

Why Labour Time Should Be the Basis of Economic Calculation

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Abstract

Since the collapse of the Soviet Union it has seemed to many that the socialist calculation debate is essentially over, with a decisive verdict in favor of the market. Recent instabilities in the world market are again prompting the question whether some form of conscious regulation of economies may be appropriate. We argue that the increasing power of modern computer technology along with the use of Ricardian–Marxian labour values opens up new possibilities for economic planning.

1 Introduction

In our talk at the Conference on 21st Century Socialism at the Rosa Luxemburg Institute in Berlin on the 11th of November 2006 we concentrated on the question of why a socialist economy should take labour time as its unit of account. That talk was necessarily brief and the ideas will have been new to many of our listeners. This article seeks to situate our talk in the context of a broader project upon which we have been engaged since the late 1980s to construct a coherent ideological and scientific basis for the revitalization of socialist economic theory.

The context is both the obvious international one caused by the collapse of the USSR, but also the more immediate political context of a Germany with between 4 and 5 million unemployed people, where privatization is accelerating and where people are now being forced to work for 1 Euro per hour. In this situation the left is in danger of losing out to conservative or radical-right forces unless it is able to offer an economic alternative that is

- appealing to the mass of the people,
- economically coherent in the sense of actually being able to work, and that
- offers a long term prospect of evolution towards a new and better society.

Our speech concentrated on how a labour-value based economy would be superior to the previous socialist economic systems. In this paper we will extend the arguments, including some ideas on how to get from here to there, and how to address the immediate needs of the population.

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Background

The collapse of the Soviet Union at the end of the 1980s established a presumption—reinforced by the arguments of the Austrian school (Hayek, Mises)—that there exists no viable alternative to capitalism and the free market. From this perspective, socialist planning appears as a utopian dream. One index of the dominance of the Austrian arguments regarding the impossibility of rational planning is provided by Joseph Stiglitz’s *Whither Socialism* (1994). Stiglitz is critical of socialist economics, but his critique is almost entirely directed against *market* socialism. As for a centrally planned economy, he says only that “Hayek had rightly criticized” the Marxian project, “arguing that the central planner could never have the requisite information” (Stiglitz, 1994, p. 9). This is a typical response: even economists who do not subscribe fully to Hayek’s views on the merits of the free market nonetheless generally believe that the Austrian critique of central planning may safely be regarded as definitive. We hope to show that this should not be taken for granted.

The next section outlines our proposals for a system of rational socialist planning, and section 3 assesses the technical feasibility of implementing these proposals. The scheme we advocate involves making extensive use of labour values (in the sense of vertically integrated labour coefficients) in the planning process, and in section 4 we examine the criticism of this sort of use of labour values put forward by Samuelson and Weiszäcker. Section 5 discusses the stages of transition to a planned economy and offers some ideas on the current German situation. A brief conclusion is presented in section 6.

2 Outline of our proposals

We first set out the general conditions which are required to operate an effective system of central economic planning. Taking an input–output perspective on the economy, effective central planning requires the following basic elements:

1. A system for arriving at (and periodically revising) a set of targets for final or net 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 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. Are they possible, given the existing labour supply and existing stocks of fixed means of production? If not, they will have to be scaled down.

The provision of these elements involves certain preconditions, notably an adequate system for gathering and processing dispersed economic information and a rational metric for cost of production. We should also note the point stressed by Alec 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 level of the enterprise “cannot know what it is that society needs unless the centre informs it” (Nove, 1977, p. 86). 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 good will 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, p. 55), who states that as of

Table 1: Average percentage deviations between market prices and labour values for the USA over selected years. Figures taken from Shaikh(1998).

year	deviation of price from value
1947	10.5%
1958	9.0%
1962	9.2%
1967	10.2%
1972	7.1%
Average	9.2%

the mid-1980s Gosplan was able to draw up material balances for only 2,000 goods in its annual plans. When the calculations of Gosplan 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 involves grasping this nettle: while we agree that “in a basically non-market model the centre must discover what needs doing” (Nove, 1977, p. 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.

Labour time as unit of account and measure of cost

“Every thing in the world is purchased by labour.” — *David Hume*

“The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consist always either in the immediate produce of that labour, or in what is purchased with that produce from other nations.” — *Adam Smith*

The classical political economists—Hume, Smith, Ricardo and Marx—held that the price of commodities is regulated by labour. Ricardo said that changes in prices were 95% due to changes in labour inputs. This idea was denigrated by neoclassical economics, but it remains a scientifically testable proposition. Since the 1980s econometric studies by marxian economists have verified that the classical theory of value is still valid.¹

As you can see from Table 1, the average error you get when predicting United States prices using the labour theory of value is only about 9%. This has proven to be the case across many industries and several decades (Table 2).

We propose that in a socialist economy 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

¹The seminal study was Shaikh (1984). For several additional references see Cockshott and Cottrell (1998), Zachariah (2006).

Table 2: Comparing the correlation of prices to labour values in different countries. Figures from Zachariah (2006).

Country	year	number of industries	price/labour correlation
Japan	1995	85	98.6%
Sweden	2000	48	96.0%
USA	1987	47	97.1%
Greece	1970	35	94.2%
UK	1984	101	95.5%
Germany	1995	33	96.5%
France	1995	37	97.6%

of labour time minimization is adopted as the basic efficiency criterion. We are in agreement with Mises (1935, p. 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 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). We can only summarize our responses here. If one uses *marginal* labour time as a measure of cost, that takes into account the growing difficulty in obtaining non-reproducible resources. In addition, planners could decide to devote resources to the research into alternatives, the use of solar power instead of oil for instance. Furthermore, there is no reason to believe that any real market furnishes an optimal solution to such problems. As for the non-homogeneity of labour, one can in principle treat skilled labour in the same way as any other product, evaluated in terms of the training time required to produce it. For an elaboration of this idea, see Cockshott and Cottrell (1993, chapter 2).

Labour-token system of distribution

From Marx’s *Critique of the Gotha Programme* (Marx, 1974) 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. 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.

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.

Consumer goods algorithm

Our proposal on this count may be described as “Lange plus Strumilin”. From Oskar Lange (1938) we take up a modified version of the trial and error process, whereby market prices for consumer goods are used to guide the 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.²

The central idea is this: the plan calls for production of some specific array of final consumer goods, and these goods are marked with their social labour content (in the same sort of way that goods are marked with their caloric or fat content at present). 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. That is, prices of goods in short supply are raised while prices are lowered in the case of surpluses. In the next step of the process, the planners examine the ratios 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 1) 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.

In each period, the plan should be balanced, using either input–output methods or an alternative balancing algorithm.³ 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 requirement that the pattern of consumer demand be perfectly anticipated in advance; adjustment in this respect is left to an iterative process which takes place in historical time.

The proposed scheme as a whole is set out in Figure 1. This scheme meets the objection of Nove (1983), namely 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 different goods. Of course this is true,⁴ but it only means that

²This point—a basic theme of his work over half a century—is expressed particularly clearly in Strumilin (1977, pp. 136–7).

³An alternative algorithm which makes allowance for given stocks of specific means of production is given in Cockshott (1990).

⁴As 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;

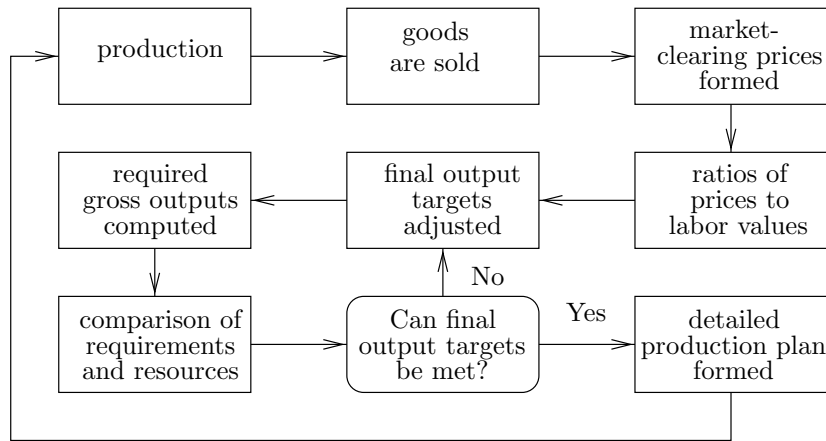


Figure 1: Outline of planning mechanism

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 (Mises, 1951, p. 196ff). One of the dynamic factors he considers is change in consumer demand. 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

The proposals above rest on the assumption that it is possible to calculate the labour content of each product in the economy, and that it is possible to produce a fully detailed, balanced plan in a timely manner. Since the calculations required to balance a plan and the calculations required to determine labour values are very closely related, we will look in detail only at the problem of planning. We will show that the millions of equations required to balance the plan can be easily solved. A similar proof could be given on the ease of computing labour values.

Mises was of course right when he said that the planning problem is greatly simplified if there are no changes in the economy. But not all the chaotic changes of a market economy are potential problems for a planned system. If we retain some form of market for consumer goods, as discussed above, to provide information on final requirements, then the process of deriving a balanced plan is tractable.

Let us take a very simple example, an economy with four types of goods which we will call bread, corn, coal and iron. In order to mine coal, both iron and coal are used as inputs. To make bread we need corn for the flour and coal to bake it. To grow the corn, iron tools and seed corn are required. The making of iron itself demands coal and more iron implements.

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, pp. 186-7)."

Table 3: Convergence of gross output on that required to support the desired final product

iron	coal	corn	bread	labour	
0	20000	0	1000	0	Net output
2000	24500	1500	1000	61000	1st estimate gross usage
2580	29400	1650	1000	129500	
3102	31540	1665	1000	157300	
3342	33012	1666	1000	174310	
..	(intermediate steps)
3708	34895	1667	1000	196510	
3708	34895	1667	1000	196515	
3708	34896	1667	1000	196517	20th estimate gross usage

We can describe this as a set of four processes:

$$\begin{aligned}
 1 \text{ ton iron} &\leftarrow 0.05 \text{ ton iron} + 2 \text{ ton coal} + 20 \text{ days labour} \\
 1 \text{ ton coal} &\leftarrow 0.2 \text{ ton coal} + 0.1 \text{ ton iron} + 3 \text{ days labour} \\
 1 \text{ ton corn} &\leftarrow 0.1 \text{ ton corn} + 0.02 \text{ ton iron} + 10 \text{ days labour} \\
 1 \text{ ton bread} &\leftarrow 1.5 \text{ ton corn} + 0.5 \text{ ton coal} + 1 \text{ days labour}
 \end{aligned}$$

Suppose the planning authorities have a current estimate of consumer demand for final outputs. They start from the required net output. This is shown on the first line of Table 3. We assume that consumers want 20000 tons of coal and 1000 tons of bread.

The planners then estimate how much iron, corn, coal, and labour would be directly consumed in producing the final output, namely, 2000 tons of iron, 1500 tons of corn and 4500 additional tons of coal. These quantities of are added to the net output to get a first estimate of the gross usage of goods. Since this estimate involved producing more iron, coal and corn than they had at first allowed for, they repeat the calculation to get a second, better estimate of the gross usage of goods.

Each time they repeat the process they get different total requirement of iron, coal corn and labour, as shown in Table 3. Does this confirm the claims of Hayek that the equations necessary for socialist planning are unsolvable? Hardly. The answers differ each time round, but the differences between successive answers get smaller and smaller. Eventually—after 20 attempts, in this example—the planners get a consistent result. If the population is to consume 20000 tons of coal and 1000 tons of bread, then a total of 3708 tons of iron, 34896 tons of coal, and 1667 tons or corn must be produced.

Is it feasible to scale this sort of calculation up to the number of goods produced in a real economy? While the calculations would be impossibly tedious to do by hand, they are readily automated. Table 3 was produced by running a computer algorithm. To assess whether or not detailed planning is to be feasible we need to know:

1. How many types of goods an economy produces.
2. How many types of inputs are used to produce each output.
3. How fast a computer program running the algorithm would be for the scale of data provided in (1) and (2).

Table 4 illustrates the effect of running the planning algorithm on a server computer of 2004 vintage. We determined the calculation time for economies whose number of industries

Table 4: Timings for applying a planning algorithm to model economies of different sizes. Timings were performed on a 3 Ghz Intel Zeon running Linux, with 2 GB of memory.

	Industries N	Mean inputs M	CPU time seconds	Memory requirement bytes
Law $M = \sqrt{N}$				
	1,000	30	0.1	150KB
	10,000	100	3.8	5MB
	40,000	200	33.8	64MB
	160,000	400	77.1	512MB
	320,000	600	166.0	1.5G
Law $M \approx \log N$				
	1,000	30	0.1	150KB
	10,000	40	1.6	2.4MB
	100,000	50	5.8	40MB
	1,000,000	60	68.2	480MB

ranged from one thousand to one million. Two different assumptions were tested for the way in which the mean number of inputs used to make a good depends on the complexity of the economy.

It is clear that the number of *direct* inputs used to manufacture each product is only a tiny fraction of the range of goods produced in an economy. It is plausible that as industrial complexity develops, the mean number of inputs used to produce each output will also grow, but more slowly. In the first part of Table 4 it is assumed that the mean number of inputs (M) grows as the square root of the number of final outputs (N). In the second part of the table the growth of M is assumed to follow a logarithmic law.

It can be seen that calculation times are modest even for very big economic models. The apparently daunting million-equation problem yields gracefully to the modest home computer. The limiting factor in the experiments is computer memory. The largest model tested required 1.5 Gigabytes of memory. Since the usable data space of a P4 processor is at most 2 Gigabytes, larger models would require a more advanced 64-bit computer.

The experiment went up to 1 million products. The number of industrial products in the Soviet economy was estimated by Nove to be around of 10 million. Nove believed this number was so huge as to rule out any possibility of constructing a balanced disaggregated plan. This may well have been true with the computer technology available in the 1970s, but the situation is now quite different. A single PC could compute a disaggregated plan for a smallish economy like Sweden in a couple of minutes.

Suppose we want to plan an economy of continental scale with, say, 10 million products. Let us assume that the average number of inputs required to produce each output is large, namely 2000. On the basis Table 4 this would require a computer with 80 Gigabytes of memory. Using a single 64-bit processor of 2006 vintage the computation would take of the order of an hour. We have obtained commercial quotations from suppliers for such machines with prices in the range of Euro 100,000 to 200,000.

4 Should prices of production be used in planning?

We have proposed using “simple” labour values as a measure of cost of production arguing that this is not so different from what happens in a capitalist economy where prices are closely correlated with labour values. But is it not well known that a rational planner could do better than this? Are we not condemning our economic calculus to sub-optimality by ignoring the dating of labour? Peter Flensner raised this issue in the November 11 debate in the Rosa Luxemburg Stiftung. We should, he said, consider using instead the system of prices described by Karl Marx in volume III of *Capital*, the famous Production Prices.

This is a serious issue, both in the context of Marxist economics, where the question of Production Prices dominated the debates of Western Marxist economic theory in the latter part of the 20th century, and also from the standpoint of Samuelson and Weizsäcker’s (1972) discussion of “rational planning through use of the bourgeois profit rate”. For a detailed examination of this argument, see Cockshott and Cottrell (1999); we offer a brief summary here.

Bourgeois prices in the planned economy

Samuelson and Weizsäcker set the scene for their argument by noting the way in which a positive rate of profit disturbs the simple labour theory of value:

In an economic system where all goods are ultimately producible by labor... if the rate of profit or interest were always zero, the competitive equilibrium prices would be exactly equal to the total embodied labour required for each good... If, however, there is a positive interest or profit rate, labor will not receive a real wage large enough to buy all the consumption goods producible by labor in the stationary synchronised equilibrium... [W]ith positive interest the prices will no longer be proportional to the respective embodied labor contents. Thus, if the same historic labor total, say 1 labor, is needed for either a liter of grape juice or for a liter of wine, but for wine the labor is needed 2 time-units earlier rather than only one time-unit earlier as for grape juice, the ratio of wine price to grape juice price will not be $P_2/P_1 = 1/1$, but will instead vary with the profit rate per period r , being $P_2/P_1 = 1(1+r)^2/1(1+r) = (1+r)$... Thus grape juice and wine have equal “values” since they both involve unit labor inputs; but their bourgeois “prices” differ from the Marxian values because the former calculate labor requirements, dated by when they occur and carried forward at nefarious compound interest. (Samuelson and Weizsäcker, 1972, p. 312)

Samuelson’s use of the phrase “nefarious compound interest” is just a matter of teasing the Marxists. He goes on to argue that in a rationally planned society, where class exploitation is abolished, all goods should be “valued” or priced at their “synchronised needed labor cost”. Such plan prices will, in general, not be proportional to sums of undated labour content, but will be expressible in the manner of “bourgeois” prices, provided that an appropriate analog of the rate of profit is used. Specifically, Samuelson and Weizsäcker argue that the rate used should be the R that solves

$$(1 + R) = (1 + g)(1 + b)$$

where g is the growth rate of the labour force and b is the ongoing rate of labour-saving technological change. That is, R is basically the real growth rate of output.

If the planning authorities have at their disposal all the input–output coefficients, and are using these to calculate labour values from direct labour requirements, then it would

not be very difficult to calculate modified values along the lines suggested by Samuelson, by first augmenting all the input coefficients by an appropriate growth factor. We suggested above that consumer goods ought to be marked with their actual labour content, but for the purposes of determining target prices—in order to apply the consumer goods algorithm⁵—there may be some merit in this alternative. One might carry out sensitivity analysis to see how much difference it would make to the workings of the consumer goods algorithm.

Choice of technique

While there may be a case for modifying the calculation based on undated labour time, under certain conditions, nonetheless real bourgeois pricing (in actual capitalist economies) is likely to produce results that compare unfavorably with the application of simple labour time minimization via socialist planning.

Consider a simple illustration. Suppose we have two methods of digging a ditch: one technique uses equal quantities of direct labour and labour time embodied in means of production, the other saves on labour but at the cost of additional implements. For instance a contractor might employ 2 men with pneumatic drills to dig the ditch, or one man with an earth-moving machine.

method	direct labour	indirect labour	Total time
old	100	100	200
new	50	125	175

In terms of labour-time accounting the new method is superior; it saves society 25 hours of labour. Costing in money terms is likely to give a different result. Suppose that an hour's labour adds a value of £7.50 to the product, while a labourer is paid £3.00 per hour. In terms of money cost we obtain:

method	direct labour	indirect labour	total money cost
old	100×£3	100×£7.50	£1050.00
new	50×£3	125×£7.50	£1087.50

In monetary terms the old technique is cheaper. This is because the contractor pays only for part of the labour expended by his workers while he pays for the whole cost of the labour embodied in machines. From the standpoint of labour time minimization the bourgeois calculation appears socially irrational, though profitable.

The sleight of hand in the Samuelson–Weizsäcker argument lies in presenting the use of a discount rate equal to the real rate of growth of the economy as if it were the standard bourgeois method of economic calculation. But of course the actual bourgeois profit rate is generally greatly in excess of the real growth rate. A substantial part—perhaps the greater part—of aggregate profit goes to meet the extravagant lifestyle of the upper classes and contributes nothing to economic growth.

Consider the effect of a uniform reduction of wages by 30% in an economy with an initial split of the working day 60/40 wages to surplus value: the rate of surplus value would rise from 66% to 150% and in the process a whole mass of labour intensive activities—sweated trades, fast food outlets, telephone cleaning services and assorted skivvying—would become

⁵See section 2 above, and for more detail Cottrell and Cockshott (1993), Chapter 8.

economically viable.⁶ This would have taken place without any alteration in b (the rate of exogenous technical change) or in g (the rate of growth of the labour force). There is no socially rational basis for switching labour into these labour-intensive activities; the switch comes about solely due to the change in the distribution of income between classes in society. The example is not fanciful; one saw it work in reverse between 1939 and 1950 when a rise in the share of income going to workers meant that the middle classes could no longer afford private servants, and encouraged the market for domestic appliances. Vacuum cleaners and washing machines had been available—with little technical change—since the turn of the century, but it was not worth buying them so long as servants were cheap.

This rise in wages did not mean that the rate of growth of the economy slowed down; on the contrary a higher cost of labour encourages the use of more machinery which in turn accelerates technical change. Historically, one could argue for an *negative* correlation between the rate of surplus value under capitalism and the rate of technical improvement. The classic example of this must be the USA in the 19th century, where the free availability of land held wages up and encouraged labour saving innovations, which in turn led to the US having the highest labour productivity in the world.

By contrast in a socialist economy, where the wasteful consumption of the rich has been done away with, the rate of surplus product and the rate of growth of the economy might be more closely related. In the case of an economy undergoing extensive growth—e.g. the USSR during initial industrialization—there will be a strong positive correlation between the two: when the rate of surplus product extraction is high, we might assume that R will also be. Under these circumstances it may be rational to use techniques that are more labour-intensive than a simple undated labour-time calculation would justify.

Consider the large scale irrigation work done in China in the 1960s, which was largely accomplished using manual labour even though it might have been cheaper on a labour cost basis to use bulldozers. But the point was that the bulldozers did not exist whereas the labour power did. Even a simple planning in kind would reveal this. Consider what would happen if China had been using our proposed planning mechanism. The local communes would propose to build a dam and calculate the cheapest way of doing it in terms of labour. This could involve half a dozen bulldozers and 10 workers. They submit this plan to the planning computers, which perform a physical balance operation and come out with the result that the activity is to be operated at a zero intensity level because there are not enough bulldozers to go around. The commune then puts in for a second attempt suggesting the use of 50 workers with picks and wheelbarrows. Since there are no material resource constraints, this is allowed to go through. What this shows is that the most labour saving alternative technique for a given task may not be feasible in an economy with severe shortages of machinery, and local attempts to optimize the use of labour time may have to be overridden by global resource constraints.

In a mature industrial economy the situation is rather different. The growth rate R is likely to be much lower than in an economy undergoing extensive industrialization as the size of the labour force does not change so fast. In this case errors due to using labour values for an initial calculation of what is the cheapest technique will be much smaller. They will certainly be far less than those induced by a 100% rate of surplus value in a capitalist economy.

⁶This is of course the objective of the infamous Herz 4 rule.

Prices and the rate of profit in capitalism

In a further twist to the argument, it is not at all clear that Samuelson’s “bourgeois prices” actually regulate production in capitalist economies.

The crucial assumption for “bourgeois prices” is the existence of a uniform profit rate r . This is clearly a rather forced assumption since in practice the profit rate is a random variable both within and between industries. In itself this not a particularly serious problem provided that the rate of profit is statistically independent of the capital–labour ratio, or organic composition (o) in Marxian terminology. It is the independence of the rate of profit vis-à-vis the capital–labour ratio that distinguishes price of production theory from the simple labour theory of value. The simple theory predicts that industries with a high capital–labour ratio will have a lower rate of profit than those with an low capital–labour ratio, or in other words that r and o would be negatively correlated.

In Cockshott and Cottrell (2003) we found, using input–output and capital stock data from the USA, that the independence required by the theory of prices of production does not hold. We computed the total value of output, industry by industry, using the labour-value and price of production models. This gave two estimates for the aggregate price vector; the correlation matrix with observed prices is given in Table 5. Both estimates of the value of total industry output are highly correlated with market prices, but the labour-value estimates are marginally better.

Table 5: Correlation matrix of logs of estimates of total industry output for 47 sectors of US industry (P = observed price, E_1 = labour values, E_2 = prices of production)

	P	E_1	E_2
P	1		
E_1	0.971	1	
E_2	0.968	0.936	1

Prices of production are not clearly better than simple labour values in predicting market prices. This is because profit rates, counter to the theory of prices of production, are lower in industries with a high organic composition of capital. This point is illustrated in Figure 2, which shows:

1. the observed rate of profit, measured as s/C where C denotes capital stock;
2. the rate of profit that would be predicted on the basis of commodities exchanging at prices proportional to their labour values, i.e. $s'v/C$ where s' is the mean rate of exploitation in the economy as a whole; and
3. the rate of profit that would be predicted on the basis of prices of production (mean s/C).

Note that the observed rates of profit fall close to the rates that would be predicted by the simple labour theory of value (labeled the “vol. 1 rate” for short in Figure 2, since it corresponds to Marx’s assumption in Volume I of *Capital* that prices are proportional to values). A more recent study by Zachariah (2006) compared the closeness of labour values and prices of production to sectoral market prices for 18 countries. For several of the countries, he provides data for several years covering a roughly 30 year period. Zachariah found that in 25 of the 51 combinations of year and country, labour values were better

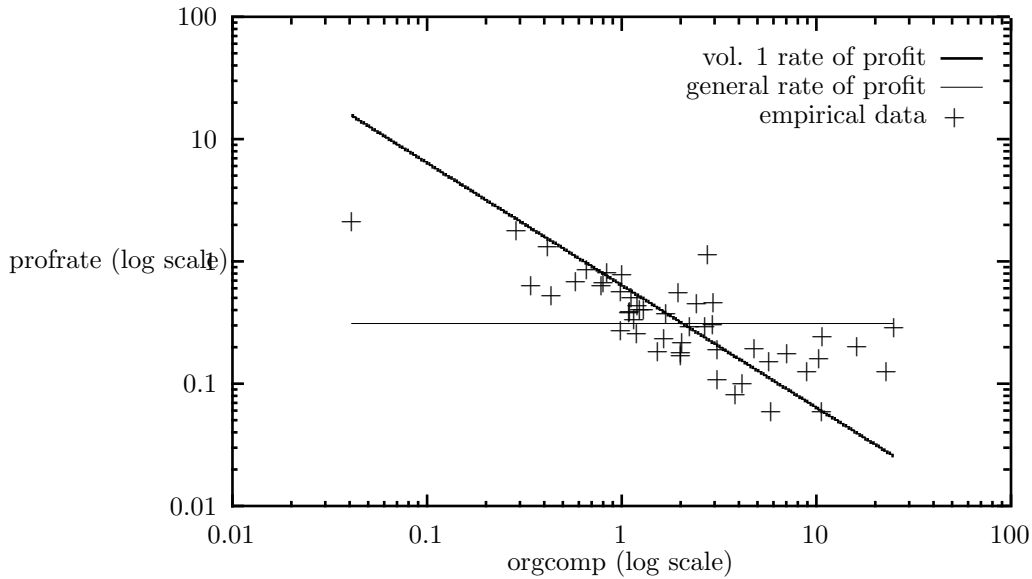


Figure 2: Relationship between profit rates and organic composition

predictors of market prices than were prices of production. In 25 cases prices of production were the better predictor, and in one case the accuracy of both models was identical.

Thus, to return to the main theme of this section, if it were judged economically inefficient for a socialist economy to base its economic calculus on labour values rather than upon prices of production, the same inefficiency would appear to affect leading capitalist economies.

5 Transitional measures

The most obvious gap in our 1993 book is that it does not deal with the process of transition from capitalist to socialist economy—that is, the transition from an economy regulated by the exchange of commodities for money, and the extraction of surplus as surplus value, to one regulated *in natura* by a plan, and with a plan-governed extraction of the surplus product. Broadly speaking we see this as happening through the intermediary forms of co-operatives and state-owned capitalist enterprises in a three-stage process.

A first stage of transition involves moving from a system of shareholder capitalism to a combination of state capitalism and worker-owned enterprises.

What has to be ensured here is the continuity of material production while the property relations change. It is commonplace for enterprises to change ownership in a capitalist economy, so the mere change in ownership need not directly threaten the continuity of production. There is plenty of history of orderly transitions of enterprises from private to state ownership and back. All that is required for a smooth transition at the level of commodity production is that the staff of the enterprises should remain at work, and that a clear line of state-guaranteed credit should be provided to pay commercial bills falling due for the supply of raw materials. A recent example of this sort of thing was the effective re-nationalization of the railway network in the UK, where almost overnight and without any special legislation the government had the private company running the railways declared insolvent, and its assets passed to a new “not for profit” company. In the process the shareholders found—like the shareholders in any liquidated company—that they were entitled to only a fraction of what they thought they had owned. This was a special case, however, since the enterprise

being taken over was almost insolvent and dependent on government orders.

Turning to the formation of workers' co-operatives, it would be relatively easy to legislate that the board of limited companies was to be elected either entirely by employees or, say, 75% by employees. In such circumstances the enterprises remain liquid and retain their assets, but change their board of management.

In the formation both of "not for profit" companies and employee managed companies, the losers are the original shareholders. In the case of the enactment of a law allowing workers to convert their enterprises to employee management the issue is fudged somewhat. The rights of shareholders are restricted without being abolished outright. But it is clear that a board elected by the employees would be likely to pay lower dividends than one elected by shareholders. The inevitable consequence would be a drastic fall in the price of the shares of the companies.

Where the state directly takes companies into its ownership the question of compensation for shareholders inevitably arises. It was the practice of Labour governments in the UK to fund the nationalization of companies by issuing government bonds to former shareholders. The net cost to the exchequer both on the revenue and capital account can be negligible. On the capital account the increase in state liabilities is offset by the shares acquired, while on the revenue side, the obligation to pay interest on the bonds can be offset against the expected profits of the new state-owned firms. One can envisage an analogous provision in legislation creating worker-owned enterprises, whereby in compensation for loss of voting rights equity shares are converted to debentures.

Such measures would enable a relatively smooth transition from rentier-owned capitalism to state- and employee-owned capitalism, but would have the disadvantage in the medium term of burdening the restructured firms with annual interest payments to the rentier class. It is clear that very substantial differences in income and wealth would persist in such a scenario.

During the period in which transitional forms dominate the economy, some alternative would be needed for the limited real role that the stock market continues to play as a source of new investment funds. The obvious recourse here would be an expansion of the role of the banks, perhaps particularly the state bank, as a source of investment funding.

At this stage of the transition the economy would still be capitalist, but the ownership role of individual capitalists would be greatly reduced. The most serious economic disruption would likely be to the financial sector, where the profitability of stockbroking and investment banking firms would drastically decline. But this decline should be manageable, being no worse than the structural changes to many heavy industries that occurred during the last 20 years.

A second phase of transition involves the development of the capacity for detailed planning. Appropriate administrative systems must be set up, democratic control mechanisms established, computer networks constructed and software developed, so as to be able to carry out the sort of planning we discuss in the book. Initially these plans would be indicative, becoming mandatory as the system bedded down.

A third phase involves the actual abolition of monetary exchanges and the movement to payment in labour tokens. At this point the class interests of the residual rentier class and the mass of the employed population come into sharp conflict. The installation of a system of payment by labour tokens is incompatible with paying interest, since the money in which the interest payments were made will cease to be legal tender. By this point, the essentially parasitic nature of the rentier class will be generally evident, since they would at this point have lost any remaining productive function. The major complication that arises here is the extent to which the pensions system of a country depends upon financial assets in the form

of stocks and shares. If a large part of the population are dependent upon pensions schemes whose assets might suddenly become worthless, then the political opposition to a movement to labour tokens would be serious. However, pension schemes based on the stock market are encountering serious liquidity problems anyway. It should be possible to make the move to a non-stock market based public pension scheme attractive provided that prospective pensioners can transfer pro-rata. Were this done prior to the transition to labour tokens, then the prospective losers would be limited to the capitalist class properly speaking.

The political appeal of the final abolition of money among the bulk of the population would have to be based on two prospects. First, it would simultaneously abolish all debts. Since a very large part of the population are net debtors—whether on credit cards or on house mortgages—this would create a strong constituency of gainers to outvote the minority who would lose under the scheme. Second, the transition to an egalitarian payment system would represent a significant improvement in income for the majority of the population. To give an idea of what it would mean, consider the fact that one hour of average labour in Germany currently creates a value of 32 Euro. This means that the purchasing power of a one hour labour token would be the same as 32 Euro, and that the average pay (before tax) would thus rise to the equivalent of 32 Euro per hour.

A socialist response to unemployment

Before closing this section we turn to a topical issue and see what policies might be suggested on the basis of our general conception of the economy.

In our perspective, the labour time available to society is a scarce resource. There are many things we need or want, and there's only so much time available to produce them. As technology advances, we have a choice (in principle): we can work the same amount of time, and take the benefit of improved productivity in a higher standard of living, or we can choose to work less hours while enjoying the same standard of living as before. In this context there's nothing wrong with arguing for a shorter working day or week—if, knowing the cost, that's what people really want.

We are critical, however, of proposals for “work-sharing” as a response to high unemployment in capitalist economies, and related proposals to “pay people for not working”. Unemployment under capitalism is never caused by a shortage of useful work to be done. Neither is it caused by mechanization or automation as such. The introduction of labour-saving technology can reduce employment in particular industries at particular times, but this will not produce a lasting rise in unemployment unless aggregate demand fails to expand in line with the economy's increased capacity to produce. Unemployment always reflects the fact that, for whatever reason, it is not sufficiently *profitable* for capitalist enterprises to employ everyone who wants to work. Possible causes of this situation include a rate of interest that is too high relative to the feasible rate of profit, and restrictive government fiscal policy. If the problem is of this sort, then the right short-term response is expansionary monetary and/or fiscal policy (lower interest, higher government spending, or lower taxes). Socialists should not propose work-sharing as a fallback policy, a second-best. This is defeatist, it takes for granted—takes as “natural”—the overall level of employment generated by the capitalist economy under the current macroeconomic policy regime.

In the longer term it may become insufficiently profitable for capital to employ everyone for reasons that can't easily be “fixed” using the levers of monetary or fiscal policy. If the stock of capital continues to accumulate while the labour force is no longer growing, this will tend to drive down the general rate of profit (Marx's “tendency for the rate of profit to fall”). If the working population refuses to submit to the “usual” rate of exploitation

under capitalism, that too can reduce profitability and create unemployment. In these cases the solution is clear, though not necessarily easy. If the capitalists can't provide work for people, then we'll provide work for ourselves. That is, we'll work out what needs to be produced and organize its production—via cooperatives, worker-owned enterprises or state-owned enterprises at first, but eventually via a full-blown planning system.

6 Conclusion

We have presented the outlines of a model of socialist planning which we claim would be efficient and responsive to popular needs. We have argued that such a system is technically feasible given the current state of computer technology, and we have defended the use of labour values in our proposed system from the charge that “bourgeois prices” (involving an equalized rate of profit) provide a superior means of economic calculation. From this perspective the failure of the Soviet model cannot be taken as synonymous with the failure of socialism: what failed in Russia was a particular form of planning, while other, superior forms of planning are possible.

A question may suggest itself: Are we not being supremely arrogant in 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 favor of a transition to the market.) But it's not that we think ourselves smarter than the Soviet economists; rather we are not operating under the same constraints.⁷ 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 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.

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