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April 2000

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ABSTRACT

Research in the temporal single-system (TSS) interpretation of Marx's value theory has refuted the Okishio theorem, which had supposedly disproved the law of the falling profit rate. In response to critics who confirm the correctness of the TSS refutation but, curiously, still uphold the Okishio theorem, this paper clarifies what the theorem actually asserts and why that assertion is false. It also shows that TSS results do matter: the contradiction between value and use-value, and the difference between temporal and simultaneous valuation, are crucial. Finally, the paper examines the role the Okishio theorem has played in suppressing Marx's work.

INTRODUCTION

A long overdue reappraisal of the standard view of Marx's Law of the Tendency of the Rate of Profit to Fall (LTRPF), and of the implications of Nobuo Okishio's (1993 [1961]) theorem for this law, was opened in a symposium in the last volume of this journal. What makes this debate different from past ones is a new theoretical discovery, recognized as such by all contributors to the symposium. The new discovery is that, under circumstances

Value, Capitalist Dynamics and Money, Volume 18, pages 243–267.

ISBN: 0-7623-0696-3

in which the Okishio theorem holds that the rate of profit must rise, it can in fact fall when calculated according to the temporal single-system (TSS) interpretation of Marx's value theory (see, e.g. Freeman & Carchedi, 1996; Ramos, 1997; Kliman & McGlone, 1999).

Although this discovery was first reported in 1988, David Laibman's (1999a) lead paper, which critiques it, is to our knowledge the first response in print. Our differences with Laibman remain deep, and to achieve clarity we may at times express them sharply, but this in no way diminishes our respect for the exemplary care and time he has spent examining and critiquing our research.

In our brief responses in last year's symposium (Freeman, 1999; Kliman, 1999), we were unable to respond to Duncan Foley (1999), whose contribution was likewise a critique of the TSS interpretation, or to address Laibman's (1999b) rejoinder. The editor, in allowing us to respond here at a more adequate length, has provided a rare and welcome opportunity to develop the debate beyond the confines of the initial exchange. Rather than rehash what we have already said, this chapter will address the new issues raised in the latter critiques.

Laibman and Foley acknowledge, even if at times only tacitly, that their investigations have confirmed the TSS results (Laibman, 1999a, p. 215; Foley, 1999, p. 232). So it is rather curious that they continue to uphold the Okishio theorem. To help straighten this matter out, in the next section we will clarify what the Okishio theorem actually asserts and why that assertion is false.

The results that TSS researchers have discovered explode a century of dogmas – that Marx's value theory has been proven to be false or riddled with errors; that profitability is just a matter of physical input-output relations; that surplus-labor and surplus-value are just alternative ways of expressing the physical surplus. We thus find it somewhat surprising that, having confirmed that these results are valid, Foley and Laibman nonetheless adopt a "business as usual" attitude, as if nothing has really changed. So the next task we will take on is to show that the TSS results really do matter: the difference between temporal and simultaneous valuation is crucial, and the contradiction between value and use-value is even more crucial.

The concluding section discusses the significance of the present debate. We will examine the role that the Okishio theorem has played in suppressing Marx's work, and we will respond to Laibman's and Foley's charges that efforts of TSS authors to reclaim Marx's insights amount to orthodoxy, scholasticism, and obscurantism.

We have employed mathematics only where necessary. Readers who skip the mathematics should be able to follow the argument without loss of continuity.

WHAT IS THE OKISHIO THEOREM? WHY IS IT FALSE?

Laibman's lead-off article argued at length that the Okishio theorem is true, and that the counter-demonstrations brought forth against it by TSS authors have failed to refute it. The bulk of Foley's (1999, p. 229) response similarly attempted to demonstrate that "the TSS arguments cannot sustain some of the more extreme conclusions claimed for them, particularly the 'refutation' of Okishio's Theorem."

As each of our responses in last year's symposium showed, however, there are circumstances under which Okishio predicts a rising rate of profit but *Laibman's own* rate of profit falls. This result follows trivially from the fact that, in a striking and welcome break from tradition, Laibman now *accepts* the argument made in the TSS literature that prices are determined temporally – prices of inputs may differ from prices of outputs – and that the rate of profit must take both sets of prices into account.

Foley, too, now accepts this argument. Precisely because he does so, it is likewise true that *Foley's own* rate of profit can fall when the Okishio theorem says it must rise. He studies a single-sector example and derives a useful expression linking the "material rate of profit"[1] (r) to his measure of the monetary rate of profit (r'):

$$r'_t = \left(\frac{p_{t+1}}{P_t}\right) r_t + \frac{P_{t+1} - p_t}{P_t} \tag{1}$$

where p_t and p_{t+1} are the input and output prices of period t (Foley, 1999, p. 230). This relation holds whether or not the real wage rate is constant, as the Okishio theorem assumes. The theorem also assumes that technical innovation is "viable" – cost-reducing at current prices – which is equivalent to the condition that r rises. This tends to raise r'. Yet any "disinflation" (fall in p_{t+1}/p_t) tends to lower r'. It is therefore always the case, no matter what the trajectory of r, that given sufficient disinflation, the monetary profit rate will fall even though the material rate rises. If, for example, r increases from 0.10 to 0.12 while p_{t+1}/p_t declines from 1.08 to 1.02, r' falls from 0.1880 to 0.1424.

This negates the conclusion of the Okishio theorem while adhering to its premises: uniform profitability, viability, and constancy of the real wage rate. It therefore refutes the theorem.

Foley (2000, p. 34) has claimed that such examples yield a falling profit rate only because monetary prices are diverging from labor-time values – the monetary expression of labor-time (MELT) is changing. This is not the case. As

we show in the Appendix, viable innovation may very well lead to a falling rate of profit even when the MELT, even when computed in accordance with the New Interpretation's own definition, is held constant.

Why, then, does Foley and Laibman continue to assert that the theorem is true? We think the answer is that, amidst their strenuous efforts to counter the TSS refutations, they have simply lost sight of what the theorem actually says. It is necessary, therefore, to clarify this.

The Okishio theorem holds that viable technical changes can *never* cause the uniform rate of profit to fall. As Foley has written:

> Okishio claims that, on Marx's assumptions, the rate of profit must *rise* in the course of capitalist adoption of new techniques of production. . . . Okishio's theorem states that if capitalists adopt a viable technique and if the real wage rate remains constant, *then the new average rate of profit can never be lower than the initial rate.* (Foley 1986, pp. 136–37, 2nd emphasis added.)

This is substantially identical to Laibman's reading of the theorem:

> . . . only if the new technique is *viable* . . . will it have been introduced. The question now is, what is the relation between $r1$ and $r0$ [the new and old uniform profit rates]?
>
> One answer is that given by the now-famous Okishio Theorem. If . . . the real wage rate, w, has remained constant, then the new uniform ("equilibrium") profit rate cannot be lower than the old one. . . . The Okishio Theorem therefore implies that *rational innovation cannot lead to a falling rate of profit* (Laibman 1997, p. 36, 2nd emphasis added).

Both definitions conform closely to others found throughout the literature, including Okishio's presentation of his own theorem. We have emphasized the statements in the following citations that make this clear. Thus Okishio (1993 [1961]) writes:

> If the industry introducing the new technique is one of [the] basic industries, *then the general rate of profit necessarily rises* (p. 365).
>
> [H]owever large the organic composition of production may become, *the general rate of profit must increase without an exception*, only if the newly introduced technique satisfies the cost criterion and the rate of real wage remains constant (p. 366).
>
> Unless the rate of real wages rises sufficiently, the technical innovations adopted by capitalists *do not reduce the general rate of profit* (p. 369).

Or as Roemer (1981), the theorem's other foremost exponent, writes

> We shall show that if the real wage remains constant then the technical changes which capitalists will introduce *always produce a rise in the rate of profit*. (p. 91).
>
> *Hence, if real wages are assumed fixed, then rational innovation never leads to a falling rate of profit*, regardless of complications introduced by fixed capital, differential turnover times, and so on (p. 130).

As all four authors point out in the clearest possible terms, the Okishio theorem asserts that viable technical changes *cannot* cause the uniform profit rate to fall.

This assertion is untrue. The statements we emphasized above are false statements. It is this that we mean when we say that the TSS interpretation refutes Okishio's theorem. If capitalists adopt a viable technique, and if the real wage rate remains constant, the new uniform rate of profit *can* be lower than the initial rate and, moreover, continuing viable innovation can cause it to fall indefinitely.

Foley and Laibman do not refute these findings or even attempt to do so. They have instead chosen to defend a very different proposition: viable technical changes do *not always* cause the rate of profit to fall. This is true but completely uncontroversial. We have never disputed it and indeed we have drawn attention to it. We are happy to acknowledge it again here in the hope that it ends, once and for all, a common misconception about what we assert. Contrary to what Laibman (1999b, p. 254, note 4) writes, neither Kliman nor any other proponent of the TSS interpretation,[2] nor indeed Marx, has ever "claim[ed] that mechanization and rising productivity *must* lead to a falling rate of profit."[3] (Indeed, Laibman (1999a, p. 215) himself cites a passage in Kliman (1996, pp. 218–19) that says the very opposite.)

That TSS results refute the Okishio theorem instead means that these results have proven that viable innovations *can* lead to a falling uniform rate of profit. This assertion is not trivial: it runs contrary to the entire received wisdom of the debate on the LTRPF, as our citations above illustrate.

We think the failure of our critics to acknowledge this straightforward point in mathematical logic borders on the evasive; it is at best unhelpful and at worst unscientific. It is just not a valid response to exhibit a different viable technical change that does not lower the profit rate. Although the special cases Foley and Laibman have studied are not without interest, they simply do not and cannot validate the Okishio theorem because the theorem claims to be valid, not just for some cases but for all possible cases; therefore, no special case can rescue it. The theorem asserts that *no* viable technical change lowers the profit rate. Even one counterexample is sufficient to refute the theorem. We have provided not one, but many, such counterexamples.

THE SIGNIFICANCE OF THE TEMPORAL APPROACH IN DISTINGUISHING BETWEEN CONCEPTS OF PROFIT RATE

We noted above that Laibman and Foley do not even attempt to prove that our results are wrong, and indeed, their own results confirm ours. Instead they have chosen to construct particular examples of profit rates that, although computed temporally, move in tandem with the material rate (Laibman, 1999a,

pp. 212–14), fall below it forever but by a finite amount (Foley, 1999, pp. 231–32), and so forth. Yet since such examples do not substantiate Okishio's claim that a falling profit rate resulting from viable innovation is impossible, their purpose is unclear. They are undoubtedly constructed as challenges to TSS claims, but precisely which claims of ours do the examples call into question?

One possibility, which we consider below, is that Laibman and Foley are trying to show that our results are just not important. Another is that they want to show our results do not necessarily arise from temporal determination, and that temporality as such is therefore insufficient to overturn Okishio's conclusion. This seems, for example, to be the motivation behind Laibman's construction of a temporal profit rate that is identical to the material rate.

We are happy to acknowledge that temporality is not a sufficient condition because, here again, we have never said otherwise. Temporality is a necessary condition. What generates the TSS results is temporal determination *combined with* the determination of value by labor-time; that is, the calculation of all economic quantities in real time *and* the proposition that living labor is the sole source of new value.

Our results cannot therefore be refuted by combining temporal determination with sources of value added other than living labor, though (as we will show below) that is precisely how Laibman manages to make his "marginal value" rate of profit correspond to the material rate. This is an important point to grasp, and allows us to clarify the precise role of temporalism in refuting Okishio's theorem: only when magnitudes are computed temporally – recognizing that input and output prices differ – can it be recognized that there is more than one rate of profit, and that the differences between profit rates are the result of different concepts of the source(s) of value. For instance, the material rate of profit is temporally determined, being simply the particular temporal rate which arises if prices are constant.[4] The TSS value profit rate is also temporally determined. Nonetheless these two rates behave completely differently, as we will show, because one identifies net material output – use-value – while the other identifies living labor, as the source of new value.

When the profit rate is calculated simultaneously, variations in prices or values during a given period cannot affect it, because only one set of prices or values is employed. This is not so for the temporal calculation. It is a direct consequence of Foley's equation (1) that there are as many different profit rates as there rates of inflation, and thus that there are as many different profit rates as there are *measures of value* (units of account). This consideration alone shows that Okishio's theorem cannot be valid. To any given sequence of use-values and any arbitrary sequence of profit rates, there corresponds some

sequence of prices that yields these profit rates. In order to arrive at the profit rate, it is therefore not enough to know the purely technical conditions of production. Knowledge of prices, an additional determinant of the profit rate that the simultaneous calculation suppresses, is also necessary.[5]

The same point can also be put as follows. It is well known that "money is a veil" under simultaneous determination.[6] More precisely, what is turned into a veil is money in its role as a measure of value, and therefore value itself. Whatever prices may be, the prices in the numerator are the same as those in the denominator, and they cancel out. Because prices therefore have no effect on the profit rate, it matters not how one measures value or what one deems to be the source(s) of value; all profit rates are equal. The simultaneous profit rate is like the proverbial night in which all cows are black. Simultaneous valuation collapses all profit rates onto one particular profit rate, the material rate.

Temporal determination does not convert the material rate back into the value rate. It does not magically transform rising profit rates into falling ones, turning black cows into white ones. It illuminates the differences that actually exist, but are obscured by simultaneous valuation. It lets us see what color the cows actually are. It lets us see that various potential sources of value are actually growing at different rates and therefore see that, associated with these different sources of value are various different profit rates, profit rates that may move in opposite directions from one another.

In marked contrast to almost all their colleagues, Laibman and Foley have had the courage to step into the light of real-time valuation. They have recognized that seen in this light, there are different profit rates, with different determinants; although changes in values and prices are not determinants of the material rate of profit, they are indeed determinants of other rates of profit. We consider this the most significant advance to date in the renewed debate on value theory.

Having accepted this proposition, however, it is now incumbent upon them to face up to its self-evident implications. As we showed above, if changes in prices do influence the actual rate of profit, it follows directly and obviously that disinflation can lower the actual rate of profit even though the material rate rises. It follows, in other words, that the Okishio theorem is false.

GENERALITY AND QUANTITATIVE SIGNIFICANCE OF TSS RESULTS

It is noteworthy that although Foley, like Laibman, now agrees that price changes do influence the rate of profit, it remains absent from his list of "useful and historically relevant" determinants of the rate of profit (Foley, 1999, pp.

232–33). Why? We sense a desire on the part of both authors to return to the *status quo ante*, and we suspect that what underlies this desire is a belief that the TSS results are insufficiently general or quantitatively significant, if not indeed a mere trick.

This is the other possible reason why they have answered us with algebraic examples that neither refute our results nor vindicate the Okishio theorem. They want to show that, even though the value rate of profit can fall when the material rate rises, movements in the material rate more or less govern the value rate; the physicalist conception of profitability is "essentially" correct. Researchers can therefore return in good conscience to business as usual, i.e. to studying profit rate tendencies in terms of their essential determinants, technical conditions of production and the real wage.

We will now argue, to the contrary, that the value and material rates of profit are algebraically determined in completely different ways. The value rate is not even approximately governed by the material rate. After considering some special cases that illustrate this point in a simple way, we will show that the divergence of the value rate of the material rate is a perfectly general, systematic, and quantitatively significant phenomenon. Finally, we will examine a counterexample that apparently disproves these claims, Laibman's (1999a) "marginal valuation" case.

By "value rate of profit" we again refer to a temporally determined rate in which value is determined by labor-time – living labor is the sole source of new value. It is a direct consequence of this proposition that movements in the value rate of profit depend solely on movements in labor-time; no physical input-output relations enter into its determination. In contrast, value is "redundant" in the physicalist theory of profitability; no labor-time magnitudes enter into the determination of the material rate. The divergence of the value rate from the material rate is thus no mystery, much less a result of modeling tricks or hidden assumptions. It is simply to be expected that two profit rates determined in such different ways can and will move along different paths.

What has made it difficult to recognize this fundamental contrast is that simultaneous valuation yields a "value" rate of profit that does depend upon input-output relations. It is therefore worthwhile to demonstrate that the temporally determined value rate does not.

Our presentation proceeds from widely-known and simple propositions contained in Marx's analysis of the valorization process in Chapter 7 of *Capital*, Vol. I. Capitalists begin with a sum of capital-value, *C*. (Marx works with monetary sums that he then converts into sums of labor-time. For simplicity, we will work directly with the latter.) Part of this sum, c, is transferred to output through consumption of materials and wear-and-tear of

fixed capital. New value is added, equal to the amount of living labor, *L*, extracted. The total value of output is therefore $W = c + L$. Some of the value added merely replaces the value of wages, the variable capital, *v*, advanced. The remainder is surplus-value, $s = L - v$ (and the value rate of profit is *s/C*). The sum of capital-value at the end of the period, C', is the initial *C*, minus the productively consumed value, *c* and *v*, plus the value transferred, *c*, plus the value added, *L*:

$$\begin{aligned} C' &= C - c - v + c + L \\ &= C + L - v \\ &= C + s.^{7} \end{aligned}$$

Finally – and here we move to Marx's analysis of accumulation – the capital-value at the start of the next circuit of capital, C_{+1}, must be determined. C_{+1} is equal to last period's initial *C* plus accumulated surplus-value (net investment); the latter is total surplus-value minus "revenue," *m*, the amount capitalists remove for their personal consumption (Marx, 1977, p. 738). Thus $C_{+1} = C + s - m = C' - m$, and the process resumes.

All of the above figures have been determined simply by tracking flows of value, adding and subtracting amounts of labor. It is for a very simple reason that Marx's sums of value in Chapter 7 are computed without regard to the amounts of physical output, gross or net, that labor produces: they are not relevant. As he said up front, in Chapter 1, "variations in productivity have no impact whatever on the labor itself represented in value. . . . The same labor, therefore, performed for the same length of time, always yields the same amount of value, independently of any variations in productivity" (Marx 1977, p. 137).

Gross and net output are also irrelevant to the determination of the value rate of profit. To see this, consider the simplest possible case: $C = c$, and $v = m = 0$. This means that all capital is circulating, wages are zero, and net investment equals profit. Assume that capitalists begin with a *C* of 500, and that $L = 100$ in every period. On the basis of the foregoing valuation rules, we have

Period	C = c	L = s	W = c + L	s/C	$C_{+1} = C + s$
0	500	100	600	20.0%	600
1	600	100	700	16.7%	700
2	700	100	800	14.3%	800

The value rate of profit falls and would fall to zero if this process were to continue *ad infinitum.*

But what is happening to the material rate? Mathematically, anything could be happening; the sequence of values places no algebraic constraint on the sequence of use-values. Since the above value relations have been determined without reference to any physical quantities or techniques of production, they are compatible with *absolutely every* possible path of technical innovation. We may, for instance, have the following:

Period	Seed-Corn (K)	Corn Output	Net Output = Corn Profit (π)	Material Profit Rate = π/K
0	500	600	100	20.0%
1	600	750	150	25%
2	750	975	225	30%

If this process were to continue *ad infinitum,* with net investment always equal to profit and net output increasing by 50% each period, the material rate of profit would eventually rise to 50%, even as the value rate falls to zero. But the *same* value process is equally compatible with the following path of technical innovation:

Period	Seed-Corn (K)	Corn Output	Net Output = Corn Profit (π)	Material Profit Rate = π/K
0	500	600	100	20%
1	600	720	120	20%
2	720	864	144	20%

yielding a constant material profit rate. A path in which the material rate falls even faster than the value rate, due perhaps to harvest failure, is also possible. It matters not; there are two completely *independent* process of determination. The real movement of the economy is, of course, a combination of the two

processes (as well as monetary processes), just as the commodity itself is the contradictory unity of use-value and value. The error, however, consists in supposing that one of these two moments may be *reduced* to the other.

Laibman's (1999b, p. 252) rejoinder in last year's symposium was principally devoted to defending his claim that, given any degree of depreciation of old means of production and their replacement by new ones, "the 'value/price' rate [of profit] tracks the 'material' rate." If the material rate rises, in other words, the value/price rate must rise as well. The example we have just presented disproves this claim. We assumed that *all* capital was circulating; *all* seed-corn was fully used up in each period and replaced in the next. The value/price rate of profit did not, however, track the material rate.

Yet neither do the above results depend on the absence of fixed capital. They are entirely general. Consider the polar opposite case, in which $c = 0$; all capital is fixed, or physically nondepreciating. We may have the following value tableau:

Period	C	L = s = W	s/C	$C_{+1} = C + s$
0	500	100	20.0%	600
1	600	100	16.7%	700
2	700	100	14.3%	800

together with the following use-value tableau:

Period	Units of Software Input (K)	Gross Software Output = Net Output = Profit (π)	Material Profit Rate = π/K
0	500	100	20%
1	600	150	25%
2	750	225	30%

Once again, the value rate of profit heads toward zero while the material rate heads toward 50%.

These simple examples, incidentally, help put into perspective the key result of Foley's (1999, p. 232) mathematical analysis: "Continuing technical change can depress the monetary [or value] rate of profit below the material rate of profit, but the two do not diverge asymptotically." This certainly sounds like an impressive finding, until one recognizes that it does not contradict the above examples. The material rate of profit rose forever; the value rate fell forever to zero; the difference between the two rates was eventually a full 50 percentage points. Yet it never *exceeded* 50 percentage points – the two rates did not "diverge asymptotically." True enough, but it is not clear to us why this matters.[8]

We now wish to show that the divergence of the value rate of profit from the material rate is a completely general phenomenon, as well as a systematic and quantitatively significant one. To do so, we must consider the general case.

The symbols s and C will now refer to profit and capital advanced, whether measured in value terms or material terms. This enables us to use $r \equiv \frac{s}{C}$ to denote both the value and the material rates of profit. The tendency of the rate of profit depends on its relationship to the marginal profit rate, $\frac{\Delta s}{C}$. Specifically, the rate of profit moves in the direction of the marginal rate:

$$\textit{Rate}: \frac{\Delta s}{\Delta C} \gtrless r \rightarrow \Delta r \gtrless 0.$$

By definition, $s \equiv N\sigma$, where N is new value (value added) and σ is the profit share, the ratio of profit to value added. Also by definition, the change in capital-value advanced, or net investment, is a certain fraction of profit that we will call the "accumulation share," α, so $\Delta C \equiv s \equiv \alpha N\sigma$. If we now abstract from fluctuations in the profit share, then $\Delta s = \Delta(N\sigma) = \sigma\Delta N$, and the marginal rate of profit can be expressed as

$$\frac{\Delta s}{\Delta C} = \frac{\sigma\Delta N}{\alpha N\sigma} \equiv \frac{\Delta N/N}{\alpha} \equiv \frac{g_N}{\alpha},$$

the ratio of the growth rate of new value, g_n, to the accumulation share.

Yet how is N, and thus g_N, determined? In Marx's theory, living labor (L) is the sole source of new value, and so $g_N = g_L$, the growth rate of living labor. The counterpart to living labor in the physicalist theory – what one might call the sole source of new material "value" – is net output (Y), so here $g_N = g_Y$. There thus exist two different marginal rates of profit, the value rate g_L/α_v and the material rate g_Y/α_m. But since the current rates of profit each tend toward their respective marginal rates, the value and material rates of profit have two

different tendencies. In the examples above, for instance, the parameter values were $g_L = 0\%$, $g_Y = 50\%$, and $\alpha_v = \alpha_m = 1$, so the value rate of profit tended toward 0% while the material rate tended toward 50%. What we now see is that this result is a general one: the growth rates of living labor and net output differ in general and therefore divergence of the value rate of profit from the material rate is the general rule.

Because, moreover, productivity growth under capitalism is systematic – technical progress has caused the labor required to produce a given amount of use-value to fall by factors of hundreds and even thousands – *divergence is systematic*. Productivity growth means precisely that the growth rate of net output outstrips the growth rate of living labor. The source of physical surplus grows faster than the source of surplus-value. All else being equal, then, the value rate of profit systematically falls below the material rate when productivity rises. The more rapidly productivity grows, the greater is the divergence. It follows that any increase in the rate of productivity growth accelerates the divergence – widens the gap between the two rates of profit.

We come finally to the question of quantitative significance: by how much can the material and value rates of profit diverge? Since they could be equal at some moment (if, say, technical advance comes to a temporary halt in a slump), the amount by which they have *diverged* can be as great as the amount by which they *differ*. We emphasize this point because, although Laibman acknowledges that the difference between the two rates can be "quantitatively significant," he nonetheless asserts that they do not diverge – the value rate of profit "tracks" the material rate (Laibman, 1999a, p. 214; cf. Laibman, 1999b, pp. 250–52).

The amount by which the two rates can differ is basically the difference between their respective marginal rates. This difference can be enormous, particularly in relative terms. Consider the case in which the accumulation shares equal unity, so that the marginal material rate of profit equals g_Y while the marginal value rate equals g_L. If net output grows three times as fast as living labor does, the value rate of profit will tend to fall to just one-third the level of the material rate. Or consider the case in which employment in value–producing occupations fails to grow. Given only that some value is being accumulated, the value rate of profit will tend toward zero, no matter how high the material rate may be.

ONCE AGAIN ON SELLING DEAR AND BUYING CHEAP

We have shown that, when temporal valuation is combined with the proposition that living labor is the sole source of new value, the value rate of profit diverges

systematically from the material rate. We have argued, moreover, that this conclusion is generally valid. Yet the "marginal valuation" case that Laibman presented in his lead-off paper and defended in his rejoinder may seem to be a counterexample that disproves our claim.

It does not. Laibman did indeed construct a temporal "value" rate of profit that was exactly equal to the material rate. Yet his manner of doing so actually substantiates our claim since, to derive this result, he was obliged to abandon the supposition that living labor was the sole source of new value. As Kliman (1999) pointed out, Laibman's method of valuation allowed firms to obtain profits in excess of the surplus-values they extracted: they continually *sold* new investment goods for a price greater than the price *paid* by the purchasers! This additional source of profit artificially propped up the "value" rate of profit, preventing it from falling below the material rate.

In his rejoinder, however, Laibman assures us that his valuation procedure did not permit profit to arise in circulation. Investment goods were "both *bought and sold*" at the same price. This price was simply different from the price of consumer goods. Contrary to Kliman's claim that the *whole* product was sold at one price, while *one portion* of that same product, new investment goods, was bought at a lower price, "Different units of output . . . [were] bought-and-sold at different prices, based on whether they [were] 'trans-mogrified' into latest-vintage machines or consumer goods" (Laibman, 1999b, p. 250).

It simply isn't so.[9] If the increments to the capital stock had in fact been "both *bought and sold*" at the same price – their marginal value – then the profit upon alienation present in Laibman's example would have been eliminated and rising productivity would have caused the actual rate of profit to fall below the material rate. This result holds generally, but it is easiest to illustrate if we assume that all profit is reinvested. Profit in physical terms is thus equal to new physical investment, the increment to the physical capital stock, and profit in value terms is equal to the value of the new investment goods.

In Laibman's example, living labor grows at rate $c - 1$. Output and physical capital grow at the rate $b - 1$, so the aggregate physical capital stock is $K_t^S = b^t K_0$. The capital stock is nondepreciating, so new physical investment in period $t+1$ is $K_{t+1} = b^t(b-1)K_0$ [L(3)].[10]. Since all profit is reinvested, K_{t+1} is also the physical "profit" of period t. The material rate of profit is therefore

$$r_t^M = \frac{K_{t+1}}{K_t^S} = \frac{b^t(b-1)K_0}{b^t K_0} = b - 1.$$

Laibman stipulates that new investment goods produced in period t are *bought* at their marginal value of period $t+1$:

$$\lambda_{t+1} = \left(\frac{c-1}{b-1}\right)\left(\frac{c}{b}\right)^{t}\lambda_0, \qquad [L(4)]$$

so that the new sum of value invested in period $t+1$ is

$$\lambda_{t+1}K_{t+1} = \left(\frac{c-1}{b-1}\right)\left(\frac{c}{b}\right)^{t}\lambda_0 \cdot b^t(b-1)K_0 = (c-1)\lambda_0 K_0 c^t,$$

and the sum of the investments, i.e. the total value of the capital stock, is

$$VK_t^S = \lambda_0 K_0 c^t. \qquad [L(8)]$$

Now, what would have happened had Laibman stipulated that the new investment goods must be *sold* as well as bought at their marginal value, λ_{t+1}? Since K_{t+1} is not only new investment but also physical "profit," $\lambda_{t+1}K_{t+1}$ would also be the value measure of period t's profit. The value/price rate of profit would therefore be

$$r_t^S = \frac{\lambda_{t+1}K_{t+1}}{VK_t} = \frac{(c-1)\lambda_0 K_0 c^t}{\lambda_0 K_0 c^t} = c - 1.$$

While the material rate of profit equals the growth rate of *output*, the corrected value/price rate of profit equals the growth rate of *living labor*. The two rates of profit are equal if and only if output and living labor grow at the same rate, i.e. if and only if productivity is constant. If productivity is increasing, living labor is growing more slowly than output, so the value/price rate of profit falls below the material rate. If the growth rate of living labor falls while the growth rate of output rises, the actual profit rate falls although the material rate rises. If extraction of living labor fails to grow at all, the value/price rate equals zero, irrespective of how quickly output is growing or how high the material rate may be.

In short, once we prevent profit from arising by selling dear and buying cheap, the actual rate of profit no longer tracks the material rate.

CONCLUSION: THE IDEOLOGICAL FUNCTION OF THE OKISHIO THEOREM

What is the relevance of the TSS results? In particular, why do we place such emphasis on the fact that the Okishio theorem has been refuted? Foley (1999, pp. 232–33) sees it all as a diversion:

> it seems to me that the TSS discussion of the tendency for the rate of profit to fall aimed at the wrong target in the first place in focusing on Okishio's Theorem. A more useful and

> historically relevant line of thinking would center on Marx's discussion of the tendency to a labor-saving, capital-using bias in technical change under capitalism, the impact of labor-saving technical change on the profit rate when the rate of exploitation stays roughly constant, and the complex interplay of these tendencies with Marx's "counteracting influences". . . .

This statement, we suggest, overlooks one of the central functions of a theory: to identify causes. From the time of Smith, Ricardo, and Marx to the present, the debate over the falling rate of profit has never been about whether the rate falls, but about *why* it falls. Instead of merely dealing with *how* the rate of profit changes under this or that set of circumstances, the chief function of all these theories has been to identify *why* it does so.

In this regard, Marx's theory and the Okishio theorem are diametrically opposed. The theorem holds that the rate of profit *cannot* fall due to the causes that Marx's theory identified. They cannot both be right. It is therefore just not possible for anyone concerned with the causes of movements in profit rates lightly to set the Okishio theorem to the side and focus on other matters. The opposition between the two theories must be faced squarely. Roemer (1981, p. 113) poses this opposition very clearly:

> Although the real wage in fact does not remain fixed, the problem has been to understand whether a FRP [falling rate of profit] can be construed to be due to technical innovation itself, independent of changes in the real wage. . . . [I]f one believes Okishio's model, then there is no increase possible in the organic composition of capital so great as to reduce the rate of profit.

Indeed so. It is thus an evasion of the theoretical issues at stake – the contrasting causal claims – to dismiss the controversy over the Okishio theorem as not "historically relevant" on the ground that the real wage rate rises, as is implied by a constant rate of exploitation. Although the theorem does imply that the profit rate can fall if the real wage rate rises, the *cause* of the fall in this case is the rising wage rate, not technical innovation or the rising composition of capital themselves. Hence, if one believes the Okishio theorem, Marx's theory of the falling rate of profit is just as wrong when real wages rise as it is when they remain constant. The invocation of rising wages does nothing to vindicate it.

We doubt that Foley himself actually thinks it is irrelevant to debate the truth-value of the Okishio theorem. We say this because the research program he recommends is not an alternative to that debate. It rather presupposes that Okishio has already won the debate, that his theorem proves Marx was wrong about the determinants of the profit rate and the causes of its fall. Foley selects only a subset of historical phenomena as relevant to an explanation of falling profitability while ignoring others – including others that Marx singled out,

such as the deflationary or disinflationary impact of rising productivity (Marx, 1981, pp. 332–38). What informs this choice? Is it that price changes are not *historically* relevant? Or is it that, because Foley has subscribed to the same physical quantities approach to profitability that generates Okishio's result, he has not deemed price changes to be *causally* relevant? It is no accident that the particular phenomena Foley considers historically relevant, a constant rate of exploitation and "capital-using" innovation – a rising physical capital/output ratio[11] – are the minimum conditions needed to obtain a falling profit rate within the physicalist framework, i.e. a falling *material* rate of profit (see Foley, 1986, p. 138).

This shows that the Okishio theorem is not a mere point of abstruse theory. It serves a crucial ideological function, that of excluding entire lines of inquiry.[12] Rather than a mere possible set of causes of falling profitability, it is marketed as a proof that no other causes are possible. As such, the theorem has become a core justification for rejecting alternative lines of theoretical inquiry. And because this proof is a matter of logic alone, it has become a justification for rejecting alternative lines of empirical inquiry on *a priori* grounds.

Such exclusion would be bad enough if the Okishio theorem really did prove that Marx's LTRPF cannot be right. But actually the theorem is false and, when read in light of the TSS interpretation, Marx's law is rigorous and error-free. TSS authors have spent so much time and effort substantiating these propositions because we want to demonstrate that the exclusion is improper, that Marx's theory deserves to be considered on an equal footing with every other theory.

Unfortunately, Foley radically misconstrues our purpose. He writes that

> the TSS literature also has a curiously scholastic and obscurantist vision of theoretical practice, for example, the idea that a highly technical reinterpretation of the labor theory of value can unlock secret insights into the nature of capitalism hidden in Marx's text. [Foley, 1999, p. 233]

The central point that is missed here is that Marx's insights are not *secret;* they are *suppressed.* The ideas we have shown to be rigorous and error-free are straightforward and simple propositions that are among the *best known* aspects of Marx's work. Indeed, a century-long series of charges that they are in error has made them rather notorious. Innumerable papers and whole books have been written about them. They are widely available and can readily be learned from and developed – or could, if they were not suppressed.

What is only implicit in Foley's evaluation is stated explicitly in Laibman's (2000, cf. Laibman, 1999b, p. 253) – TSS research elevates the *textual* validity of Marx's writings into an independent source of inviolable truth:

> The new orthodox Marxists (NOMists) assert that Marx's formulations, in both the theory of value and the analysis of capitalist accumulation and crisis, are *literally* and *completely* correct; that Marx made no errors, bequeathing to us a system that is complete in all essentials.

This likewise completely misses the point. We have never said that Marx's contested insights are necessarily true, much less that they should be accepted on Marx's say-so. (Neither Laibman nor Foley supports their allegations with any evidence from our writings, because none exists.) We simply say the claims that his value theory is *necessarily wrong*, because it is logically invalid, are false. Thus, it *may be* right, so the suppression should stop. Marx's theory should be treated the way any other theory is treated.

But economics does not do this. It continues to uphold key propositions – for example, that the rate of profit must rise with viable technical change – regardless of what holds empirically, by ruling the alternatives out of court a priori. It does so even after the charges of logical error have been refuted. Foley and Laibman's refusal to address this point borders on the disingenuous.

Prejudice against Marx is of course not peculiar to economics. It is everywhere evident. What is peculiar to economics is the idea that his ideas cannot *possibly* be true, that his views should not even be studied or considered as a *possible* explanation the world we live in. Nowhere else in the social sciences or humanities is his work excluded in this manner, or excluded so totally. In these disciplines, Marx is a minority but respected figure and his ideas appear in many undergraduate programs. In short, the way economics treats Marx's work shows that it is not science, but dogma.

The dogmatic character of economics is, however, already well known. Ormerod (1997), for instance, chronicles how economists cling to their theories despite an abysmal forecasting record and despite the fact that key theorems depend on premises that could not possibly be true. Likewise, Hausman (1992, Chapter 13) documents how, even when the profession was forced to acknowledge that empirical evidence had definitively refuted one of its most crucial axioms, it continued to go about business as usual. What philosophers of science debate is not whether economics is dogmatic, but why that is so.

Foley's and Laibman's charges of obscurantism and orthodoxy overlook all this. Underlying the charges is faith in the scientificity of economics. The charges presuppose that economics functions like a science is supposed to function, weeding out what's wrong and incorporating what's right. Were that the case, then economics would indeed exhibit progress over time. Later would necessarily be better, and efforts to reclaim Marx's insights in their original form would be a step backward. Yet if what governs the evolution of economics is not the testing and amending of ideas in a objective manner, but one school's

suppression or destructive cooptation of its rivals, later is not necessarily better.

It is therefore neither obscurantist nor scholastic to seek, in the writings of earlier thinkers, insights that twentieth-century thought obscured. Nor are efforts to reclaim the past unusual. Scientists have often had to return to earlier ideas (in Copernicus' case, to the very distant past, the system that Aristarchus founded in 216 BC) in order to overthrow the reigning orthodoxy's dead-end lines of inquiry.

At this point it must be noted that Foley and Laibman's charges of obscurantism depend on an inversion of the actual relation between Marx and contemporary theory. Foley (1999, p. 233) additionally charges that the TSS research program

> seeks to restore Marx's scientific credibility through an esoteric reinterpretation of the labor theory of value and the construction of idiosyncratic accounting systems.

But from where do the "reinterpretations" emanate? We haven't yet found the page references in Marx, Smith, Ricardo or Mill for Leontief inverses, Perron-Frobenius roots or square net product matrices. The highly technical and esoteric theory that now calls itself the "labor theory of value" is *itself* a reinterpretation of Marx.[13] In our demonstration above we simply returned to what Marx actually says, employing nothing but the most standard business accounting practices to demonstrate the independence of the value profit rate from physical input-output relations.

We don't even say that reinterpreting Marx is bad or illegitimate, which *would* be scholastic; all we say is it isn't necessary. You don't have to. The usual justification for reinterpreting Marx – that as stated, his basic theory contains irreconcilable errors – is itself false. The onus of proof is thus not on ourselves, for asserting – and proving – the rigor and robustness of the original.

To sustain the charges of obscurantism and orthodoxy, Foley and Laibman must first demonstrate that the highly technical and esoteric reinterpretation of Marx as a dualist equilibrium theorist is an improvement upon the original. Nowhere in their contributions do we find any evidence for this idea. For our part, we strive always to root our assertions in evidence, not dogma or tradition.

We plead guilty to the following idea: what happened in the last century was not progress but regress. Modern economics has replaced the scientific legacy of political economy, and modern Marxian economics has replaced Marx's critique of political economy, with inferior products. This is directly visible in

their recognized failure to explain or predict facts that anyone can see. More importantly, their methods of assessment are distinctly inferior, as is visible in their failure to confront their own theoretical mistakes; and this is the real significance of the present discussion. It is *not* irrelevant or dismissable that a theorem that economics has taken as unshakeable truth for nearly 40 years, on the basis of which it has excluded an entire line of inquiry, has been proven logically false.

What exactly is it that economics excludes, when it rules Marx's theory out of court? Foley's primary interest, like that of most modern Marxist economists, is Marx's theory of exploitation. He suggests that "The power and usefulness of Marx's analysis of exploitation as the central social relation of capitalist society ... do not stand or fall" on the outcome of the current controversy in value theory (Foley, 1999, p. 233).

But if Marx's primary contribution was to explain exploitation, he would indeed be little more than a minor post-Ricardian. His violent opposition to orthodoxy is inextricably bound up with his account of capitalist crisis. The central notion in this account is that crisis is a product of capital itself. Capital's drive to expand production without limit comes up against an internal barrier: the technical advances it adopts in order to achieve its aim end up reducing commodities' values. Falling values impede the self-expansion of value – i.e. lower the rate of profit – and annihilate existing wealth, factors that in turn provoke slumps in material production.

This idea has been excluded by economics as unworthy of consideration, on the basis that it is logically impossible. All we have done is prove this premise false. From this there follows a clear conclusion that can be stated independent of the person of Marx: although economics has claimed to be a science, it has long functioned as a dogma. The function of economics is not scientific but ideological; it is not to study capitalism as it really exists, but to furnish "esoteric," "idiosyncratic," and almost incomprehensible mathematical theories of the system's perfection, accompanied by even more esoteric and even less comprehensible mathematical theories to explain why this perfection is not attained.

In short, the problem is not that we say Marx could not be wrong; it is that orthodoxy, buttressed by the Okishio theorem, says he could not be right. This, not our own, perfectly scientific, attempt to assess Marx's own claims in their own terms against the historical evidence, is the real source of dogma in the debate. It is this suppressive function that the theorem has had in practice that so concerns us, and that impels us to emphasize that the theorem – the claim of impossibility – is false. *Hic Rhodus, Hic Salta*.

NOTES

1. The term "material rate of profit," introduced by Ernst (1982), is the rate of profit conceived in terms of use-value or "physical quantity"

2. **Please supply copy**

3. The opening lines of Kliman (1996, p. 206, emphasis added) read: "This chapter will vindicate Marx's contention that mechanisation *can* cause the rate of profit to fall. It will assume profit maximizing behavior and a constant real wage, and thus demonstrate precisely that which the Okishio (1961) theorem is generally thought to have refuted."

4.This can be seen by writing $p_t = p_{t+1}$ in equation (1).

5. This point is widely appreciated in the Post-Keynesian literature on the determination of both prices and profits: see Townshend (1937), Cardim de Carvalho (1992)

6. See for example Pascal Bridel's (1997) brilliant exigesis of the internal contradictions which Walras himself recognized, in trying vainly to incorporate money into his system.

7. Our conclusions are unaffected by what Marx (1977, p. 528) calls "moral depreciation," the devaluation of unconsumed capital ($C - c - v$) during the course of the circuit. If moral depreciation occurs, the end-of-period capital-value will be less than $C + s$. As in standard accounting practice, the loss must be charged against profits, so net profit, the amount by which capital "self-expands," will accordingly be less than profit extracted through production, s. Hence, devaluation of capital *lowers* the value rate of profit, both absolutely and in relation to the material rate. It is true that this devaluation also creates the possibility of a higher rate of profit in the future, since the denominator of the rate of profit in subsequent periods will be lower, but it must first lower the *current* rate. Unless losses are charged against profits, existing capital-value cannot be wiped off the books. In the real world, unlike the world of simultaneous valuation, value does not simply vanish between one period and the next.

8. Nor is the finding universally applicable. The material rate of profit could rise without limit while the value rate falls to zero.

9. A glance at equations (6) and (8) of Laibman's original paper confirms that the entire product was indeed sold at its average value, while new investment goods were bought at their lower marginal value. Laibman's (1999a, p. 212) original explanation of his valuation procedure likewise confirms this: "The average unit value . . . applies to the output of the given period. . . . On the other hand, it is also reasonable to assume that capitalists separate out that strategic portion of the output [new capital goods], and value it according to the latest-vintage (marginal) unit value." This passage states clearly that all output has one value, but some units of that output, new capital goods, *also* have a different value. The latter are therefore sold at one value but bought at another.

10. [L(3)] denotes equation (3) of Laibman 1999a. Subsequent references to his equations will be indicated in the same manner.

11. It is at minimum highly debatable whether the capital/output ratio actually rises over time. Its constancy has long been a key "stylized fact" in the economic growth literature.

12. This was of course not Professor Okishio's intention. We refer to the role that the theorem has played, not to the desires of its author.

13. Recall, yet again, that this began with Bortkiewicz's simultaneous and dualist interpretation of Marx, which at least recognized that Marx's own theory was neither of these things: "Alfred Marshall said once of Ricardo: 'He does not state clearly, and in some cases he perhaps did not fully and clearly perceive how, in the problem of normal value, the various elements govern one another *mutually*, not *successively*, in a long chain of causation'. This description applies even more to Marx . . . [who] held firmly to the view that the elements concerned must be regarded as a kind of causal chain, in which each link is determined, in its composition and its magnitude, only by the preceding links . . . Modern economics is beginning to free itself gradually from the successivist prejudice, the chief merit being due to the mathematical school led by Léon Walras" (Bortkiewicz, 1952: 23–24). Note also that the term "labor theory of value" was never used by any of the people to whom it is attributed. Marx speaks either of the "theory" of value, the "concept" of value, or the "law of value."

14. Kliman's measure of the profit rate differs markedly from Foley's, but they are identical in the special case in which all capital is circulating ($\delta = 1$). We will assume this is the case, which allows us to express Kliman's example in terms of relation (1).

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APPENDIX
ON THE CONSTANCY OF THE MELT

In rejecting our claim to have refuted the Okishio theorem, Foley (2000, p. 34) has argued that the refutations fail because, although the monetary rate of profit falls, the value rate of profit, measured in labor-time, does not. The monetary expression of labor-time (MELT), the relation between a unit of money and a unit of labor-time, has not been held constant. He writes that

> in the examples that Andrew Kliman (1996) puts forward as 'refutation' of the Okishio theorem . . . the monetary expression of labor in the New Interpretation sense is not constant, and the falling monetary rate of profit in the examples reflects this changing monetary expression of labor. When this aspect of the examples is corrected, the resulting price and profit rate paths do not contradict the Okishio theorem.

Yet the theorem makes no reference whatever to the MELT, or to the value rate of profit. The constancy of the MELT is simply not one of its premises, and one therefore need not hold it constant in order to refute the theorem. Hence, whether or not one accepts that they held the MELT constant, Kliman's examples refute the theorem.

Although it is unnecessary to hold the MELT constant when refuting the Okishio theorem, it is nonetheless possible to do so. And it is possible to do so using *the New Interpretation definition* of the MELT rather than the TSS definition. Foley is simply mistaken when he claims that that the examples would no longer contradict the theorem once the specification of the MELT were "corrected."

Kliman's (1996, p. 216) paper assumed a single-sector economy that was initially in static equilibrium without technical change, so that the input price of period 0, p_0, was equal to the output price, p_1. Thereafter, labor productivity grew at a constant rate and the physical capital/output ratio was constant. Thus, in Foley's notation, where γ denotes the (positive) rate of productivity growth, x_t the gross output per worker, and k_t the physical capital per worker, $x_t = x(1+\gamma)^t$ and $k_t = k(1+\gamma)^t$.

The New Interpretation defines the MELT, μ, as the monetary value of the net-product-per-worker, evaluated at the end-of-period (output) price: $\mu_t = p_{t+1}(x_t - \delta K_t)$, where δ is the rate of depreciation. The price path along which the MELT remains constant ($\mu_t = \mu$) is thus

$$p_t = \left(\frac{\mu}{x - \delta k}\right)\left(\frac{1}{1+\gamma}\right)^{t-1} \quad \textit{for } t \geq 1; \textit{ and} \tag{2}$$

$$p_0 = \frac{\mu}{x - \delta k}. \tag{3}$$

Relation (2) is the same as that derived by Foley (1999, p. 231). Yet it is also necessary here to specify the initial condition (3) separately. If (2) were applied to $t = 0$, the initial input and output prices, p_0 and p_1, would differ, which would violate the assumption that the economy is initially in static equilibrium.

Because $p_1 = p_0$, the rate of inflation equals zero in period 0. Hence, as equation (1) indicates, the initial monetary rate of profit is equal to the material rate.[14] But (2) implies that, from period 1 onward, productivity growth causes the ratio of the output price to the input price, p_{t+1}/p_t, to fall to $1/(1 + \gamma) < 1$. Substituting this result into (1), we find that, from period 1 onward,

$$r'_t = \frac{r_t - \gamma}{1 + \gamma} < r_t. \tag{4}$$

The premises of the Okishio theorem – a constant real wage and viable technical change – imply that r, the material rate of profit, rises. In the present case, this rise is bounded, because the maximum value of r is the output/capital ratio minus 1, and that ratio is constant. Thus, even as r rises to its maximum level, there is always some rate of disinflation – some γ – large enough to more than offset that rise, so that the monetary rate of profit, r', falls.

Assume, for example, that the material rate initially equals 0.04 and rises to a maximum level of 0.05. The monetary rate of profit initially equals the material rate, 0.04. Yet if $\gamma = 0.05$, then (11) implies that the monetary rate falls to an eventual level of zero, although the material rate has risen. This refutes the Okishio theorem. Even when Kliman's example is "corrected" in a way that keeps the *New Interpretation's* MELT constant, the resulting price and profit rate paths *do* contradict the Okishio theorem.

As Freeman (1999, p. 243) noted in last year's symposium, "A highly significant TSS result is that the rate of profit falls with *no* fixed capital." It is likewise, as we have seen, a highly significant New Interpretation result. Indeed, it is the result of any theory that permits the relationship between input and output prices to affect the rate of profit.