gauss–Seidel or Jacobi) to obtain approximate solutions, we obtain a computational complexity function of order $An^{1.4}$, where A is a small constant determined by the accuracy required of the answer.

This reduces the problem to one that is clearly within the scope of current computer technology, as shown in Table 2. The most testing requirement remains the memory, but it is within the range of currently available machines.

Number of products	Multiplications	Words of memory	Time taken in seconds: *Uniprocessor*	*Multiprocessor*
1,000	158,489	31,698	0.158	1.6×10^{-4}
100,000	100,000,000	20,000,000	100	0.1
10,000,000	6.3×10^{10}	1.2×10^{10}	63,096	63.10

Table 2: Iterative solution to labour values (Assuming A=10)

From this we conclude that the computation of labour values is eminently feasible.

3.2 Resource Allocation

If we assume that the mix of net or final outputs required by the plan is specified, as are the available technologies and the stocks of means of production, how difficult is it to compute a feasible plan? By a feasible plan we mean one which produces at least the required outputs using the available resources. Following on from this, can we determine if the planned mix of outputs is infeasible given the resources?

The classic approach to this is to use linear programming, whose computational requirements are unfortunately forbidding for an economy with millions of products. But if we are willing to relax our requirements somewhat and settle for a 'good' rather than an optimal solution, we can perform a simplification similar to that described for labour-value calculations. One approach would be to start from the target list of final outputs, and work back to the corresponding required gross outputs (via the same sort of iterative solution method set out for labour values, and exploiting the sparseness of the input–output matrix in the same way). Given the vector of gross outputs, it is then

[11] This means, for instance, that in a 10 million product economy each product is assumed to have on average 631 direct inputs.

straightforward to determine the overall requirements for labour and fixed means of production of various kinds. If the latter requirements can be met, well and good; and if not, then one trims the target list of final outputs and tries again. These steps are shown in the form of a loop at the bottom left of Figure 1. While it is computationally feasible, this method has the drawbacks of requiring a 'manual' adjustment of the target output vector each time round the loop, and of failing to ensure that all resources are used as fully as possible. A preferable alternative technique, which draws on ideas from the literature on neural nets, is set out in Cockshott (1990). This is of complexity $An^{(1+k)}$, as was the iterative solution for labour values. The computational requirements are thus essentially the same.

In what sense is the solution produced by the latter method a 'good' one? The procedure involves defining a metric for the degree of fit between the target set of final outputs and the computed feasible set, as constrained by existing stocks of means of production of various kinds, and by the available labour time. The algorithm then in effect searches the space of feasible plans, aiming to maximize this degree of fit. The nature of the search algorithm is such that it may settle at a local maximum rather than finding the global maximum; this is the price paid for computational tractability. Nonetheless, the fact that the solution is not the optimal plan, but merely a good feasible one, is not a serious problem when comparing planning to the market, since no real market achieves an optimal structure of production.

3.3 Comparison with existing computer technology

We have set out the scale of computer resources required either to compute labour values or to compute a feasible plan for a whole economy. From Table 3 (see Bell, 1992) we can see that the required memory and processing power are well within the capabilities of current machines. We have assumed a multiprocessor capable of 10^9 multiplications a second; the peak rates of the machines shown in the Table range from 1.6×10^{10} to 3×10^{11} multiplications per second. One must allow some reduction in peak rates before arriving at a sustainable performance for a computer, but our target performance is clearly realistic. Memory requirements are also within the range of current products. With modern computers, one could envisage computing an updated list of labour values daily and preparing a new perspective plan weekly. This is somewhat faster than a market economy is able to react.

Machine	Number of processors	Peak Gflops	Price ($M)	Memory (GB)
Cray90	16	16	30	16
KSR1	1088	43	30	34
INTEL Paragon	4096	300	55	128
DEC Alpha	1024	150	20	32

Table 3: Characteristics of 1992 supercomputers

4 The Soviet model of planning and its problems

Our argument is that the Soviets, for reasons both ideological and technical, did not come close to building the sort of systems we have identified as essential. Of course the Soviet planning system was quite effective at first. The Soviets were able to build a heavy industrial base, and in particular an armaments industry capable of defeating the Nazi war machine, in a much shorter time than any capitalist economy, albeit at a very high cost. At that stage of development, crude planning methods were adequate: the economy was, of course, much less technologically complex than at present, and the plans specified relatively few key targets. Even so, there are many tales of gross mismatches between supply and demand during the period of the early 5-year plans; a huge expansion of the inputs of labour and materials meant that the key targets could be met despite such imbalances.

It should be noted that the early Soviet plans were not drawn up according to the schema outlined above. Working backwards from a target list of final outputs to the required list of gross outputs, consistently and in detail, was quite beyond the capacity of Gosplan. Often, instead, the planners started out from targets that were themselves set in gross terms: so many tons of steel by 1930, so many tons of coal by 1935, and so on. This early experience arguably had a deleterious effect on the economic mechanism in later years. It gave rise to a sort of 'productionism', in which the generation of bumper outputs of key intermediate industrial products came to be seen as an end in itself.[12] In fact, from an input–output point of view, one really wants to economise on intermediate goods so far as possible. The aim should be to produce the minimum amounts of coal, steel, cement, etc., consistent with the desired volume of final outputs.

At any rate, it became increasingly evident after the period of post-war reconstruction that the sort of planning system inherited from the early industrialization period was incapable of developing a dynamic, technologically progressive economy that would satisfy consumer demand. Certain priority sectors such as space exploration showed remarkable successes, but it seemed to be an inherent feature of the system that such successes could not be generalized; indeed, the converse of the priority given to the privileged sectors was the relegation of the production of consumer goods to the role of residual claimant on resources. Over the course of the 1960s and 70s, repeated attempts at reform of one kind or another were basically a failure, leading to the notorious 'stagnation' (*zastoi*) of the later Brezhnev years.

Why this outcome? In the light of the arguments given above, one point that suggests itself immediately is the state of Soviet computing and telecommunications facilities at the time. That is, while we have argued that effective, detailed planning is possible using current Western computing technology, the technology available to Soviet planners in the 1970s was very primitive by comparison. This point is important, and we shall return to it, but it is only part of the story, and some other considerations deserve emphasis.

[12] It is noteworthy that Stalin (1952) felt obliged to take issue with the idea that the basic purpose of economic activity under socialism was production itself (see his criticisms of Comrade Yaroshenko). As with his criticism of the 'excesses' of forced collectivization in agriculture in 'Dizzy with Success' (1930; reprinted in Stalin, 1955), this may be a case of Stalin belatedly attacking a view or practice that he had earlier encouraged.

4.1 Ideological resistance to rational planning methods

It is well known that official Soviet adherence to 'Marxist' orthodoxy placed obstacles in the way of the adoption of rational planning methods. New approaches to planning were generally regarded with suspicion, even those which had nothing to do with the introduction of market relations. As regards the input–output method, Augustinovics (1975: 137) has pointed out the double irony whereby this method "was accused of smuggling the evil of Communist planning into the free democratic economy and the evil of bourgeois ideology into the socialist economy." Treml (1967: 104) also suggests that the very idea of starting the planning process from final output targets was seen by the official guardians of orthodoxy as consumption-oriented and therefore somehow 'bourgeois'. Similarly, Kantorovich's path-breaking work on linear programming was for long rejected.

It would appear that the worst of this sort of ideological rejection of theoretical innovation had been overcome by around 1959. Tretyakova and Birman (1976: 161) cite 1959 as the year by which input–output had become officially respectable; this was also the year in which Kantorovich's *Best Utilization of Economic Resources*, written in 1943, was finally published. Nonetheless, even after Kantorovich was awarded the Lenin prize in 1965 (along with Nemchinov and Novozhilov) his ideas still attracted uninformed criticism from the orthodox.[13] And although input–output and linear programming eventually received some degree of official blessing, these techniques remained marginal to actual Soviet planning procedures. This was due in part to the computational problems alluded to above, which meant that input–output methods could not replace the much cruder 'material balance' calculations for the full range of goods covered by the latter (which was itself only a relatively small subset of the complete list of goods produced).[14] Some other reasons are noted below.

4.2 The disjunction between 'practical planning' and high-flown research

We refer here to the bifurcation between the routine activities of Gosplan and Gossnab (lacking an adequate theoretical basis, and driven by ad hoc political pressures from the Politburo) and the hypertrophy of high-mathematical theorization of planning in the research institutes. This disjunction has two sides to it. On the one hand the 'practical planners' seem to have been resistant to innovation even when their resistance was not rationalized in ideological terms. Kushnirsky (1982) notes that while work on input–output was done at two Gosplan research institutes—the Scientific Research Economic Institute and the Main Computer Centre—participation in this work by the actual Gosplan departments was 'minimal'. One of the reasons he gives for this is that "the planners think that determining final demand components is even more difficult than determining gross output" (p. 118). Moving to a system of planning final outputs in the first instance would, as we have already noted, mark a substantial change from the traditional Soviet pattern, a change that Gosplan was apparently reluctant to make. As Kushnirsky notes, "since the demand for goods and services in the Soviet

[13] As discussed in the Introduction to Smolinski (1977); see also Nove (1977, chapter 12).

[14] For the limitations on the size of the input–output systems which the planners reckoned themselves able to deal with at various times, see Treml (1967), Ellman (1971), Yun (1988), Treml (1989).

economy is substituted with 'satisfied' demand, which is derived from the level of output, planners believe they can determine production plans more precisely than they can components of final demand." (*ibid.*).

Again, the introduction of the Automated Planning Calculations System (ASPR) in the late 1960s is seen by Kushnirsky as having little impact on the actual procedures of Gosplan. He points out that "the ASPR project [did] not create new problems for planners since their involvement [was] minimal" (p. 119), and goes on to explain that "there is not much room for changes in planning techniques through ASPR, even if its developers possessed the required skills. ASPR must follow the existing planning methodology, and elaborate only such alterations as are approved by Gosplan. Otherwise the suggested techniques could not be applied, and Gosplan would not pay for them" (p. 123). Summing up, he remarks that "Gosplan is not the place for experiments" (*ibid.*).

The second aspect of the disjunction lies in the abstracted nature of at least some of the work done in the research institutes. The latter produced some good ideas for planning at the micro level (e.g. Kantorovich's linear programming), but much of the work done on 'optimal planning' of the system as a whole was hopelessly abstract, in that it required a prior specification of some sort of 'social welfare function' or general measure of 'social utility'.[15] While making little headway on this quixotic task, the 'optimal planning' theorists contributed to the 'cooling of interest' in input–output methods described by Tretyakova and Birman (1976: 179): "Only those models and methods that would lead to optimal results were worthy of attention. Inasmuch as it became clear almost immediately that an optimal model could not be built on the basis of input–output, many simply lost interest in the latter."

In this context it is interesting to note that S. Shatalin—author of the briefly celebrated but absurdly impractical '500 Days' plan for the crash introduction of capitalism in the USSR in 1990—was in a previous incarnation the author of an equally impractical notion to optimise the plan. (See the account in Ellman, 1971, p. 11, where Shatalin is cited as discussing both input–output and 'optimal planning', and claiming that only the latter is 'really scientific'.)

By contrast, our own proposals—although they certainly depend on sophisticated information systems—are relatively robust and straightforward. There is no attempt to define a criterion for social utility or optimality a priori; rather 'social utility' is revealed (a) via democratic choice on the broad allocation of resources to sectors, and (b) via the pattern of ratios of market-clearing prices to labour values for consumer goods.

4.3 The idea that improved technique obviated the need for fundamental reform

A further reason for the failure of attempted reform of the Soviet planning system in the period from the 1960s to the early 1980s was the idea—apparently held at various times by the leadership of the CPSU—that the application of new mathematical

[15] Besides this sort of problem, Kushnirsky notes the poor quality of the studies of existing planning technology conducted in the research institutes in the context of the ASPR project. He found that the accounts produced in the institutes were not amenable to algorithmic presentation, and "it was difficult to ascertain the purpose of these materials" (1982: 124).

or computational methods offered a 'painless' means to improve the functioning of the economy, a means that would not fundamentally disturb the existing system (as opposed, say, to the widespread introduction of market relations). In fact, advanced technical methods could yield real dividends only in the context of an overhaul of the economic system as a whole, involving, *inter alia*, a re-examination and clarification of the goals and logic of planning, as well as reorganization of the systems for assessing and rewarding the performance of enterprises. Goodman and McHenry (1986: 332) make clear that the Automated Management Systems (ASUPs) introduced from the late 1960s were to a large extent rejected as an alien implant, whose purposes were at odds with the actual purposes of enterprises under the existing system. For example, the idealized ASUP goal of "optimal, minimal levels of inventory" conflicted directly with the traditional enterprise goal of amassing "as many supplies as possible", and the ASUP goal, "realistically evaluate capacity", ran counter to the enterprise objective, "understate capacity". Clearly, it would have taken a bold and far-reaching reform of the system to make the goals of ASUP effective.

Consider the sort of planning scheme we outlined in section 2 above, in which production is expanded for those products showing an above-average ratio of market-clearing price (expressed in labour tokens) to labour value, and reduced for those products showing a below average ratio. Such a system effectively rewards (with an increased allocation of labour and means of production) enterprises making particularly effective use of social labour; hence enterprises should have an incentive to employ any methods which enable them to economise on labour input (both direct and indirect) per unit of output. Some such scheme would be required to break out of the traditional Soviet pattern whereby enterprises merely aimed at securing easily attainable plan output quotas, and had no interest in improving their own efficiency.

4.4 Failure to employ labour-time accounting

Following on from the point above, one has to consider why the classical socialist idea of using labour time as a unit of account was abandoned—a step which, we would argue, vitiated any rational economic calculation at the micro level. We have shown (Cottrell and Cockshott 1993a) that the idea of using labour-time accounting had already been abandoned by the influential German Social Democracy prior to the Russian Revolution. But the idea was lying around to be rediscovered by anyone who was familiar with Marx or Ricardo. That it was not adopted seriously in the USSR must, we think, reflect the economic interests of those with power and influence in that society. Its radically egalitarian implications would have been unwelcome to officials whose incomes differentials it would have threatened.

Having once failed to adopt labour-time calculation, pressure from the working class for egalitarian measures was bought off by subsidies on essential goods. Subsidies were the bad conscience of socialist inequality. One of their consequences was to depress wages below the level of necessary labour time. Under capitalism, the fact that employers pay for only part of their employees' labour, whereas they pay in full for all capital equipment, introduces a systematic bias against the introduction of labour-

saving technology that varies inversely with the level of wages.[16] Low wage rates encourage the squandering of labour with sweatshop technology. The effects in the USSR were similar. With labour-power cheap, it was rational for enterprises to hoard labour and pay little attention to staffing levels. The use of Marxian labour values for payment and economic calculation would, by contrast, have introduced a strong pressure to economise on the use of labour. A plant that had to meet its output targets within a pre-given labour budget, according to which an hour of living or an hour of embodied labour were costed at par, would tend to be alert to the possibility of replacing labour with machinery.

4.5 The state of computing and telecommunications technology

As noted above, we have argued for the feasibility of our planning proposals by reference to the latest generation of Western supercomputers, and there is no doubt that the computing technology available to the Soviets was primitive by comparison. Goodman and McHenry (1986: 329) describe the state of the Soviet computer industry as of the mid-1980s, noting that the substantial lag behind the West was in part the result of that industry's isolation: "no computing community, including that of the United States, would be able to move at its current pace if it were to have its contacts with the rest of the world severely restricted".

Nonetheless, although we have found it convenient to take current supercomputers as a benchmark in our calculations, we have argued elsewhere (Cockshott and Cottrell, 1989, appendix) that the same object could be achieved—more slowly, but still on a time scale useful for practical planning purposes—by means of a distributed network of personal computers at enterprise level, in communication with a relatively modest central computer. From this perspective, perhaps the most serious technical limitation in the Soviet case was the backwardness of the telecommunications system. Goodman and McHenry (1986) draw attention to the slow speed and unreliability of the Soviet phone system, and the problems of finding links that are good enough for data transmission. They also quote the striking statistic that in 1985, only 23 per cent of urban families had phones.

Once again, however, we do not wish to over-emphasize technology. The economic information systems developed by Stafford Beer in Allende's Chile (described in Beer, 1975) show what could be done with modest resources, given the political will and theoretical clarity on the objectives of the system. If the Soviets had been equally clear on what they hoped to achieve via the computerization of planning, then even if it were impossible at first to implement all that they hoped for, they would have been in a position to exploit new developments in computer and communications technology as they appeared. In fact, of course, it would seem that Soviet economists—or at any rate, those who had the ear of the political leadership under Gorbachev—were little interested in developing the sorts of algorithms and computer systems that we have discussed. By the mid-1980s they had apparently lost their belief in the potential of efficient planning, and many had jumped on the bandwagon of resurgent free market economics epitomized by the Reagan and Thatcher administrations.

[16] See Marx (1976: 515–7), and for further discussion of the point, Cockshott and Cottrell (1993).

5 Conclusion

A question may well suggest itself to the reader of the above arguments: Are we not being supremely arrogant is supposing that we have come up with an adequate scheme for central planning where the 'best minds' in the USSR failed over a period of, say, 25 years? (That is, from 1960 or so, when the issue of reform of the planning system emerged, until the late 1980s, when this whole conception was abandoned in favour of a transition to the market.) Our answer is, Not really, it's not that we think ourselves smarter than the Soviet economists, rather we are not operating under the same constraints. The two main intellectual inputs into our scheme are (a) a critical, non-dogmatic Marxism and (b) modern computer science. It was very difficult to combine these in the old USSR, where 'Marxism' so often served an obscurantist, anti-scientific function. Our views would probably have been considered deviationist by the guardians of orthodoxy... and at the same time naively socialist by those whose view of socialism was formed in the cynical Brezhnev years, and to whom Marxism was therefore nothing but a fossilized dogma.

A further point merits at least brief mention in conclusion. The material in section 3 above relates only to the technical feasibility of our planning proposals; political feasibility is another matter altogether under current conditions. But we have two remarks to make on this. First, although it lacks any clear political articulation at present, there remains a reserve of popular support for some form of socialism in Russia, according to the research cited in Kotz (1992).[17] Secondly, we would point out that although our own proposals are further removed from current conventional wisdom than market socialist proposals, so far as feasibility of implementation is concerned the market socialists are essentially in the same boat as ourselves: if the principal means of production are privatized, socialism of any sort is off the agenda, and probably for a long historical period.

Whatever might be the prospects for implementing the sort of planning scheme we have outlined in the foreseeable future, we hope that these arguments will provoke a further reconsideration of the socialist calculation debate. We hope, that is, to have shown that the collapse of the Soviet system cannot in itself be taken as proof of the validity of the Austrian, or any other, case for the general impossibility of effective socialist planning.

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[17] As of May 1991, a poll conducted in Russia showed 12% of respondents in favour of "a socialist society along the lines we had in the past", plus 43% favouring "a more democratic kind of socialism". Only 20% favoured "a free market form of capitalism such as found in the U.S. or Germany".

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