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# Physicalism and the Exploitation Theory of Profit are Incompatible: A Response to Robert Paul Wolff

## by Chris Byron, Alan Freeman, and Andrew Kliman

The Sraffian-influenced philosopher Robert Paul Wolff published a blog piece on May 4 in which he claimed that, if one wishes to show that "capital rests on the exploitation of the working class," it is possible (and necessary) to do so without Marx's own exploitation theory of profit. Noting that he has "written a whole book and a serious mathematical article about this subject," Wolff says that "I am unaware of anyone who has actually answered my critique and analysis [except John Roemer …]."

What follows is that answer.

*In essence*, two of the authors of this response (Freeman and Kliman) have disproved Wolff's claim in various publications during the last decade and a half. They have shown that, contrary to what the so-called "Fundamental Marxian Theorem" seems to imply, the physical quantities approach of Sraffian (and physicalist Marxist) economists is incompatible with Marx's exploitation theory of profit. Physicalist models actually imply that profit can be negative although workers perform surplus labor, and that profit can be positive even if workers don't perform surplus labor. Hence, surplus labor is neither a sufficient condition nor a necessary condition for the existence of profit. In other words, physicalist models imply that, contrary to what Marx argued, surplus labor is not the exclusive source of profit.[1]

Wolff's commentary suggests that he considers his book and mathematical article to be a new or distinct contribution, even within the Sraffian literature. We assume that this is why he believes that nobody has "actually answered" his critique and analysis. However, Freeman and Kliman's previous proofs demonstrate that *any* physical quantities approach is incompatible with Marx's exploitation theory of profit. Although Wolff's specific argument may differ from other physical quantities arguments, it is in fact simply another variant of a generic approach whose claims Freeman and Kliman have refuted. To re-establish this point, we will provide here a variant of our general refutation that refutes Wolff's specific claims.

Wolff's argument doesn't run in terms of surplus labor and profit. He claims instead that there will be positive profit whenever less than one unit of each commodity is needed, directly and indirectly, to produce a unit of that commodity. (This condition ensures that a surplus of every produced commodity is possible.) In fact, he claims, total profit will be exactly equal to the physical surplus "value." For instance, if we choose to make iron the "substance of value," "[t]he sum total of all that surplus iron value will exactly equal the profit appropriated by the capitalist, measured in units of iron value."

Although Wolff's conclusion is not about surplus labor specifically, Freeman and Kliman's prior demonstrations have disproved it precisely because, as Wolff himself states and indeed emphasizes, labor has no privileged status in physicalist models. It is just one input among many. Thus, what the prior demonstrations have shown regarding surplus labor actually applies to every possible "'substance of value' -- be it labor, iron, corn, or whatever" (Wolff): physicalist models imply that profit can be negative even though a surplus of every produced commodity is possible, and they imply that profit can be positive even when a surplus of every produced commodity is impossible.

We trust that this last comment, together with the previous demonstrations by Freeman and Kliman, suffices as a proof for Wolff and for anyone else who is familiar with physicalist models. That the demonstrations carry over from labor to "iron, corn, or whatever" is obvious. But since this is undoubtedly not obvious to everyone, we here provide a *direct* disproof of Wolff's conclusion.

Consider an economy in which there are just two produced commodities, Gummi Bears and Botox. Gummi Bears, Botox, and labor are needed to produce Gummi Bears, and these same three inputs are needed to produce Botox. The amounts of each input that are needed to produce one unit of each commodity are given in Table 1.

Table 1: Input-output coefficients

| Industry | Input per Unit of Output | | |
| --- | --- | --- | --- |
| | Gummi Bears | Botox | Labor |
| Gummi Bears | 0.49 | 0.49 | 0.02 |
| Botox | 0.49 | 0.49 | 0.02 |

These input-output coefficients satisfy the Hawkins-Simon conditions (to which Wolff refers implicitly in point 1 near the end of his blog post). In other words, an input of less than one Gummi Bear is needed, directly and indirectly, in order to produce one Gummi Bear, and an input of less than one dose of Botox is needed, directly and indirectly, in order to produce one dose of Botox. Another way of saying the same thing is that a physical surplus of Gummi Bears and a physical surplus of Botox are both possible at the same time. For instance, if both industries produce 1000 units of output, it would be possible to have a surplus of up to 20 Gummi Bears and up to 20 doses of Botox. Multiplying all of the figures in Table 1 by 1000, we obtain Table 2:

Table 2: A Gummi Bear-Botox economy for which Wolff's conclusions hold

| Industry | Inputs | | | Output |
| --- | --- | --- | --- | --- |
| | Gummi Bears | Botox | Labor | |
| Gummi Bears | 490 | 490 | 20 | 1000 |
| Botox | 490 | 490 | 20 | 1000 |
| Total | 980 | 980 | 40 | |

The maximum potential surplus of Gummi Bears is the output minus the economy-wide input, 1000 – 980 = 20, and similarly for Botox. (The size of the actual physical surpluses will depend on how many Gummi Bears and doses of Botox the workers receive. If they receive less than 20 units of each good, physical surpluses of both goods would be positive.)

To measure the economy's *total* surplus and profit, we need to add up the Gummi Bear surplus and the Botox surplus, and thus we need a measure of value (which is what Wolff means by "substance of value"). One can't add up Gummi Bears and Botox because they are heterogeneous goods with no common measure, but one can add up the value of Gummi Bears and the value of Botox.

Recall that labor has no privileged status in the physicalist models. It is just one input among many. So instead of choosing labor, we make Botox the "substance" (i.e., measure) of value.

To compute the Botox-Values, let us use $\lambda_g$ to denote the per-unit value of Gummi Bear and $\lambda_\ell$ to denote the per-unit value of labor. (Since Botox is the measure of value, its per-unit value equals 1.) Using the input-output coefficients in Table 1, the Botox-Values of Gummi Bears and labor are the solutions to the following two equations:

$$0.49\lambda_g + 0.49 + 0.02\lambda_\ell = \lambda_g$$
$$0.49\lambda_g + 0.49 + 0.02\lambda_\ell = 1$$

and the solution is $\lambda_g = \lambda_\ell = 1$.

The maximum potential surplus Botox-Value of Gummi Bears in the above system is therefore $1000\lambda_g - 980\lambda_g = 20\lambda_g = 20$, and the maximum potential surplus Botox-Value of Botox is $1000 \times 1 - (980 \times 1) = 20 \times 1 = 20$. So the total, economy-wide, maximum potential surplus Botox-Value is positive.

What about profit? Well, in the physicalist models, profit is just the total price of the physical surpluses. So, given only that Gummi Bears and Botox have positive per-unit prices, the maximum potential profit—the total price of the 20 potentially surplus Gummi Bears plus the total price of the 20 potentially surplus doses of Botox—must be positive.

This *seems* to confirm at least part of Wolff's conclusion. There is, potentially, positive total profit and positive total surplus Botox-Value. And thus, if one doesn't think too hard about the matter, it's possible to argue that the positive total surplus Botox-Value is the exclusive *source* of the positive total profit. (Actually, in this physicalist model, the sources of the profit, and of the surplus Botox-Value, are the physical surpluses of the two goods, but no matter.)

But the above example is just one particular case. Does Wolff's conclusion hold true in all cases? As we will now show, it does not.

In point 1 near the end of his blog post, he tells us that it holds true "[s]o long as the system as a whole produces some sort of physical surplus in each cycle over and above what is required to run the system for another year …. In order for this to be true, it is not necessary that there be a surplus of X in the system each year."

Let us suppose that a physical surplus of Botox is produced—this is "some sort of physical surplus"—but there is a physical deficit of Gummi Bears. More Gummi Bears are used up as inputs into the production of Gummi Bears and Botox than are produced as outputs at year's end. Specifically, imagine that 900 Gummi Bears and 1100 doses of Botox are produced. Multiplying the input-output coefficients in the first row of Table 1 by 900 and those in the second row by 1100, we obtain the input-output system shown in Table 3.

Table 3: A Gummi Bear-Botox economy for which Wolff's conclusions do not hold

| Industry | Inputs | | | Output |
| | Gummi Bears | Botox | Labor | |
| --- | --- | --- | --- | --- |
| Gummi Bears | 441 | 441 | 18 | 900 |
| Botox | 539 | 539 | 22 | 1100 |
| Total | 980 | 980 | 40 | |

The maximum potential surplus of Gummi Bears is, again, the output minus the economy-wide input, which is now $900 - 980 = -80$. The maximum potential surplus of Botox is $1100 - 980 = 120$. Thus, the total (economy-wide) maximum potential surplus Botox-Value is $-80 \lambda_g + 120 \times 1 = (-80 \times 1) + 120 \times 1 = 40$.

The actual total surplus Botox-Value depends also on the Botox-value of the workers' wages (BVWW). If they are paid in kind, BVWW is the Botox-Value of the Gummi Bears they receive, plus the number of doses of Botox they receive, from their employers. (If they are paid money wages, BVWW is the Botox-Value of the Gummi Bears they buy, plus the number of doses of Botox that the remainder of their wages enables them to buy.) Thus,

actual total surplus Botox-Value = 40 – BVWW                              (1)

What about profit? Let us denote the per-unit price of Gummi Bears as $P_g$ and let the per-unit price of Botox equal 1. In this physicalist model, total profit is the total price of the physical surpluses minus BVWW, that is

actual total profit $= -80 P_g + 120 \times 1 - \text{BVWW}$                              (2)

Now recall that all conditions that Wolff stipulated hold true here. Less than one Gummi Bear is needed, directly and indirectly, to produce a Gummi Bear. Less than one dose of Botox is needed, directly and indirectly, to produce a dose of Botox. And there is "some sort of physical

surplus" in the system as a whole. Given these conditions, he contends, total profit must be positive if total surplus Botox-Value is positive.

It is trivial to show that this claim is incorrect. Assume that $P_g = 1.05$ and BVWW = 38. Plugging these number into equations (1) and (2), we obtain

actual total surplus-Botox-value = 40 − 38 = 2

actual total profit = (−80 × 1.05) + (120 × 1) − 38 = −84 + 120 − 38 = −2

Q.E.D.

It is also trivial to show that total profit can be positive even if total surplus Botox-Value is negative. Assume that $P_g = 0.95$ and BVWW = 42. Plugging these number into equations (1) and (2), we obtain

actual total surplus-Botox-value = 40 − 42 = −2

actual total profit = (−80 × 0.95) + (120 × 1) − 42 = −76 + 120 − 42 = 2

The first demonstration shows that positive surplus Botox-value is not a sufficient condition for the existence of profit. The second demonstration shows that it is not a necessary condition, either. Hence, surplus Botox-value is not the exclusive source of profit.

As we noted above, Freeman and Kliman have produced several analogous demonstrations which show that physicalist models imply that that surplus labor is not the exclusive source of profit. Physicalist economists have continually tried to dismiss these demonstrations on the grounds that they use "arbitrary" prices (see Mohun 2003, p. 98; Veneziani 2004, pp. 105–6; and *Reclaiming Marx's "Capital": The Movie*). We trust that Wolff, as a competent philosopher who understand and respects logic, will not employ such a stratagem.

He undoubtedly understands that one counterexample is enough to disprove a claim such as his if it satisfies the stipulated conditions but not the conclusion, as our counterexample does. And he undoubtedly understands that no deductive argument is valid if its premises include certain restrictions while the conclusion it purports to derive pertains to circumstances in which those restrictions do not hold true.

Thus, he undoubtedly understands that if he were to try to rescue his argument by imposing additional restrictions that prevent the price of Gummi Bears from being 1.05 or 0.95, he could not validly conclude that positive surplus Botox-value is a sufficient condition or a necessary condition for the existence of profit. He could, at best, conclude that a set of conditions that includes restrictions which prevent the price of Gummi Bears from being 1.05 or 0.95 is necessary and sufficient. Such a demonstration would tell us nothing about the origin of profit *in the real world* unless Wolff could also prove that the additional restrictions hold true in the real world.

The above argument has demonstrated that, if one wishes to argue that "capital rests on the exploitation of the working class," it is not possible do so validly by means of Wolff's version of the physicalist model. Freeman and Kliman's previous demonstrations have shown that it is also not possible to do so validly by means of physicalist versions of "the labor theory of value." Yet there is a valid way to make such an argument—Marx's way.

But Marx's argument is logically valid *only* if it is interpreted properly, not misinterpreted in the physicalist manner. On the basis of the non-physicalist interpretation of which we are proponents, the temporal single-system interpretation of Marx's value theory (TSSI), it does indeed follow validly that surplus labor is the exclusive source of (real) profit.[2] A decade of debate confirmed this result beyond reasonable doubt.[3]

Let us now turn to two other issues. One is Wolff's complaint, in the article to which he refers us, against Marx's conclusion that labor is the substance of value, and that commodities' values are therefore determined by the amount of labor socially necessary to produce them. Wolff objects that "Marx's argument for [this], at the beginning of Chapter I of *Capital*, is extremely weak--so weak as not to constitute any argument at all." He says nothing more; we have quoted the objection *in its entirety*. Clearly, it is extremely weak--so weak as not to constitute any argument at all.

Secondly, we wish to comment on the following remark that Wolff makes at the end of his blog post:

> Marxism is not a religion. There is no catechism, no official teaching of the Marxist Church to which one must subscribe in order to be allowed to call oneself a Marxist. Marx was a great social scientist, a great philosopher, and also, as it happens, a great writer. But he was not the Second Coming [or even the First]. So let us once for all time set aside debates about who is and who is not a true Marxist.
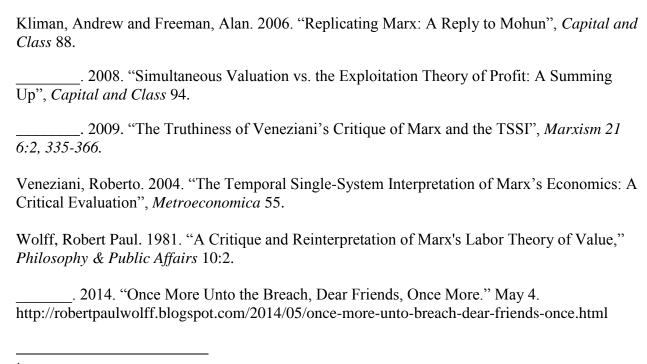
For far too long, proponents of the TSSI have been victims of Sraffian boilerplate invective about critics' supposed religious attitudes, fundamentalism, and obscurantism. It is illogical--ad hominem and strawman argumentation—and it is uncalled for, especially because TSSI arguments are more rigorous and respectful of logic than their own arguments, as has been shown consistently. We hope that this is not what Wolff had in mind.


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[1] See Chapter 10 of Kliman (2007) for a relatively non-technical discussion and numerical examples. Also see Kliman (2001), Kliman and Freeman (2006, 2008, 2009), and Freeman and Kliman (2009).

[2] See Kliman (2001), chap. 10 of Kliman (2007), and Kliman and Freeman (2006, 2008, 2009).

[3] See Kliman and Freeman (2008) and Freeman and Kliman (2009).