A Reexamination of the Quantitative Issues in the New Interpretation

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Abstract

This article evaluates the new interpretation (NI) of Marxian value theory consistent with its inherent logic. The problem of double counting will be examined thoroughly. The relationship between the NI's value of labor power and bundle of wage goods will also be discussed. While the NI generally emphasizes aggregate variables, this article will demonstrate that its inherent logic implies a specific quantitative relationship on the micro level between value and price.

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1. Introduction

The most notable interpretation of Marxian value theory since the early 1980s has been the "new interpretation" (NI) developed by Dumenil, Foley, and others. Although it has changed the landscape of the labor theory of value and has contributed remarkably to contemporary macro-level empirical studies, the NI is premised upon modifications to conventional Marxian interpretation, modifications that cannot be supported easily by textual evidence from Marx's works.

Proponents of the NI argue that the object of transformation procedure is net product rather than gross product, and they have provided a new definition of the value of labor power by using the product of money wage and the "value of money."[1] With regard to the former, NI theorists claim that using the aggregate of gross product creates a problem of double counting.[2] With regard to the latter, most NI theorists insist that the conventional

1. Foley (2000) used the term *monetary expression of labor time* instead of *value of money* because the latter has caused a great deal of misunderstanding. In this article "value of money" is used only for descriptive convenience.

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definition, by bundle of wage goods, should be discarded,[3] while other NI theorists argue that the two definitions are compatible.[4]

This article evaluates two important issues: the problem of double counting and the relationship between the NI's value of labor power and bundle of wage goods. While the NI generally emphasizes aggregate variables, this article will demonstrate that its inherent logic implies a specific quantitative relationship on the micro level between value and price. I am going to restrict discussion here to the quantitative issues of the NI; for example, the issue of qualitative mediation between labor time and price will not be discussed.[5] The NI is based on several postulates, which are repeatedly emphasized by its proponents. I will attempt to distinguish the premises of the NI from the results that may or may not follow from them.

This article is structured as follows. Section 2 summarizes the formal structure of the NI, demonstrating its reliance upon two postulates regarding value of money and value of labor power. Section 3 reviews the problem of double counting, which NI proponents argue is the reason for applying the new aggregate to net product; in this section, I will look at how the NI's logic leads to a problem with accepting the conventional aggregate on gross product. In section 4, I discuss what I term the "microeconomics of the NI"; the systematic relationship between the organic compositions of capital and value-price disparities will be exemplified numerically. Section 5 examines the relationship between the value of labor power and the bundle of wage goods, which is related to one of the NI's postulates. Section 6 provides concluding remarks.

2. The structure of the new interpretation[6]

The NI's standard postulates can be summarized in two points.

Postulate 1. Value of money (m) is defined with regard to net product:

$$m = \frac{lx}{py} = \frac{l_1x_1 + \cdots + l_nx_n}{p_1y_1 + \cdots + p_ny_n}. \tag{1}$$

Here, the $1 \times n$ vectors of $p = (p_1, p_2, \ldots, p_n)$ and $l = (l_1, l_2, \ldots, l_n)$ denote prices and labor inputs, respectively, while $x = (x_1, x_2, \ldots, x_n)^T$ and $y = (y_1, y_2, \ldots, y_n)^T$ are gross product and net product, respectively, defined as $n \times 1$ vectors. The equation relating gross product and net product is

$$x = Ax + y \tag{2}$$

where A represents an $n \times n$ matrix of input-output coefficients.

2. Lipietz (1982) has pointed out that traditional aggregate equalities are misleading because profit on production of the means of production is counted twice. This issue has been explored by Glick and Ehrbar (1987), Ramos-Martinez and Rodriguez-Herrera (1996), Saad-Filho (1996), and Campbell (1997).

3. See Dumenil (1980), Foley (1982), and Mohun (1994).

4. See Lipietz (1982), Glick and Ehrbar (1987), and especially Campbell (2002).

5. Fine, Lapavitsas, and Saad-Filho (2004) have criticized the NI for assuming a direct and unmediated relationship between value and money. Actually, this is somewhat related to the application of "value of money" to an individual sector level, which is discussed in the following section.

6. This section draws upon Nakatani and Rieu (2003). Although these kinds of derivations have been done many times, a short summary of the NI's formulation is necessary for further discussion. In this section, the NI's standard premises or postulates are regarded as given. Therefore, I do not ask why the rectified aggregate holds or why the value of labor power must be newly defined; this does not imply that I support the NI.

Equation (1) implies that value of money is equal to the ratio of the total amount of living labor to total net revenue. This postulate represents the ratio of transforming the prices of the net product into total labor expended over the same period. As monetary unit and hour measure the net product and total living labor, respectively, m is not a nondimensional quantity. Its dimension is, for example, hours per dollar.

Postulate 2. Value of labor power (λ_l) is defined as the product of money wage (w) and value of money[7]:

$$\lambda_l = wm. \tag{3}$$

The NI is derived from postulates 1 and 2 above.

First, the profit per unit of commodity is equal to price minus labor and nonlabor cost:

$$p - pA - wl. \tag{4}$$

Since the surplus value per unit of commodity is defined as labor expenditure minus total value of labor power, using equation (3), it is given by

$$1_l - \lambda_l l = (1 - wm)l. \tag{5}$$

Without a doubt, value and price are dimensionally different. Therefore, if we wish to discuss aggregate equalities of transformation, dimensional consistency must be obtained. The NI multiplies m to price, or divides value by m. The latter case, denoting t as the difference between profit and surplus value represented in terms of price, is as follows. Dividing equation (5) by m and subtracting it from equation (4) gives

$$t = p - pA - wl - \left(\frac{1}{m} - w\right) l = p - pA - \frac{1}{m} l. \tag{6}$$

Postmultiplying the gross product vector x to both sides of equation (6) and using postulate 1:

$$tx = p(I - A)x - \frac{1}{m} lx = py - \frac{1}{m} lx = 0. \tag{7}$$

Equation (7) implies that total profit and total surplus value are equal. In contrast, from the definition of value and net product:

$$lx = \lambda(I - A)x = \lambda y \tag{8}$$

where λ is the $1 \times n$ value vector.

Therefore, equation (7) also implies that, with regard to net product, assuming $m = 1$, the total price (py) is equal to the total value (λy). In other words, using the two postulates modifies and directly leads to Marx's two aggregate equalities in the transformation procedure.

7. The dimension of λ_l is to be considered later.

As recently emphasized by Fine, Lapavitsas, and Saad-Filho (2004), the above formulation of the NI can be done without sectoral equations. For further discussion, however, it is necessary to set the value and price equations of the NI as follows, where π represents the $1 \times n$ profit vector:

$$\lambda = \lambda A + l = \lambda A + wl + (1-w)l \tag{9}$$

$$p = pA + wl + \pi. \tag{10}$$

On one hand, it seems unusual to introduce the money wage rate directly into the value equation. To put it differently, w must be a scalar for dimensional consistency in equation (9). However, as w represents hourly wage, its dimension is dollars per hour. Therefore, a parameter is needed to transform hourly wage into a scalar with the dimension of hours per dollar. This parameter is the value of money, and in this article it is assumed to be equal to 1 for analytical convenience.[8] On the other hand, equation (10) clearly shows that the NI is not related to an equal rate of profit. As one of the NI theorists has emphasized,[9] Marxian transformation can be analyzed without assuming an equal distribution of profit across sectors.

3. The double counting problem

According to Glick and Ehrbar (1987), Saad-Filho (1996), and Campbell (1997), the so-called double counting in NI literature shares a problem with calculation of the GNP or GDP in the sense that intermediate goods are counted twice. Ramos-Martinez and Rodriguez-Herrera (1996) tried to negate the existence of double counting in any sense, while Fine, Lapavitsas, and Saad-Filho (2004: 14) have argued that this kind of discussion is just a "red herring."

Here, I want to clarify how the inherent logic of the NI requires that net product is chosen as the new aggregate. The goal is to show that double counting necessarily arises if one accepts the postulates of the NI with total value invariance on gross product. This is not to say that the NI is the only correct view, but that the NI is logically consistent with respect to the double counting problem.

Equations (9) and (10) can be modified as follows, where s is the surplus value vector:

$$\lambda = wl(I - A)^{-1} + (1 - w)l(I - A)^{-1} = wl(I - A)^{-1} + s(I - A)^{-1} \tag{11}$$

$$p = wl(I - A)^{-1} + \pi(I - A)^{-1}. \tag{12}$$

The second equality in equation (11) results from equation (5) assuming $m = 1$.

If we adopt an invariance aggregate on gross product within the NI's equations using equations (11) and (12), respectively, postmultiplied by x, the result may be written as follows:

$$\lambda x = wl(I - A)^{-1}x + s(I - A)^{-1}x = px = wl(I - A)^{-1}x + \pi(I - A)^{-1}x.$$

8. Lipietz (1985: 40) also used this assumption.

9. "As far as the new interpretation of the transformation problem is concerned, the required conditions are *the existence of a positive set of prices regardless of the rates of profit, guaranteeing not necessarily uniform positive wages, and a positive aggregate price of the net output*" (italic original; Dumenil 1984: 348).

Hence, the total value and total price are equal if and only if the following condition holds:

$$s(I-A)^{-1}x = \pi(I-A)^{-1}x. \tag{13}$$

Under standard assumptions, equation (13) can be represented as

$$\begin{aligned} &s(I + A + A^2 + \ldots)x = \pi(I + A + A^2 + \ldots)x \\ &\therefore (s + sA + sA^2 + \ldots)x = (\pi + \pi A + \pi A^2 + \ldots)x. \end{aligned} \tag{14}$$

While the term on the left side represents total surplus value plus the sum of surplus values contained in constant elements of the capital at all stages of production, the term on the right side represents profits aggregated in the same manner.

The famous flax-linen example may help to show the implications of this result. Flax is produced by four hours of labor, and linen is produced by two hours of labor and one unit of flax.

$$\begin{aligned} &4 \text{ hours of labor} \rightarrow 1 \text{ unit of flax} \\ &1 \text{ unit of flax} + 2 \text{ hours of labor} \rightarrow 1 \text{ unit of linen} \end{aligned}$$

Glick and Ehrbar (1987), Saad-Filho (1996), and Campbell (1997) used this numerical example to illustrate the existence of double counting, although Saad-Filho cannot be considered an NI theorist. However, this example is too restrictive in the sense that it has a peculiar input-output structure. Therefore, the following discussion is offered here simply to illustrate the problem with the example used by NI theorists.

Suppose that the gross product of a society consists of one unit of flax in the first sector and one unit of linen in the second sector; then

$$A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \quad A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \quad x = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

Therefore,

$$\pi(I-A)^{-1}x = \pi(I+A)x = \pi_1 + \pi_1 + \pi_2 \tag{15}$$

$$s(I-A)^{-1}x = s(I+A)x = s_1 + s_1 + s_2 \tag{16}$$

where π_i and s_i, the elements of π and s, represent profit and surplus value in the ith sector. The reason equations (15) and (16) cannot be equal in general is that the magnitude of surplus value in the flax sector is not conserved in the transformation procedure, namely $\pi_1 \neq s_1$. In other words, the profit in the flax sector is counted twice.[10]

It should also be emphasized that this double counting results from the NI's specific formulation of the relation between value and price, especially as related to the new definition

10. Once again, the specificity of this example should be noted. The goal here is to show that, at least in this special case, surplus value and profit in the flax sector are counted twice within the NI's logic. In a general input structure where $a_{ij} > 0$, equations (15) and (16) will be more complicated. This case must be treated within a general framework of equation (14).

of the value of labor power. Without the NI's postulates, equation (11) does not hold because $(1 - w)l$ cannot be taken as the surplus value. It is well known in conventional interpretation of Marxian value theory that total living labor minus the labor equivalent of total wage is not necessarily equal to surplus value. It follows from this that those who do not accept the NI's postulates may consider double counting to be a pseudo-problem. Now that this point is clarified, we can examine other issues related to the NI.

4. Microeconomics of the NI

Before turning to a closer examination of "microeconomics of the NI," a few remarks should be made concerning the definition of the value of money. As the NI's value of money is the ratio between the quantity of direct embodied labor over a certain period and the total price of the net product in the same period, equation (1) may be rewritten, using an axiomatic equality between total living labor and total value of net product:

$$\begin{aligned} m &= \frac{lx}{py} = \frac{l_1x_1 + \cdots + l_nx_n}{p_1y_1 + \cdots + p_ny_n} \\ &= \frac{\lambda_1y_1 + \cdots + \lambda_ny_n}{p_1y_1 + \cdots + p_ny_n} \\ &= \frac{\left(\frac{\lambda_1}{p_1}\right)p_1y_1 + \cdots + \left(\frac{\lambda_n}{p_n}\right)p_ny_n}{p_1y_1 + \cdots + p_ny_n} \\ &= \alpha_1\omega_1 + \cdots + \alpha_n\omega_n \\ &\quad \text{where } \alpha_i = \frac{\lambda_i}{p_i}, \quad \omega_i = \frac{p_iy_i}{\sum_{i=1}^{n} p_iy_i}. \end{aligned} \tag{17}$$

In other words, the NI's "value of money" can be represented as the weighted average of the value-price ratio of commodities (α_i), where the weight is the sectoral ratio of the price of the net product. Therefore, it is impossible to apply this concept directly to an individual sector level (Saad-Filho 1996: 127). We can use the microeconomic value-price relation, however, to consider NI.[11]

Let us start with Bortkiewicz's numerical example, shown in Table 1; it describes a reproduction scheme in terms of value. Departments I, II, and III, respectively, denote the department producing means of production, wage goods, and luxury goods. These can be analyzed without necessarily assuming a simple reproduction.

According to Glick and Ehrbar (1987), the Okishio-Shaikh-like iterative procedure can be used to find a solution for this numerical example within the NI, assuming a constant money wage. Accordingly, if the sum of surplus values at every step is equal to the sum of the profits, and the money wage is equal to the value of labor power,[12] the results are shown in Table 2 using the values in Table 1.

11. The term *microeconomics* here is used just for simplicity. All discussions about determining relative and absolute values are microeconomic in the sense that they presuppose individual commodity equations.

12. These assumptions imply that *value of money* is equal to 1, which was discussed above with regard to equation (9).

Table 1
Example of a Three-Department Model

	C	V	S	Total
Department I	225	90	60	375
Department II	100	120	80	300
Department III	50	90	60	200

Table 2
The New Interpretation's Solution

	C	V	S	Total
Department I	279.8	90	96.5	466.3
Department II	124.3	120	63.8	308.1
Department III	62.2	90	39.7	191.9

This procedure can be generally formulated as follows (Nakatani and Rieu 2003: 56):

$$p_0 = \lambda \tag{18}$$

$$p_{s+1} = (1 + r_s)(p_s A + mwl) \tag{19}$$

$$r_s = \frac{\lambda y - mwlx}{p_s Ax + mwlx}. \tag{20}$$

In equation (20), money wage is represented as the value of labor power using the value of money, while the real wage basket is not addressed.[13] Surplus value is obtained by subtracting the value of labor power from the constant value of the net product. The following aggregate condition can be obtained from equations (19) and (20):

$$p_{s+1}x - p_s Ax = \lambda y. \tag{21}$$

If this procedure converges ($p_{s+1} = p_s = p$), equation (21) becomes

$$py = \lambda y. \tag{21'}$$

Therefore, the value of money at the sth step converges to 1, as s approaches infinity:

$$\lim_{s\to\infty} m_s = \lim_{s\to\infty} \frac{lx}{p_s y} = \frac{lx}{py} = \frac{lx}{\lambda y} = 1. \tag{22}$$

13. As Glick and Ehrbar (1987) have shown, another version of the NI can be used to relate the value of labor power to the wage basket. In that case, equations (19) and (20) should be modified to include wage basket vectors.

Furthermore, from equation (20), total profit can be shown to equal total surplus value:

$$r(pAx + wlx) = \lambda y - wlx = lx - wlx = (1 - w)lx. \tag{23}$$

In contrast, setting up and solving the simultaneous equations system can represent the above procedure; this is shown by equations (24) to (27), where k_1, k_2, and k_3 denote the price-value ratio of each department. Note that the value of labor power is not multiplied by any price-value ratio, but merely by the inverse of the value of money assumed here to be 1. Equation (27) represents "the total profit = the total surplus value," which also implies an aggregate on net product assuming $m = 1$. The solutions are as follows: $k_1 = 1.2434$, $k_2 = 1.027$, $k_3 = 0.9595$, and $r = 0.2610$:

$$(225k_1 + 90)(1 + r) = 375k_1 \tag{24}$$

$$(100k_1 + 120)(1 + r) = 300k_2 \tag{25}$$

$$(50k_1 + 90)(1 + r) = 200k_3 \tag{26}$$

$$(375k_1 + 300)r = 200. \tag{27}$$

Although the logical order is from value to price, only the data about prices are readily observed. Therefore, if a price system is given like the one shown in Table 2, NI theorists can inversely transform it into labor values like those in Table 1 using the corresponding simultaneous equations system, assuming an equal rate of exploitation.[14] Contrary to popular criticism, the NI does not simply assume away constant parts of capital because it is possible to calculate their values when their prices are given, and vice versa.

Let us now extend the above analysis into an examination of the problem of correspondence between price-value deviation and composition of capital. Marx (1981: 264) presented his famous law on the deviation of price from value in the third volume of *Capital*:

> Commodities produced by capital II [with higher composition of capital – Rieu] thus have a value less than their price of production, and those produced by capital III [with lower composition of capital – Rieu] have a price of production less than their value. Only for capitals such as I, in branches of production whose composition chanced to coincide with the social average, would the value and the price of production be the same.

The above rule can be represented as follows, where OCC_i and $\overline{OCC}$, respectively, denote the organic composition of capital in the ith sector and in the social average:

$$p_i - \frac{\lambda_i}{m} = f(OCC_i - \overline{OCC}) \quad f' > 0,\ f(0) = 0. \tag{28}$$

Since the NI rectifies the aggregate equality on gross product, Marx's rule does not hold in this case. For example, although the organic composition of capital in department II is lower than the social average in Table 1, its value divided by the value of money (assumed to be 1) is smaller than the price of production in Table 2.[15]

14. Without this assumption, a distribution of variable capital among departments cannot be determined uniquely. Certainly, this assumption does not cause any problem with the NI's consistency.

15. This problem has been relatively neglected in the NI tradition. To the best of my knowledge, Mohun (2004) is the only exception; he showed that the vertically integrated capital-paid labor ratio determines price-value

Table 3
The Numerical Example for the New Interpretation

	Composition of Capital in Terms of Price (PCC_i)	Difference from the Social Average ($PCC_i - \overline{PCC}$)	m^* Prices
Department I	3.109	1.555	422.5
Department II	1.036	–0.518	279.1
Department III	0.691	–0.863	173.9

However, if we use the ratio of total value to total price with regard to gross product (m^*),[16] a new rule for price-value deviation in the NI emerges, as shown in Table 3.

In this example, $m^* = (375 + 300 + 200)/(466.3 + 308.1 + 191.9) = 0.906$. Note that the sectoral composition of capital (PCC_i) and its social average ($\overline{PCC}$) are measured here in terms of price, not in terms of value. The new rule is as follows[17]:

$$m^*p_i - \lambda_i = g(PCC_i - \overline{PCC}) \qquad g' > 0,\ g(0) = 0. \tag{29}$$

For example, since PCC_2 is smaller than $\overline{PCC}$ in department II, its price multiplied by $m^*(279.1)$ is smaller than its value (300) in Table 1. If any economic meaning can be given to m^*p_i, Marx's theory about the relation between value-price deviation and composition of capital is supported, albeit in a modified form. Furthermore, this rule is operational in the sense that one can easily calculate the composition of capital in terms of price without dealing with difficult problems such as different vintages in elements of constant capital.

An objection may be raised to the point made in this section; in constructing Marxian political economics, it is not important to forecast the direction of value-price deviation from the sectoral composition of capital. Without a doubt, value is not just an accounting concept. However, at least in the practical application of the theory, it is both useful and necessary to explain the systematic quantitative divergence between value and price.

5. The value of labor power

Let us now look at the value of labor power in detail. Marx defined the value of labor power as the quantity of labor required for producing commodities whose consumption is necessary to reproduce labor power. This can be represented as λb where $b = (b_1, b_2 \ldots b_n)^T$ denotes the $n \times 1$ vector of the commodities necessary for the reproduction of labor power.

Central to this issue is the problem of compatibility between Marx's and the NI's definition of the value of labor power. A good place to start solving this problem is with an

deviation. Even Mohun (2004: 87), however, noted that "Within the DF [Dumenil-Foley] approach this sort of proposition is at best of only doubtful interest."

16. It may seem strange to use a ratio defined for gross product to evaluate the NI's result. However, what I wish to show is that a simple relation exists between the NI's value-price deviation and the sectoral composition of capital measured in terms of price. Furthermore, calculation of this ex-post ratio is not incompatible with any of the NI's postulates or propositions. In passing, I want to note that a precursor of the NI, De Vroey (1981: 190), defined the "monetary expression of social labor-time" as the ratio of the sum of prices to the sum of values with regard to gross product.

17. It is easy to show the generality of this rule by replacing p_i and PCC_i with price of production and organic composition of capital, as defined in the third volume of Marx's *Capital*; in this case, they are not "rectified" by transforming the constant and variable capital.

examination of the dimensionality of the value of labor power, as noted earlier. Since the value of labor power per unit of labor is equal to real wage per unit of labor multiplied by the value of wage goods and unit labor, it is given by

$$\lambda b = \lambda b \cdot 1 = \lambda_1 b_1 \cdot 1 + \cdots + \lambda_n b_n \cdot 1 \tag{30}$$

where 1 represents unit labor. As the dimensions of λ_i, b_i, and 1 are, respectively, hour per *i*th commodity, *i*th commodity per hour, and hour, Marx's value of labor power becomes the dimension of hour.[18]

In contrast, as can be seen from the two postulates in section 2, the NI's value of labor power is equal to wage share and, at first glance, its dimension looks like a pure number.[19] Thus, Fine, Lapavitas, and Saad-Filho (2004: 12) have pointed out that, in the critical context of the NI, the value of labor power is "neither a quantity of money nor goods but a quantity of value." However, in the NI, the value of labor power should be conceived as magnitude multiplied by unit labor. As the dimensions of *wm* and unit labor are, respectively, pure number and hour, the dimension of the NI's value of labor power becomes hour. Therefore, for both Marx and the NI, dimensions of the value of labor power can be equal and remain consistent with common sense.

However, the implication of each of these two definitions is different. Using equation (17), the NI's value of labor power may be rewritten as follows:

$$\begin{aligned}
\lambda_l &= wm \\
&= (p_1 b_1 + \cdots + p_n b_n)m \\
&= \left(\frac{\lambda_1 b_1 p_1}{\lambda_1} + \cdots + \frac{\lambda_n b_n p_n}{\lambda_n}\right)\left(\sum_{i=1}^{n} \alpha_i \omega_i\right) \\
&= \left(\frac{\lambda_1 b_1}{\alpha_1} + \cdots + \frac{\lambda_n b_n}{\alpha_n}\right)\left(\sum_{i=1}^{n} \alpha_i \omega_i\right) \\
&= \lambda_1 b_1 \delta_1 + \cdots + \lambda_n b_n \delta_n.
\end{aligned} \tag{31}$$

Here $\delta_i = \dfrac{\sum_{i=1}^{n} \alpha_i \omega_i}{\alpha_i}$ is the weighted average of the value-price ratios divided by the individual value-price ratio. Note that the second equality in equation (31) results from the ex-post identity between wage and expenditures on wage goods. In other words, even when defining the value of labor power independently of the consumption bundle, equation (31) still holds.

Despite the obvious differences between the two definitions, it is debatable whether the NI theorists abandon the definition of consumption bundle. While Dumenil-Foley-Mohun have argued that a new definition should be substituted for the conventional one, another version of the NI seems to allow for both definitions to be compatible.

18. The author thanks Takeshi Nakatani for this analysis.

19. See Foley (1982: 40). Especially relevant is the following remark of Dumenil (1984: 341) : "The issue at stake here is whether the situation of workers must be assessed through a vector of consumption of goods or through a scalar." It is obvious that Dumenil considers the value of labor power as a scalar.

According to the Dumenil-Foley-Mohun line of thought, a connection between value of labor power and wage basket must be severed. Mohun (1994) gave the best explanation for this: if one supposes a hypothetical sector "producing" a labor power commodity, one cannot conceptualize this hypothetical sector as production combining constant and variable capital. Clearly, the rate of profit cannot be calculated or applied. In this sense, labor power itself must be regarded as a "net product," and its value magnitude can be regarded as proportional to price. This interpretation does not lead to problems within the NI's logical consistency, so its definition of the value of labor power, postulate 2, can be integrated successfully into postulate 1 of the new aggregate on net product.

On the other hand, Campbell (2002) has recently tried to clarify the relationship between the two definitions. He added a novel concept into the NI: "the vector of redistributed value," defined as $\gamma \neq pm$:

$$\lambda_l = wm = (pb)m = (pm)b = \gamma b. \tag{32}$$

Accordingly, λ_l is argued to be a way of representing the wage basket vector. However, $\gamma = pm$ is an inappropriate and misleading concept because it ignores the deviation between value and price. In other words, the ith element of vector γ is simply the number of hours, which is the product of its weight and total labor time, the weight being the price of the ith commodity divided by the aggregate price of all the commodities produced. This is similar to the concept m^*p_i in section 4, except it is related to the aggregate of net product, rather than gross product.

One might expect this concept to bridge the gap between the NI's value of labor power and prices, a discrepancy criticized by Fine, Lapavitsas, and Saad-Filho (2004: 13). However, it may actually produce an effect contrary to the original intention of complementing the NI. If a concept of "redistributed value" is used to explain the connection between the NI's value of labor power and the real wage basket, then it should be applicable to constant capital. This relates to Moseley's (2000) criticism of the NI, that is, that it treats constant capital and variable capital asymmetrically. Although Foley (2000: 24), one of the NI theorists, appears not to be against application of the value of money to constant capital, this application may ultimately lead to the NI's deconstruction, or to the introduction of another redundant concept, which is neither value nor price.[20] As noted previously with regard to the derivation of equation (31), certain economic interpretations like "redistributed value" can be given to γ only in an ex-post sense. If such an interpretation is taken as an ex-ante or definitional relation, the NI will be assimilated into a so-called single system interpretation, which is based on the argument that it is unnecessary to transform the constant capital, or that it has already been transformed.

This leads us to the last question: whether or not the NI's two postulates are logically interdependent. Recalling equations (24) to (27) in section 4, if m is an unknown variable, instead of being equal to 1 or constant, the equations may be rewritten. Note that a separation

20. Recently, Freeman (2004) has argued for a similar concept as a good approximation for "value," a development that was predated by Brinkman's (1999) attempt to conceptualize "essential price": in our notation, mp_i. Freeman's proposal implies the idea of transforming the NI into a different interpretation, one similar to the "temporal single-system interpretation" (Kliman and McGlone 1999), while Brinkman's proposal implies that mp_i is as important as value.

between value of labor power and the consumption bundle is maintained here because the transformation coefficients of wage goods (k_2) and m are set differently:

$$(225k_1 + 90m)\,(1 + r) = 375k_1 \tag{24'}$$

$$(100k_1 + 120m)\,(1 + r) = 300k_2 \tag{25'}$$

$$(50k_1 + 90m)\,(1 + r) = 200k_3. \tag{26'}$$

This system is underdetermined in the sense that there are a greater number of unknowns (k_1, k_2, k_3, m, r) than equations. That is, two additional equations are required to produce a unique solution. If the two conventional aggregates are used, instead of the NI's new aggregate, then two additional equations will result, and this system can be solved uniquely. In this case, all of Marx's results will be maintained, except for the aggregate on net product. Loranger's (2004) recent "profit-rate invariant solution" is similar to this idea.[21] Loranger's "solution" (or rather "interpretation" in the same sense as the NI) clearly shows that a choice of net or gross aggregate is a kind of postulate that cannot be logically derived from a definition of the value of labor power.

This all means that the NI's postulates 1 and 2 are mutually independent. We are left with a choice between postulate 1 and a conventional aggregate, even after using postulate 2, a new definition of value of labor power.

6. Conclusion

The main points made in this study can be summarized as follows:

(1) It has been shown that given the NI's specific formulation of the relationship between value and price, profit contained in constant capital is counted twice.

(2) Although the NI's "value of money" cannot be directly applied to an individual sector level, the value-price relation can be specified quantitatively on a microeconomic level.

(3) Marx's rule about the relationship between capital composition and value-price deviation does not apply in the NI. However, some operational meaning can be given to Marx's theory.

(4) To maintain the NI's logical consistency, value of labor power must be defined separately from the real wage basket, especially with regard to the asymmetrical treatment of constant and variable capital.

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21. For analytical simplicity, Loranger (2004) assumed a fully decomposable structure of production, in which every commodity requires itself as a sole input. Using my notation, his solution results in $k_1 = 1.2597$, $k_2 = 0.8223$, $k_3 = 0.7765$, $m = 0.9$, as calculated from the following equations:

$$(225k_1 + 90m)(1 + r) = 375k_1$$

$$(100k_2 + 120m)(1 + r) = 300k_2$$

$$(50k_3 + 90m)(1 + r) = 200k_3$$

$$375k_1 + 300k_2 + 200k_3 = 875$$

$$r = 200/875 = 0.2963.$$

Bortkiewicz's example itself also assumes a decomposable structure of production because the products of departments II and III do not enter into the production of any commodity directly or indirectly, while the product of department I is an indispensable input of all the commodities.

(5) The NI's two postulates are mutually independent in the sense that one of them cannot logically lead to the other.

Although it is still unclear whether the NI's postulates are desirable (or not) as compared to other postulates, the NI is logically consistent, given its premises and postulates. Therefore, considered as a first step, the NI has useful implications for examining the reality of capitalist society.

As this study has concentrated on the NI's inherent logic in connection with quantitative issues, it has paid scant attention to explaining whether privileged status should be given to net product aggregate, or if it is even consistent with the NI's logic. Further inquiry into the matter would lead us into an examination of the methodological and qualitative issues in Marxian value theory, which is beyond the scope of this study.

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