1. Abba Lerner Understanding the Marxian Notion of Exploitation
2. Paul A. SamuelsonEconomics of Marx: An Ecumenical Reply
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Communications

A Note on "Understanding the Marxian Notion of Exploitation"

In his article on the Marxian notion of exploitation, in the June 1971 number of this journal, Professor Samuelson demonstrates in impressive detail that the "undiluted" labor theory of value of Marx' *Capital,* Volume I, is valid only for an economy where homogeneous labor is the only scarce factor of production. It is therefore a complete failure in explaining exchange values or relative prices in any economy that has ever existed. This is recognized by sophisticated Marxists (to be distinguished from true believers in the Volume I theory of value) as the problem of "transforming values into prices of production"—a problem discussed in Volume III and in a great deal of later Marxist literature.

It is perhaps because he realizes that no number of even the most scholarly of additions to the mountains of refutations of the Volume I labor theory of value is likely to have any impact on the true believers, that Professor Samuelson goes on to provide what he calls "a conciliatory formulation that preserves honor all around." In this he says of "Volume I's digression into surplus values" that its "essential insight does depend crucially on comparison of the subsistence goods needed to produce and reproduce labor with *what the undiluted labor theory of value calculates to be* the amount of goods produceable for all classes *in view of the embodied labor requirements of the goods.*"

The italicized phrases (my italics) seem to me to constitute unwarranted concessions to the so over-thoroughly demolished labor theory of value—concessions which do impinge on the honor of scientific inquiry while they only becloud the significance of "the essential insight."

The essential insight, on which is based the whole of the Marxian movement, is that the workers are *exploited* in that a part of what is produced is made available for others than workers to consume. For the purpose of the Marxian movement for the elimination of this exploitation, there is no need to consider how the labor theory of value (or indeed *any* particular theory of value) calculates either the quantity of labor subsistence goods or the total amount of goods produceable. The "embodied labor requirements" are no more relevant for estimating these quantities than the "embodied" land, time, electricity, sunshine, or any other single one of the myriad elements that go into their production.

What *is* needed—and was provided by Marx—is the political injection of the ethical axiom that only labor has the right to consume. This is achieved by the semantic device of calling the labor input into a product the "value" of the product, thereby giving the ethical axiom an aura of scientific authority.

The labor theory of value, diluted or undiluted, while of interest for the history of economic thought, has no place in today's economic analysis. The essential insight that labor does not get the whole of the product[1] is unquestionable. The ethics may be debated *ad infinitum.* Policies for changing the distribution of consumption can be reasonably discussed with due recognition of the effects on production and that the various interests will not stay silent. The semantic device has well served its political purpose of mobilizing workers' feeling of rightful property in all the "value" produced. But the theory of value—the explanation of exchange values or relative prices—has nothing to do with the case.

Furthermore, a distinction should be made between exploitation and surplus. Surplus is that part of the product remaining over and above what is *necessary* to "produce and reproduce" labor. Exploitation is that part of the product remaining over and above what is *received* by labor. The two concepts become identical only by virtue of the silent assumption that labor receives only its "value" which is the minimum of subsistence. The revision of this assumption by redefining subsistence as

[1] Presumably what is meant here by "the product" is the *net* product—that part of the gross product remaining over and above what is necessary to "produce and reproduce" all the scarce factors other than direct labor.

whatever is the standard of living that labor has learned to require, makes the proposition less ridiculous but only to the degree that it makes it less meaningful.

Sympathy with some of the humanistic or liberal objectives of some of the Marxists does not justify any concessions to exploded theories. Even less justifiable are concessions that hinder rather than help those sophisticated Marxist economists advancing understanding.[2] Concessions like those in the italicized phrases above tend rather to support the "ultra Marxist" true believers who have so narrowly concentrated on Marx' simplifying abstractions from non-labor factors in Volume I that they have turned these into hardened dogmas to be guarded against the "heresy" of seeing that Marx himself discarded these simplifying abstractions in Volume III.

ABBA LERNER
Queens College, City University of New York

[2] One such sophisticated Marxist economist is A. L. Lur'e, as quoted in Professor Letiche's article "Soviet Views of Keynes" (also in the June 1 issue of this journal), who escapes by the "marginalist" route from the Volume I "average socially necessary labor time" determination of exchange values.

The Economics of Marx: An Ecumenical Reply*

I am sorry to have incurred the displeasure of my old friend Abba Lerner [2, 1972] by my conciliatory statement that, *if* there is insight into the laws of motion of capitalism from Marx's hypothesis that real wages get set at a susbsistence cost-of-reproduction-of-man level, then that same insight can be expressed (and better expressed if we want to avoid contradiction with the arbitrage laws of ruthless competition) in terms of a model of "prices" (in which rates of profit on all cost outlays are uniform throughout all industries) rather than in terms of a *Capital* (Volume I) model of surplus-value (in which the rates of surplus in ratio to direct wage cost alone are assumed uniform for all industries). Perhaps I should have called stronger attention to the italicized "if," but I did explicitly warn all readers that I was meticulously refraining from pronouncing any judgments on empirical fruitfulness in order to concentrate on the purely-deductive logic of the Marxian and related models.

It would be sophomoric not to realize that, when there are other bottlenecks to production than labor, in the form of land and other primary natural resources and in terms of the time-phasing of production which requires us to face up to the use of raw materials and to non-instantaneous production processes, then the undiluted labor theory of value will not hold. But I ask any jury to read my paper and decide whether I am to be scolded for having overlooked these qualifications; or, rather, commended for having pointed them all out—as well as the often-neglected consideration that heterogeneous labor cannot be reduced to a common denominator of socially-necessary labor independently of demand conditions unless any two such kinds of labor happen, singularly, to be infinitely substitutable for each other in *every* use. My section on the shortcomings of the labor theory of value deals with these issues; the whole rest of my paper deals with the complication that the passage of time makes in causing price ratios to deviate from embodied-labor-contents ratios.

I do plead guilty to having dealt with matters that are of interest for the history of economic thought; but I hope the judge's sentence will not be a harsh one in view of the extenuating circumstance that my paper did appear in a journal devoted to historical subjects. I also wonder whether the charge by the prosecuting attorney is not overly strong: only a Rip van Winkle who has snoozed through the economic discussions these last twenty years among such modern economists as Joan Robinson, Solow, von Neumann, Sraffa, Dorfman-Solow-Samu-

* My thanks go to the National Science Foundation for financial aid and to Ms. Jillian Pappas for editorial assistance.

elson, Pasinetti, von Weizsäcker, Kaldor, Swan, Meade, Uzawa, and others too numerous to list could claim that models in which labor is the only nonproducible factor "have no place in today's economic analysis." To whatever the degree that my formulations and emphasis "impinge on the honor of scientific inquiry," I do not think I would add to that honor by refusing to Marxian scholars the indulgences that we so freely grant each other.

In this connection I must confess that I did lean over backwards, in comparing formulations that are peculiarly Marxian (as in the case of Volume I's values) with more traditional bourgeois concepts, to try to make the best sense out of them that I could, explicitly passing up a few opportunities to expose confusions and logical contradictions. If such be lapses from impartiality, I hope the sin will be considered a venial one, particularly since a Machiavellian reader might suspect me of the opposite tactic in the form of giving the Marxian theory all the rope it could use.

Actually, there is much in Lerner's writings on these subjects with which I am in essential agreement. How could it be otherwise when, man and boy, I have received so much consumers' surplus from the socially-necessary labor time and forgone embodied-sunshine that I have invested in reading his works? Therefore, most of this note can be devoted to the constructive task of elucidating some of the properties of these Marxian constructs, a task that seems to have been much neglected both by the system's partisans and its opponents.

First, though, let me say a word on a problem that does concern Lerner and many others. Suppose you think that the best way to express the concept of "exploitation" is in a formulation that states, both as an ethical axiom and a feasible program for rectification of the distribution of income, that whenever a non-laborer receives part of the social product there should be a presumption that this "unearned increment" be transferred from him to the propertyless laborers; and that the historic labor theory of value only muddies up the issues. Are you given no pause by the fact that eloquent expositions of this view over a third of a century, many of the best being by Lerner himself, have not succeeded in exorcizing or putting to rout the Marxian formulations based upon deviations of capitalistic or mixed-economy pricing from labor-theory-of-value norms? I ask this as a question. Whatever its answer, it would indeed be a cause for self-reproach *if*, in my attempt to be "objective," my formulations make life more difficult for "sophisticated Marxists" to arrive at a better understanding of truth. Rereading my paper as a whole, I cannot honestly report that it strikes me as undermining those who seek to make Marxism a living science rather than an embalmed ideology; but it may be that I underestimate the degree to which papers like mine serve as ammunition for nonsophisticated traditionalists in their polemics against new thinking.

It may be that we live in an age where "science as usual" is no longer a tenable position. I've quoted elsewhere the answer by the great antifascist scholar, Gaetano Salvemini, to a question by one of his history students, who asked whether one should publish a truth that might give comfort to the enemies of mankind. Salvemini instantly replied: "Publish, though the heavens falll" Perhaps in a simpler age no one really expected the heavens to fall. Yet, what one loses in the short run by foresaking guile, one picks up in the long run by earning a reputation for being without guile. So let me reiterate what some may deem an admission.

Even if we regard Marx's value analysis of Volume I as only an *approximation*, for the understanding of a subsistence wage model it *is* a simplifying description. (As I argued, it was simple enough for Karl Marx, who possessed mathematical ability but lacked mathematical training, to understand at a time when he could not manage the algebra of the more consistent model being approximated.) To illustrate this, let me propose to Professor Lerner a little game, one which he is to solve working against the clock as if he were a student in an hour exam rather than a scholar in the library with all the time in the world to think through every aspect of a problem.

For the next edition of my textbook I have worked out a little coal-corn example to illustrate stationary equilibrium and balanced growth. Two hours of direct labor produces one unit of coal. To produce one unit of corn takes two hours of direct labor and in addition

one unit of coal as intermediate product. One does not have to be a student of Leontief to realize that, if workers are to be provided daily with one unit of corn as subsistence, each must work four hours a day: two hours of live labor, so to speak, in corn plus the two hours of dead labor in the needed coal. If, in contrast, the market real wage gets set so low that workers have to work 12 hours a day for their one corn of subsistence, Marx would say, "Since workers work eight hours of the day for employers and only four hours for themselves, there is a mark-up over wages of 200 percent as the 'rate of surplus value'."

Now all this is truly a *simple* way of putting things—even if it is not quite exact in the way that it implicitly treats what would be the correct market costing of the coal. You do not have to be a Lerner to understand this terse exposition. But let us now state the *same* facts in the correct bourgeois or Ricardian way. If, in five minutes time, you can work out what will be the correct uniform rate of profit and the corresponding relative prices, then you are indeed a wizard at logic and calculation. (This is because you are guessing the correct solution of a quadratic equation; if I was not addressing a beginner audience, you might have to solve a 15th degree polynomial for a 15-sector model.)

It will be noted that this trivial example departs from the timeless labor-only technology of the undiluted labor theory of value *both* in the Volume I approximation case of "values" *and* in the exact Volume III case of "price of production." Hence the example provides a nice refutation of the preconception that Professor Lerner begins with in his opening paragraph. "Transforming values into prices of production," which is what I surveyed, is not—either to sophisticated Marxists or careful readers of my paper—a process of going from an unrealistic labor-only timeless model to a more realistic model that admits the heterogeneity of labor and the presence of scarce primary factors such as land. Before and after the transformation we stay with the assumption of no land, no heterogeneity of labor, and a significant problem of the time-phasing of production. And we stay with the assumption that Lerner considers "ridiculous" or tautologically "meaningless"—namely that the real wage gets fixed at the minimum of subsistence or cost of reproduction of labor power. This assumption is so central that I find it odd to find it described by the adjective "silent."

Before moving on to points of analytical substance, it would be churlish of me not to agree that it was probably unfortunate to use the adjective "exploitative" as a synonym for "minimum-of-subsistence" as applied to the wage rate. At the least, I should have stressed the pejorative nature of the word.

Finally, any reader who agrees that I was too "conciliatory" in the section Professor Lerner quotes should feel free to exclude that section. After the censor has deleted my p. 422, the article will be as much of value as before.[1]

Laws of Motion of Values and Prices

Imagine a "values" or a "prices" system that runs for a century or for decades after its start in 1867. What hypotheses or prophecies does the logic of the model imply?

Marx himself enunciated a Law of the falling rate of profit—and also, more ambiguously, a Law of immiseration of the working class, which with some straining is often interpreted as the hypothesis that the real wage will fall. What has been glimpsed in the literature, but not I think sufficiently emphasized, is the logical incompatibility of these two laws as stated.

[1] In my original paper I tried to take notice of every alternative treatment of the transformation problem that I could locate in the literature. Inevitably, I missed a few, as for example one by my friend Nicholas Georgescu-Roegen in the 1960 Frisch *Festschrift*, and reprinted from *Econometrica* in *Analytical economics: Issues and problems* [1, 1966, Ch. 12]. As new solutions accumulate I hope, at another time, to comment on them. Since my article appeared, C. C. von Weizsäcker's valuable monograph has become available [6, 1971].

I might also mention that while Lerner finds me too soft on Marx, some other correspondents have written to say that I do not do justice to Marx's views about the central importance of labor when I characterize his "values" as merely marked-up labor. For the transformation problem all that is necessary to say is that the actual numbers in Marx's own tables are in fact *proportional* to embodied labor contents—but that is not to assert that all there is to Marx is a set of arithmetical tables.

The following theorems provide an important correction:

LAW OF INCREASING RATE OF PROFIT

(*a*) Every viable new invention must, if the competitive real wage should stay the same (whether at the subsistence or any other level), necessarily lead to a higher competitive rate of profit.
(*b*) In a regime where Volume I's values prevail, every viable new invention must, if that regime's real wage should stay the same (whether at the subsistence or any other level), necessarily lead to a higher rate of surplus-value.

For a proof of this law, the reader need only look at my Figures 2(c) and 2(f). These depict the now-familiar factor-price tradeoff between real wages and the rates of return, a relation already perceived by Ricardo and von Thünen but rediscovered in the modern literature only a dozen years ago. A viable invention, whether "labor-saving" or "capital-saving," will in either regime shift its frontier *outward:* moving outward from one negatively-sloped curve to another can obviously rule out any southwest movement as Marx's simultaneously-held two laws would require. Q.E.D.

The same thing can be put in another way, one more appropriate in view of the known fact that profit rates wandered rather trendlessly in the century after *Das Kapital:*

LAW OF INCREASING REAL WAGES

(*a*) Whenever viable inventions or successful thrift cause the competitive profit rate to stay the same or to fall, the real wage (whatever its commodity composition) must necessarily rise.
(*b*) Within a regime of values, the effect of viable inventions and/or accumulation of superior capital goods must, if the rate of surplus-value falls or stays the same, necessarily cause the real wage to be higher.

No separate proof of this law is needed since it is merely a variant of the law of rising profit. What does need observing is this:

In 1894 an acute reader, with the more than a million words of text of *Das Kapital* before him, should have been led *on the basis of it* to extrapolate for the next decades or centuries in the advanced countries a steady growth in real wage rates and/or in profit rates, pretty much as actually happened. Preoccupation with non-labor bottlenecks, such as future land scarcity, as in the case of the neoclassical economist Knut Wicksell, would have led to more dire forebodings than turned out to be actually warranted for the advanced societies and preoccupation with qualifications introduced by joint production would have been picayunish.

How neglected a field for analytical research Marxian models have been that this truism should have largely escaped notice![2] So rosy a conclusion, if noticed, would no doubt have been resisted by those hopeful of a near-term collapse of capitalism and an imminent socialist revolution. My point is that a correct understanding of the Marxian tableaux would itself offer little comfort for such radical critics. No doubt an erudite scholar could quote copious references recognizing these simple deductive truths. I must rest content with citing Joan Robinson's 1942 essay [4] on Marx.[3]

Let us see what is misleading about the usual Marxian derivation of the necessary fall in the profit rate,[4] R, of the following type:

[2] My brief quotation in footnote 34, p. 422, of Engel's 1891 words shows that he momentarily glimpsed this truth but apparently did not appreciate its vital significance: ". . . with every new invention . . . this surplus of its [labor's] product over its daily cost increases" [3, 1968; this is the 1891 introduction by Engels to a reissue of Marx's 1849, *Wage labour and capital*].

[3] "Marx can only demonstrate a falling tendency in profits by abandoning his argument that real wages tend to be constant. This drastic inconsistency he seems to have overlooked, for when he is discussing the falling tendency of profits he makes no reference to the rising tendency of real wages which it entails" [4, pp. 42–43]. One blemish must be noted: there is a suggestion on p. 44 that the ingenious reader could contrive an exception, *i.e.,* provide a numerical example in which the rate of profit falls while the real wage is constant (by having output in her example rise to below 105, say to 104). Written before the ideas of Leontief and Sraffa became widespread, this is an understandable slip of the pen, one which unfortunately is repeated in the 1966 second edition through oversight.

[4] In my main paper I used lower-case letters for value-regime magnitudes and capital letters for their price-regime counterparts, namely (c_j, v_j, s_j) versus (C_j, V_j, S_j). To be logical I should have used R rather than r for $(\Sigma S_j)/(\Sigma C_j + \Sigma V_j)$. Hence, here I shall distinguish R so defined from

$$R = \frac{\Sigma S}{\Sigma C + \Sigma V}$$
$$= \frac{\Sigma S}{\Sigma V} \frac{\Sigma V}{\Sigma C + \Sigma V}$$
= Rate of surplus value
× (1 − organic composition of capital)
(1) $R = SV\,(1 - K)$

Obviously, if SV stays constant and K rises, it is an inescapable tautology that R must fall. As Marx and Engels looked around Manchester and London and observed the advancement of technology and the elaboration of capital equipment, how natural it was to postulate "steady growth in $\Sigma C/\Sigma V$ or K." Couple this with the conviction that exploitation of labor continued unabated, and identify this insight with the postulate "constancy of SV, the rate of surplus value." The rest of the demonstration then becomes pure arithmetic. Let us see why these postulates represent misinterpretations of the processes Marx had in mind.

There are several different confusions involved here. The primary one is this: in those cases where unchanged rate of surplus-value can be loosely identified with unchanged real wage, the only reason why profit-maximizing managers incur the additional expense of a high organic composition of capital is because such new techniques do provide them with *extra* rather than unchanged surplus-value. In other words, Marx is often holding constant what cannot be held constant except by contradiction to ruthless exploitative competition.

Indeed the Marx-like reasoning is precisely what might go on in the mind of an entrepreneur as he *rejects* a new roundabout technique that does *not* pay: "What, shall I let this highly-capital-intensive innovation that produces no extra surplus-value for me rob me of my profit? No, I shall reject it." To this an acute logician might be tempted to object: "Maybe one single entrepreneur doesn't want to adopt the new technique, but competition may force *all* of the entrepreneurs to do so, even against their will—in the sense that they would curse the day the new technique got invented." But on second thought, our logician will realize that in those situations where inventions do force a reduction in the rate of profit, it is precisely because the cheapening of goods' prices is greater than the subsequent increase in money wage rates—or in short, as students of Leontief and Sraffa know, the forcing down of the profit rate is the concomitant of the forcing up of the real wage rate.

I say this is the primary confusion involved in the conventional Marxist tautologous derivation of a lower profit rate. But there are others. Consider for example the case where production gets elaborated into more numerous stages of production. Naturally then the average ratio of labor costs in any one stage must fall relative to other costs, and must fall relative to the fraction of total value-added represented by interest. In such cases it is unnatural to couple an increase in the organic composition of capital with an unchanged rather than an increased rate of surplus-value. Incidentally, the increase in SV or sv need involve little cause for self-congratulation on the part of the capitalists, for the real wage they have to pay may be little reduced and the profit they earn little increased; nor need such an outcome be a matter of great concern to the workers, since the posited increase in the rate of surplus-value is not associated with a cut in wages: this shows once again that giving the title of "rate of exploitation" to the technical ratio which is the "rate of surplus-value" can be a very misleading procedure. (I mean misleading to Marxian critics themselves.)

Three related cases can help to drive home the fact that viable improvements in technology cannot, despite the formula (1), drive down the rate of profit without increasing the real wage.

First, consider a one-good case. Corn is produced by nine units of labor and .1 unit of corn. Along comes a new invention with a higher organic composition of capital, say requiring .2 of corn. Now it is easy enough to specify such cases in which the rate of profit

$r = (\Sigma s_j)/(\Sigma c_j + \Sigma v_j)$. Likewise I might better have used for the rate of surplus-value not the lower-case letter s, but should have distinguished $(\Sigma s_j)/(\Sigma v_j)$ from $(\Sigma S_j)/(\Sigma V_j)$. I shall now call these respectively sv and SV, with industry counterparts being sv_j and SV_j. The organic composition of capital also requires two symbols, K and k for $(\Sigma C_j)/(\Sigma C_j + \Sigma V_j)$ and $(\Sigma c_j)/(\Sigma c_j + \Sigma v_j)$; industry K_j and k_j are defined by omitting the "Σ" symbols.

will fall: thus, if the direct labor requirements stay at nine, the higher organic composition will mean less profit left over than before at every rate of unchanged surplus-value. But who in his right mind would adopt a process that costs more of one input and no less of any other? Certainly no viable competitor. For the invention to be a viable one, it would have to bring some advantage along with the disadvantage of a higher organic composition of capital. Thus, suppose that .2 of corn goes along with a reduction of required direct labor to 8½. The invention still will not be viable *at any positive profit rate.* Only if the .2 of corn is accompanied by direct labor requirement of less than eight will the new invention be capable of displacing the old technique—and even then it will be able to do so only at low-enough profit rates, since at profit rates above 400 percent, no economy on direct labor can ever make the invention pay. Summary: in a one-good world every viable increase in organic composition automatically raises the rate of surplus-value.

All this supposes that when a new invention is chosen, it must be selected over the old technique which remains feasible. Thus, one may lose the wheel to lightning or a thief; but one cannot lose the notion of roundness. To be meticulously pedantic, there have been cultures which have lost technological knowledge—but that is not the bourgeois capitalism that Marx and Engels so eloquently described in *The communist manifesto.*

The second case to illustrate the confusion is that in which the organic compositions of capital are equal in all industries but are greater after the invention than before. Again it can be shown that a viable invention means that, at the same or lower profit rates, the new regime has a higher rate of surplus-value and real wage than before. A reader well-versed in Marx should be able to replicate the formal proof.

The third case easy to analyze is the singular one I introduced, in which the internal-organic compositions of capital are equal for all industries. In this case, let us concentrate on the factor sharing implied in producing the batch of consumption-wage-goods, again under the simplifying Santa Claus assumption that the iron ration of subsistence involves the same proportions of goods as do the constant-capitals needed for production. Concentrating only on a society producing goods in these singular proportions, we will find that there is no need to distinguish between R and r, SV and sv, or K and k. Actually, in this singular case, it is as if we had one composite good, with its specified direct labor requirements and its specified amount of itself needed as raw materials. Hence we are back in the one-good world of my first case. After some manipulation, Marx's formula (1) can now be thrown into the form

$$R = \frac{w_{\max} - w}{w}(1 - K)$$

Now an invention will be viable only if it raises the maximum real wage that could be paid workers if profits were zero, which I have written as $w_{\max}$. If now we keep the rate of surplus-value the same, we are giving labor a higher real wage proportional to the increase in technical product. If capital's share stays the same fraction, and an increase in the capital-output ratio takes place (for that is what the organic composition of capital can be correlated with in this singular case), it is no wonder that the profit rate falls. Once again the well-known fact that the capital-output ratio has not steadily risen in the last century should deter one from facilely assuming a grand law of the rising organic composition of capital.

I have not taken the time to work through every possible permutation and combination of assumptions. But any reader should be convinced that the truth of my two upside-down Marxian laws are valid derivations of the Marxian systems and that they do not contradict the familiar Marx tautology of (1).[5]

[5] One should not try to prove too much. It is easy for me to write down valid cases in which a viable invention will raise K, leave SV the same, and lower R. The point is that every such case involves a real wage that rises even though the Marxian "rate of exploitation" remains the same. The actual facts of American and European history for the last century involve a good approximation to Bowley's Law of constancy of the share of wages in rising national income, along with a fairly stable capital-output ratio. This pattern of rapidly rising real wages is quite compatible with constancy of

In conclusion, let me say that the propositions that I have enunciated should be carefully audited by economists of all descriptions. For I have found that it is a solitary existence when writing about Marx, and one misses the constructive give-and-take from other economists that serves so effectively to correct the mistakes of the lone-wolf scholar. Karl Marx would be the first to understand this remark.

PAUL A. SAMUELSON
Massachusetts Institute of Technology

the rate of surplus value, although it is only in singular cases that factor shares and SV can be tightly correlated.

By the way, here is the answer to the puzzle presented to Lerner: in the regime of prices, instead of having uniform rates of surplus-value (or mark-ups on labor alone) of 200 percent, we must have a uniform profit rate of exactly 100 percent per period; coal then will cost twice 2 labor hours, and corn will cost 12 labor hours—$\{2(2 \text{ hrs.}) + 2 \text{ hrs.}\}(1 + 1)$. Price ratio of corn-to-coal will be $12/4 = 3$ as against values ratio of $2 = 12/6 = 4$ of embodied labor / 2 of embodied labor. Profit rate of $R = 1$ is the relevant root of the quadratic $2(1 + R)^2 + 2(1 + R) = 12$. Note that in the correct version workers are still, so to speak, working 8 hours of the day for the other fellow.

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