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The rate of profit and changes in the composition of capital

A taxa de lucro e as mudanças na composição do capital

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Abstract: This article discusses two aspects of the influence of the value composition of capital (VCC) on the evolution of the rate of profit. First, it shows how changes in this composition caused by variations in the value of the material elements of constant capital or variable capital affect the rate of profit. Second, it discusses the effect of organic changes in the VCC and of their combination with changes in value on the rate of profit. The conclusion relativizes the theoretical importance of the fall in the rate of profit resulting from an increase in value compared to that resulting from an increase in the organic composition and emphasizes the distinction between tendency and countertendencies in the context of the law of the tendential fall in the rate of profit, based on the distinction between the concepts of value and organic composition of capital.

Keywords: Rate of profit; Composition of capital; Organic changes; Changes in value; Tendential law.
JEL classification: B14, B24.

Resumo: Este artigo discute dois aspectos da influência da composição de valor do capital (CVC) sobre a evolução da taxa de lucro. Em primeiro lugar, mostra de que forma alterações nessa composição provocadas por variações do valor dos elementos materiais do capital constante ou do capital variável afetam a taxa de lucro. Em segundo lugar, discute o efeito de mudanças orgânicas na CVC e da combinação destas com as variações de valor sobre a taxa de lucro. A conclusão relativiza a importância teórica da queda da taxa de lucro decorrente de elevação do valor em comparação à resultante de elevação da composição orgânica e enfatiza a distinção entre tendência e contratendências no contexto da lei da queda tendencial da taxa de lucro, a partir da distinção entre os conceitos da composição de valor e orgânica do capital.

Palavras-chave: Taxa de lucro; Composição do capital; Mudanças orgânicas; Variações de valor; Lei tendencial.
Classificação JEL: B14, B24.

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1. Introduction

The rate of profit, at the level of abstraction at which Marx analyses it in volume III of *Capital*, consists of the relationship between the mass of surplus value (*s*) and the total capital advanced (*C*), sum of constant capital (*c*) with variable capital (*v*). Designating the profit rate as *p'*, we have:

$$p' = \frac{s}{C} = \frac{s}{c + v} \tag{1}$$

And, dividing both the numerator and denominator of this expression by *v*, we have:

$$p' = \frac{\frac{s}{v}}{\frac{c}{v} + \frac{v}{v}} = \frac{s'}{VCC + 1} \tag{2}$$

where *s'* represents the rate of surplus value and *VCC* the value composition of capital[1].

The objective of this paper is to examine the influence of changes in the composition of capital on the evolution of the profit rate. As is known, the law of the tendential fall in the rate of profit (LTFRP) is set forth by Marx in section III of volume III of *Capital* based on the tendency for the organic composition of capital to rise, with the variations (in this case, reductions) in the value of the material elements of capital incorporated in the context of countertendencies to the fall in the rate of profit. However, what would occur if the organic composition of capital remained constant and only the value of the material elements of capital changed? If the latter were to increase, for example, would the profit rate fall?

Marx examines this case in *Theories of Surplus Value* (Marx, 1968)[2]. To this end, a distinction is made between the factors that lead to changes in the composition of capital, classifying them into (i) organic changes and (ii) changes in the value of the material elements of capital. The first factor refers to changes in the *method of production*, therefore in the technical composition of capital (the ratio between the mass of means of production and the number of workers who set them in motion). The organic composition of capital is reflective of such changes in technical composition in terms of value (Saad Filho, 2011, p. 124)[3]. The second factor influencing the composition of capital is the change in the value

[1] "The rate of profit is thus determined by two major factors: the rate of surplus value and the value composition of the capital" (Marx, 1991, p. 161).

[2] See chap. 12, subsection 3.c, p. 275-289. In volume III of the same work (Marx, 1971, p. 382-388), the author presents the various elements that influence the composition of capital.

[3] See Marx (1990, p. 762; 1991, p. 244-245). The understanding of organic composition in technological terms is already clear in *Theories of Surplus Value*: "[...] the organic composition of productive capital. By this we mean the technological composition" (Marx, 1971, p. 382).

of the material elements of both constant capital (the means of production) and variable capital (the labour power).

The concept of value composition of capital (VCC) brings together both factors of change – the organic elements and the changes in value. The following expression can be used to visualize them[4]:

$$VCC = \frac{c}{v} = \frac{K}{N}\frac{1}{wv_0}\frac{\lambda_1}{\lambda_2} \tag{3}$$

where: K = index of the quantity of means of production (in base year values), N = number of workers employed, w = real wage index, v_0= a constant representing the unit value of labour power in the base year, λ_1 = index of the current unit value of means of production and λ_2 = index of the current unit value of means of subsistence.

The proportion K/N corresponds to the technical composition of capital (TCC). The above equation can therefore be rewritten as:

$$VCC = \frac{TCC}{v_0}\frac{1}{w}\frac{\lambda_1}{\lambda_2} \tag{4}$$

Or, considering that the term TCC/v_0 corresponds to the organic composition of capital (OCC)[5], as:

$$VCC = OCC\,\frac{1}{w}\frac{\lambda_1}{\lambda_2} \tag{5}$$

Notice that the factors responsible for changes in the VCC include changes in the value of labour power ($w\lambda_2$ is the index of the unit value of the latter).

The changes observed in the VCC express changes in *labour productivity*, which affect the OCC, on the one hand, and the values of the means of production and subsistence, on the other. It is important to note, however, that variations in labour productivity may occur in opposite directions in the different branches of production (increase in productivity in certain branches, falls in others); or, even when variations in productivity occur in the same direction, they may occur in different proportions in the different branches of

[4] The following formalization is from Shaikh (2006, p. 413-415). The capital composition approach adopted here shares similarities – but also differences – with that of Fine and Harris (1981, chap. 4) (see also Saad Filho [2011, chap. 6] and Fine and Saad Filho [2021, chap. 8]).

[5] See Shaikh (2006, p. 414). Notice that the formula used for the OCC implies that this composition, insofar as it must reflect only changes in the technical composition, will not be affected either by variations in the real wage or by variations in the value of the means of production and means of subsistence. It should also be observed that while VCC is measured in current values, OCC is measured in constant values (following Shaikh [2006] and Fine and Harris [1981]). A more detailed discussion of the various aspects of the formulas used is beyond the scope of this paper.

production[6]. Hence, the evolution of VCC cannot be deduced linearly from the behavior of OCC. For this to occur, changes in labour productivity in the branches that produce means of production and means of subsistence would have to occur in the same direction and in the same proportion. Such productivity behavior will undoubtedly influence the evolution of the rate of profit in various ways.

Having said this, it is necessary to clarify why Marx, when dealing with the evolution of the profit rate, generally considers the OCC and not the VCC among its determinants. One possible reason is that he assumes that the values of the means of production and labour power are constant; or that increases in labour productivity occur in the same proportion in the sectors that produce means of production and means of subsistence. In either case, the VCC is equal to the OCC (given the real wage). The adoption of this assumption reflects his perception that the ratio of organic components of capital is clearly more important than the ratio of the values of the capital elements for the evolution of the rate of profit[7]. However, when it becomes necessary to consider the influence of the values of these elements on the evolution of the rate of profit, it is inevitable to resort to the concept of VCC[8]. Thus, a change in the value of the means of production can affect the rate of profit by modifying the VCC, but it does not change the OCC. Similarly, a change in the value of the means of subsistence can affect the rate of profit by modifying the VCC and the rate of surplus value, but it does not modify the OCC.

In what follows, we will address, firstly (section 2), the effect of changes in the value of the material elements of capital (abstracting from organic changes) on the VCC and the rate of profit. Next (section 3), we will address the effect of organic changes and their combination with changes in value[9]. The articulation of the components of the VCC – therefore, of the changes in the OCC with the changes in value – has been presented in different ways in the LTFRP expositions. Some authors expose the law exclusively based

[6] "The development of productive power is not even" (Marx, 1971, p. 300). See also Marx (1991, p. 368-369).
[7] Thus, when explaining in volume III of *Capital* the concept of the composition of capital, he writes: "Two relationships are involved here which are not of equal importance, even though they may in certain circumstances produce the same effect" (Marx, 1991, p. 244). The two proportions in question are the technical composition of capital and the value proportion of the material elements of capital.
[8] It appears that this differentiation between the components of VCC is reflected in the very structure of the first three sections of volume III of *Capital*. In fact, chapters 3, 6 and 7 of section I deal with the influence of changes in value on the rate of profit. This paves the way for the following two sections, which address the influence of the other VCC component, the OCC, on the rate of profit. Thus, in section II the differences in the value of the elements of capital between the spheres of production are abstracted, and the influence of differences in the OCC on the rate of profit is examined. Similarly, in section III, in the formulation of the tendency for the rate of profit to fall, changes in the value of the elements of capital are abstracted and changes in the OCC are considered, with the changes in value being considered as countertendencies.
[9] We will therefore consider the different possibilities of variation in the rate of profit, as outlined by Marx in *Theories of Surplus Value*: "A. A *change in the method of production* brings about a change in the *proportion* between the amounts of constant and variable capital employed. […] B. *The method of production remains the same.* There is a *change in the ratio of constant to variable capital*, while their relative volume [in physical units] remains the same […]. This change in their ratio is caused by a *change in the value* of the commodities which enter into constant or variable capital. […] C. *Change in the method of production and change in the value of the elements that form constant or variable capital*" (Marx, 1968, p. 380-381, original emphasis).

on organic changes, without considering the changes in the value of the elements of capital. Other authors include the latter, but sometimes give them a weight they do not have to avoid the downward trend. The section presents some possibilities for this articulation, with illustrative examples related to the probability of preventing or slowing down the fall in the profit rate resulting from an increase in the OCC by reducing the value of the material elements of capital. (Note, however, that this paper does not aim to demonstrate the validity of the LTFRP, a task that, in our opinion, has already been carried out by several authors).

In the conclusion, we evaluate the importance of the phenomenon of the fall in the profit rate resulting from changes in value in relation to the fall caused by the rise in OCC. We also highlight the distinction between tendency and countertendencies in the context of the LTFRP, drawing on the distinction between the concepts of value composition and the organic composition of capital.

It should be added that although the analysis is centered on *changes* in the composition of capital (and corresponding changes in the rate of profit), it can also be applied to *differences* in the composition of capital (and profit rates) between spheres of production, sectors and countries.

In the entire discussion that follows, we assume the working day is constant. We also assume that the wage corresponds to the magnitude of the value of labour power.

2. The fall in the rate of profit associated with changes in the composition of capital resulting from variations in the value of its elements

The changes in VCC discussed here are associated with changes in labour productivity in the industrial branches that provide means of production or in those that produce the usual means of subsistence (and thus influence the determination of the value of labour power). As Marx (1971, p. 386) explains:

> The organic changes and those brought about by changes of value can have a similar effect on the rate of profit in certain circumstances. They differ however in the following way. If the latter are not due simply to fluctuations of market prices and are therefore not temporary, they are invariably caused by an organic change in the spheres that provide the elements of constant or of variable capital[10].

That said, the VCC may vary while the OCC remains unchanged if the value of the capital elements varies. “What can happen is: a) a change in the value of constant capital;

[10] We therefore assume that variations in the prices of material elements of capital correspond to variations in their *values*. In fact, for the purposes of variations in the rate of profit, variations of any nature in the prices of those elements must be considered. This is how Marx explains it in *Capital*, regarding raw materials: “Our whole investigation has proceeded from the assumption that any rise or fall in prices is an expression of real fluctuations in value. But since we are dealing here with the effect that these price fluctuations have on the profit rate, it is actually a matter of indifference what their basis might be. The present argument is just as valid if prices rise or fall not as a result of fluctuations in value, but rather as a result of the intervention of the credit system, competition, etc.” (Marx, 1991, p. 208).

b) a change in the value of the variable capital; c) a *change in both*, in equal or unequal proportions" (Marx, 1971, p. 383, original emphasis).

Let us take the following example, taken from *Theories of Surplus Value* (Marx, 1968, p. 280-287). The constant capital is limited to raw material (cotton). TCC/OCC remains constant, reflecting the assumption that the method of production does not change. The total capital is equal to 100 in all cases. As a result, the fall in the rate of profit also corresponds to a fall in the mass of profit itself. The data are gathered in Table 1.

Table 1: Variations in the rate of profit associated with variations in the value of material elements of capital

	c	Raw material		v	Labour power		OCC	VCC	s	s'	p'
		Unit value	Qty.		Unit value	Qty.					
I	80.00	0.05	1,600	20.00	1.00	20	4.00	4.00	20.00	100.0%	20.0%
II	75.00	0.05	1,500	25.00	1.33	18.75	4.00	3.00	12.50	50.0%	12.5%
III	84.21	0.067	1,263.16	15.79	1.00	15.79	4.00	5.33	15.79	100.0%	15.8%
IV	80.00	0.067	1,200	20.00	1.33	15	4.00	4.00	10.00	50.0%	10.0%
V	80.73	0.055	1,467.89	19.27	1.05	18.35	4.00	4.19	17.43	90.5%	17.4%

Source: Marx (1968, p. 287). Adapted by the author.

In the initial situation, the constant capital is £80; given the price of £0.05 per pound, this corresponds to 1,600 pounds of cotton. The variable capital is £20, which, given the wage of £1, corresponds to the employment of 20 workers. The new value they produce is equal to £40, of which £20 replace the wages and £20 constitutes surplus value (the rate of surplus value is 100%). The rate of profit is therefore 20%.

Case II: *variation in the value of only the elements of variable capital* (increase in wages by one third). In terms of absolute magnitudes, for the same 20 workers, the total expenditure on variable capital is now £26.67; since the constant capital remains at £80, the total capital amounts to £106.67. The surplus value decreases to £13.33, since the expenditure on variable capital is higher for an invariable new value (£40). The rate of surplus value thus decreases to 50% and the rate of profit drops to 12.5%. Considering a capital of 100, as shown in the table, the composition will be 75c + 25v, accordingly adjusting the quantity of cotton to 1,500 pounds and the number of workers to 18.75, since the method of production has not changed. The surplus value produced is £12.5[11]. The fall

[11] The new value produced by each capital of 100 decreases (from £40 to £37.5) in proportion to the number of workers (the working day remains constant), while a larger part of this smaller amount goes to wages (£25 instead of £20).

in the rate of profit is due, in this case, to the fall in the rate of surplus value and, for a capital of 100, to the reduction in the number of workers[12].

Thus, if only the value of the elements of variable capital increases, the VCC decreases. This fall in VCC (or the increase in the participation of variable capital in total capital) is offset, however, by a decrease in the number of workers employed. The combination of this factor with the drop in the rate of surplus value results in a drop in the rate of profit:

> [...] a *change in the value of the variable capital* – in this case a rise – increases the proportion of *variable* to *constant capital* [...]. Nevertheless, *the rate of profit falls here*, instead of rising, for the *method of production* has remained *the same*. The same amount of living labour as before is employed now, in order to convert the same amount of raw materials, machinery etc. into products. Here [...] only a smaller total amount of immediate and accumulated labour can be set in motion with the same capital of £100; but the smaller amount of labour costs more. The necessary wage has risen. A larger share of this smaller amount of labour represents necessary labour and therefore a smaller amount forms surplus labour. The rate of surplus value has fallen, while at the same time the number of workers [...] has diminished. [...] The surplus value consequently falls and with it the rate of profit (Marx, 1968, p. 282-283, original emphasis).

The analysis of this case shows two limitations of the Ricardian theory of the rate of profit. The first is that it omits the reduction in the number of workers among the factors that cause the rate of profit to fall, concentrating its explanation exclusively on the increase in wages. Ricardo, as Marx notes, always assumes constant working day and intensity of labour[13]. In this context, he claims that the rate of profit necessarily maintains an inverse relationship with the evolution of wages. However, the statement of inverse variation in the value of labour power and surplus value is only valid under the mentioned assumption and, in any case, he does not take into account changes in the composition of capital. The other limitation concerns the fact that the fall in the rate of profit in the circumstances considered here (increase in the value of labour power and, thus, fall in the rate of surplus value) does not express the *tendency* of capitalist production[14]. In general, the fall in the rate of profit occurs simultaneously with the *increase* in the rate of surplus value:

> The tendential fall in the rate of profit is linked with a tendential rise in the rate of surplus value, i.e. in the level of exploitation of labour. Nothing is more absurd, then, than to explain the fall in the rate of profit in terms of a rise in wage rates, even though this too may be an exceptional case. [...] The profit rate does not fall because labour becomes less productive but rather because it becomes more productive (Marx, 1991, p. 347).

Marx further clarifies:

> A falling rate of profit [...] expresses a falling rate of surplus value only if the ratio between the value of the constant capital and the amount of labour-power that this sets in motion remains

[12] In this case, as in the others, it is a *relative* reduction in the number of workers, i.e. for every 100 of capital advanced.
[13] See Marx (1990, p. 660; 1991, p. 157 and 349).
[14] See Marx's critique of Ricardo in this regard in *Theories of Surplus Value*, II (Marx, 1968, p. 438-439).

> unchanged, or if this latter amount has risen in relation to the value of the constant capital (Marx, 1991, p. 349).

In other words, whether the OCC remains constant (as assumed here) or whether it decreases.

Case III: *variation in the value of only the elements of constant capital* (increase in the value of cotton by one third). Under this assumption, the VCC increases in the same proportion as the increase in the value of the elements of constant capital. Due to this increase, and the production method unchanged, the number of workers employed per 100 of capital falls. On the other hand, since wages do not change, the rate of surplus value remains constant. Thus, the reduction in the number of workers explains the fall in the mass of surplus value and the rate of profit: "If the change in value only affects the constant capital, then the variable capital falls in proportion to the constant capital and to the total capital. Although the rate of surplus value remains the same, its amount decreases because the *number of* workers employed falls […]" (Marx, 1968, p. 288, original emphasis).

The effect of this increase in the value of the elements of constant capital on VCC and the rate of profit is similar to that of an increase in OCC:

> If the *value of the variable capital remains the same* and *the method of production remains the same*, and therefore the ratio between the amounts of labour, raw material and machinery employed remains the same, a *change in the value of the constant capital* brings about the same variation in the composition of capital as if the *value of constant capital* had remained the same, but a *greater amount* of capital of unchanged value (*thus* also a *greater capital value*) had been employed, in proportion to the capital laid out in labour. The consequence is necessarily a fall in profit (Marx, 1968, p. 282, original emphasis).

This case highlights the primacy that Marx attributes to changes in the composition of capital in explaining the evolution of the profit rate, which would fall regardless of wage increases (a hypothesis not considered by Ricardo)[15]. It also highlights the importance of changes in the value of a component of constant capital as the raw material for the rate of profit (Marx, 1991, p. 200-205). In fact, "with other things being equal, the rate of profit varies inversely as the value of the raw material" (*ibid*., p. 206).

Case IV: *variation in the value of the elements of constant and variable capital in the same proportion* (increase of each by one third). For a capital of 100, this means maintaining the original proportions of constant capital and variable capital, i.e. the VCC remains the same. However, the quantity of cotton decreases and, since the production method has not changed, the number of workers also decreases. Thus, in the case in question, although the VCC does not change, the number of workers employed per 100 of

[15] "For Ricardo imagines that an increase in the price of raw produce only affects the *rate of profit* in so far as it raises the price of the *means of subsistence* of the worker. And it is true that an increase in the price of *raw produce* can only in this way affect the *rate of surplus value* and consequently *surplus value* itself, *thereby* affecting the rate of profit. But assuming a given *surplus value*, an increase in the price of the 'raw produce from the surface of the earth' would *raise* the value of constant capital in proportion to the variable, would increase the ratio of constant capital to variable and *therefore* reduce the *rate of profit* […]" (Marx, 1968, p. 379, original emphasis).

capital falls. Furthermore – and more importantly –, due to the increase in wages, the rate of surplus value falls. The result is a fall in the rate of profit:

> [...] *variations in the value* of commodities which enter into constant or variable capital – when the *method of production*, or the *physical composition of capital*, remains the same [...] – do *not* bring about a change in the organic composition of the capital[16] if they affect variable and constant capital *in the same proportion* [...]. The rate of profit falls here [...], firstly because the rate of surplus value falls due to the rise in wages, and secondly, because the *number* of workers decreases. (Marx, 1968, p. 288, original emphasis).

Case V: *variation in the value of the elements of constant and variable capital in unequal proportions* (increase of 10% in the value of cotton and 5% in wages)[17]. In this case, the VCC, obviously, can increase or decrease. In the present case, it increases, due to the increase in greater proportion of the elements of constant capital. The number of workers employed per 100 of capital decreases. The rate of surplus value also decreases, due to the increase in wages. Thus, the rate of profit falls due to the combined effect of the fall in the rate of surplus value and the decrease in the number of workers. Although this case is a variant of previous cases, its inclusion is useful in the sense that it draws attention to the fact that changes in labour productivity (in this case a decrease) can occur in unequal proportions in the branches that produce the elements of constant or variable capital, with different effects on the rate of profit.

From the analysis of these cases, the following general observations can be made:

1) In all cases, although there is no change in the production method (in TCC/OCC), the profit rate changes due to the variation in the value of the material elements of capital. Regarding constant capital, Marx writes in *Capital*:

> Fluctuations in the rate of profit that are independent of changes in either the capital's organic components [...] are possible only if the value of the capital advanced [...] rises or falls as a result of an increase or decrease in the labour-time necessary for its reproduction, an increase or decrease that is independent of the capital already in existence. The value of any commodity - and thus also of the commodities which capital consists of – is determined not by the necessary labour-time that it itself contains, but by the *socially* necessary labour-time required for its reproduction. This reproduction may differ from the conditions of its original production by taking place under easier or more difficult circumstances (Marx, 1991, p. 237-238, original emphasis).

The same applies to changes in the value of variable capital, i.e. they are based on changes in the socially necessary labour time for the reproduction of the commodities that enter the habitual consumption of workers; therefore, changes in the value of labour power.

2) Generally, changes in the value of the elements of constant or variable capital result in corresponding changes in VCC (the exception is case IV, in which the variation in the value of the elements occurs in equal proportion). Thus, if the change in value affects only the variable capital or only the constant capital (cases II and III), or if it affects both

[16] According to the understanding we adopted, *value composition of capital* would fit here.

[17] Case V is not included in the table in *Theories of Surplus Value*, II, p. 287, but is suggested by Marx on pages 288-289.

forms of capital, but in unequal proportions (case V), the VCC changes. Such value variations can have the same effect on VCC as a change in TCC/OCC, but should not be confused with the latter phenomenon. In *Theories of Surplus Value*, however, Marx occasionally views changes in value as bringing about change in the *organic* composition, as evidenced by this excerpt: "The change in value – if it affects only constant capital or only variable capital – acts like a change in the organic composition of capital and changes the *relative value* of the component parts of capital, although the method of production remains the same" (Marx, 1968, p. 288, original emphasis)[18]. Given that the production method remains unchanged in this scenario, it seems preferable to depict this as a change in the VCC, rather than the OCC.

3) Variations in the value of the means of production and labour power affect the mass of surplus value. Firstly, these variations in value translate, just like changes in the method of production, into *changes in the number of workers* set in motion by a capital of 100 (as illustrated in Table 1, this occurs in all cases). Secondly, in certain cases, the change in the number of workers is associated with a *change in the rate of surplus value*. This occurs whenever there is a variation in the value of labour power (cases II, IV and V). In summary, variations in the value of elements of constant or variable capital affect the mass of surplus value through their effect on the rate of surplus value and/or on the number of workers employed by a given capital:

> These variations in the value therefore always affect the surplus value itself, whose absolute amount decreases in both cases because either one or both of its two factors fall. In one case it decreases because the number of workers decreases while the rate of surplus value remains the same, in the other, because both the rate decreases and the number of workers employed by a capital of £100 decreases (Marx, 1968, p. 283).

3. The fall in the rate of profit associated with organic changes in the composition of capital

Organic changes in VCC correspond to changes in labour productivity in the branch of production under consideration. Such changes are expressed in changes in the OCC, due to changes in the production method. It is in this type of change that Marx is especially interested in his exposition of the LTFRP in the third volume of *Capital*.

Let us modify the example from *Theories of Surplus Value* presented in the previous section, incorporating the increase in OCC. We will initially assume that the values of the means of production and labour power remain constant (case VI) and then that these values reduce (cases VII to X)[19]. We will only consider cases of reduction in values, since we

[18] Furthermore: "Besides this first aspect [the change in the method of production] of the organic composition of capital, however, a second aspect has to be considered, namely, the change in the *value* of the elements of capital [...] (Marx, 1968, p. 276, original emphasis).

[19] Marx also considers the possibility of variations in opposite directions in the value of capital elements – for example, a decrease in the value of constant capital and an increase in wages (see Marx, 1968, p. 382-384).

consider them theoretically relevant (they are those that are of interest to the LTFRP discussion, regarding the distinction between basic tendency and countertendencies). Table 2, whose first line is identical to that of the previous table and in which the total capital is always equal to 100, brings together these possibilities.

Table 2: Variations in the rate of profit associated with variations in the organic composition of capital and the value of the material elements of capital

	c	Raw material		v	Labour power		OCC	VCC	s	s'	p'
		Unit value	Qty.		Unit value	Qty.					
I	80.00	0.05	1,600	20.00	1.00	20	4.00	4.00	20.00	100.0%	20.0%
VI	84.21	0.05	1,684.21	15.79	1.00	15.79	5.33	5.33	15.79	100.0%	15.8%
VII	84.21	0.046	1,830.66	15.79	0.92	17.16	5.33	5.33	18.54	117.4%	18.5%
VII	85.29	0.05	1,705.76	14.71	0.92	15.99	5.33	5.80	17.27	117.4%	17.3%
IX	83.07	0.046	1,805.87	16.93	1.00	16.93	5.33	4.91	16.93	100.0%	16.9%
X	83.61	0.044	1,900.24	16.39	0.92	17.81	5.33	5.10	19.24	117.4%	19.2%

Source: original work based on Marx (1968, p. 287).

Case VI: *only the OCC increases, while the values of the constant and variable capital elements remain unchanged*. In absolute terms, this increase in the OCC (by a third) means that the same 20 workers now set in motion a constant capital of £106.67; as the variable capital remains equal to £20, the total capital amounts to £126.67. The new value remains the same (£40) and, given the assumption that the value of labour power does not change, the surplus value also remains the same (£20). The rate of profit drops to 15.8%. For a capital of 100, as shown in the table, the composition will be 84.21c + 15.79v. With this relative fall in variable capital, the number of workers decreases to 15.79 and the mass of surplus value produced correspondingly reduces to £15.79. Thus, the fall in the rate of profit is entirely explained by the relative reduction in the number of workers employed.

Since the values of the capital elements remain constant, the modification of the VCC exactly mirrors that of the OCC. Furthermore, as the value of labour power does not change, the rate of surplus value remains constant. These are the assumptions adopted in some LTFRP presentations[20]. In short, this form of articulation of variables links the tendency for a fall in the profit rate to an increase in the OCC, not taking into account, when establishing the tendency, the effect of the increase in labour productivity nor on the elements of constant capital (making them cheaper) nor on those of variable capital (increasing the rate of surplus value).

It is worth noting that the decline in profit rate observed here is comparable to that seen in a scenario where OCC remains constant and only the value of constant capital

[20] See Carcanholo (2013, chap. 4).

elements rises (case III in Table 1)[21]. In other words, the effect on the VCC – and, therefore, on the profit rate – can be the same, whether it comes from an increase in the mass of means of production or their value. As Marx (1991, p. 153) puts it: "We see here again how a variation in constant capital has the same effect on the rate of profit, irrespective of whether this variation is brought about by an increase or decrease in the material components of *c*, or simply by a change in their value".

Case VII: *the OCC increases, while the values of the constant and variable capital elements decrease in the same proportion* (8% drop in the value of cotton and the value of labour power). This case constitutes a variant of case VI, in which the values of the elements of *c* and *v* remain constant, so that, here also, the modification of the VCC reflects exactly the from the OCC. Here, however, the cheapening of the elements of constant and variable capital allows the reduction in the number of workers to be smaller than in that case (in which it is entirely explained by the increase in OCC). And, unlike what happens in case VI, the rate of surplus value, here, increases, thanks to the reduction in the value of labour power. The combination of these factors causes the drop in the profit rate to be smaller than in that case.

Case VIII: *the OCC increases, while the value of the variable capital elements decreases (the value of the constant capital elements remains unchanged)*. Due to the decrease in the value of labour power, the increase in VCC will be greater than that in OCC (reflecting the drop in spending on variable capital). Two factors contribute to the fact that the fall in the rate of profit here is smaller than in case VI (in which there is only an increase in the OCC, without the operation of the countertendency): the fall in the number of workers is smaller (despite the lower expenditure in variable capital) and, mainly, the rate of surplus value increases.

The analysis of this case demonstrates that the increase in the rate of surplus value resulting from the reduction in the value of labour power may not be sufficient to prevent the fall in the rate of profit (as the Ricardian analysis and others inspired in some way by it suppose), given the increase in the OCC that this same process implies[22]. In other words, the increase in the rate of exploitation may not be sufficient to offset the net reduction in the number of workers employed per 100 of capital[23]. This case is, therefore, fundamental to highlight the limitation not only of the Ricardian approach, but also of certain Marxist criticisms of the LTFRP that do not recognize the increase in the rate of surplus value as a simple countertendency[24].

[21] In the numerical example, the drop in the profit rate is the same in both cases.
[22] Due to the assumptions adopted, we do not consider here the increases in the rate of surplus value resulting from the lengthening of the working day and the intensification of labour. In any case, their inclusion would not change the countertendency character that Marx attributes to this factor, given the limits inherent to these methods of increasing surplus labour.
[23] We refer to a net reduction because, while the increase in the OCC leads to a reduction in the number of workers, the decrease in the value of labour power makes it possible to partially compensate for it.
[24] See, for example, Sweezy (1982, chap. 6) and Heinrich (2013).

Case IX: *the OCC increases, while the value of constant capital elements decreases (the value of the variable capital elements remains unchanged)*. As the rate of surplus value remains constant, the fall in the rate of profit is explained here entirely by the reduction in the number of workers. The increase in VCC is, here, lower than that in OCC, since the cheapening of the elements of constant capital partially neutralize the increase in the latter. Thus, the drop in the number of workers determined by the increase in the OCC is partially compensated by the cheapening of constant capital (with this cheapening, a larger portion of the capital remains to be applied in its variable part). This implies the employment of a greater number of workers and, therefore, greater production of surplus value and a smaller fall in the rate of profit than in case VI (in which such countertendency is not considered).

These are the assumptions initially adopted by Marx in his exposition of the LTFRP in chapter 13 of volume III of *Capital*: "This is how the same rate of surplus value would express itself under the same degree of labour exploitation in a falling rate of profit, because the material growth of the constant capital implies also a growth – *albeit not in the same proportion* – in its value [...]" (Marx, 1999, p. 153, emphasis added)[25]. In fact, there is a "growing volume of constant capital – although this expresses only at a certain remove the growth in the actual mass of use-values which the constant capital consists of in material terms [...]" (Marx, 1991, p. 318)[26]. In theory, the value of constant capital could remain unchanged or decrease (the same occurring with VCC), depending on the extent of reduction in the value of the means of production. In other words, such a reduction in value could completely neutralize the increase in the mass of means of production[27]. However, Marx sees this possibility as an exception: "In isolated cases the mass of the elements of constant capital may even increase, while its value remains the same, or falls" (Marx, 1999, p. 167)[28]. In general, the growth in the mass of means of production is accompanied by the *growth* in their value, although to a lesser extent than that:

> With the growth in the proportion of constant to variable capital, grows also the productivity of labour [...]. As a result of this increasing productivity of labour, however, a part of the existing constant capital is continuously depreciated in value, for its value depends not on the labour-time that it cost originally, but on the labour-time with which it can be reproduced, and this is continuously diminishing as the productivity of labour grows. Although, therefore, the value of the constant capital does not increase in proportion to its amount, *it increases nevertheless, because its amount increases even more rapidly than its value falls*. (Marx, 1968, p. 415-416, emphasis added).

Marx (1991, p. 177) also says:

[25] This quote is taken from the online version of *Capital*, volume III, published by International Publishers, New York.

[26] This way of exposing the LTFRP – assuming a constant rate of surplus value and decreasing values of the elements of constant capital – seems to be the one adopted by Foley (1989, chap. 8).

[27] "Here one change may neutralize the other, for example, when the amount of constant capital grows while its value falls or remains the same […]" (Marx, 1968, p. 381).

[28] This quote is taken from the online version of *Capital*, volume III, published by International Publishers, New York.

> Of course the relative cheapening of the means of production does not exclude a growth in their absolute value; for the absolute scale on which they are applied increases extraordinarily with the development of labour productivity and the growing scale of production that accompanies it.

Thus, the situation depicted in the present case (growth in VCC despite the cheapening of the elements of constant capital) is the one that underlies the tendency of the profit rate to fall, while the alternative (constancy or even decrease in VCC) corresponds to the operation of the countertendency[29].

The question raised in case VIII is that of the limits of the rise in the rate of surplus value as a countertendency to the fall in the rate of profit. In contrast, the question that the present case raises is that of the limits of the cheapening of constant capital in the same sense. At most, this factor can have a temporary effect on capital profitability.

Case X: *the OCC increases, while the values of the elements of constant and variable capital fall in unequal proportions* (a 12% reduction in the value of cotton and 8% in the value of labour power). The increase in VCC will be less than that in OCC, provided that, as is the case here, there is a greater increase in labour productivity in the production of means of production, resulting in a greater fall in the value of these than in the value of labour power. The fall in the rate of profit is smaller than in previous situations (cases VI to IX), due to the combined action of the increase in the rate of surplus value with a smaller reduction in the number of workers. Nevertheless, *the downward tendency in the rate of profit will prevail*, since the increase in the rate of surplus value is not capable of permanently compensating for the increase in VCC. In fact, these are the circumstances considered by Marx in much of his exposition of the LTFRP. More specifically, the basic tendency is established based on the tendency for the OCC to rise, even assuming (i) the cheapening of the elements of constant capital and (ii) the cheapening of the elements of variable capital (and, thus, the increase in the rate of surplus value)[30].

Two considerations must be made regarding cases VI to X:

1) In all these cases, the fall in the profit rate is a consequence of an organic change in VCC. This change may or may not be associated with a variation (here, reduction) in the value of the material elements of capital. This highlights the need to properly distinguish the concepts of OCC and VCC. It is true that in cases VI and VII the two concepts can be used interchangeably. However, in the remaining three cases, it is essential to distinguish between them, as the concept of VCC is the one that allows us to consider the operation of the countertendencies.

2) The evolution of the profit rate depends on how the combination of the two movements – organic changes and value variations – affects the number of workers

[29] For a different point of view, which emphasizes (in our opinion, unduly) the ability of the cheapening of the elements of constant capital to counteract the tendency for the OCC to increase, and thus calls into question the status of countertendency attributed by Marx to this factor, see Sweezy (1982, chap. 6). See similar criticism by Harvey (2013, chap. 6) to the tendency for VCC to rise.

[30] The rate of surplus value is only assumed to be constant at the beginning of chapter 13 of volume III of *Capital*.

employed. If the increase in the OCC is accompanied by a reduction in the value of one or both elements of capital (as in cases VII to X), the reduction in the number of workers that the first movement (increase in the OCC) implies may be to some extent counteracted by the increase in this number resulting from the second movement, favoring the profit rate, although not always being able to prevent its fall.

4. Conclusion

The issues discussed here have as their backdrop Marx's critique of the limitations of Ricardian analysis regarding the evolution of the rate of profit. Due to the assumptions he establishes, Ricardo maintains that variations in the profit rate are necessarily due to inverse variations in wages. Against this oversimplified view of the problem, Marx shows that it is necessary to consider the effect of changes in the *composition of capital* on the rate of profit, more than changes in wages (and therefore, in the rate of surplus value). Thus, even if the wage does not change (and, with it, the rate of surplus value), the rate of profit can fall simply because VCC increases. This may occur either due to a change in the production method (increase in TCC/OCC) or, assuming the production method is constant, due to an increase in the value of the constant capital elements[31].

Within the wide range of possibilities for variation in the rate of profit that Marx considers, it is clear that it can fall due to changes in VCC associated with variation in value (increase in the value of the means of production or means of subsistence). In fact, the fall in the rate of profit thus produced may be of identical proportion to that caused by organic changes. However, it is important to note two things: (i) the change in VCC, even when it stems from a variation in value, originates from a change (in this case, a fall) in labour productivity in the branches that supply elements of constant capital or that are decisive in determining the value of labour power; and (ii) the change in the VCC arising from a variation in value, in the same way as those resulting from a change in the OCC, translates into a change in the *number of workers* set in motion by a given capital and, therefore, in the mass of surplus value.

On the other hand, although the profit rate may fall as a result of changes in VCC caused by variations in the value of capital elements, this must be seen as a secondary phenomenon compared to the decline produced by organic changes in that composition. This is due to the fact that the tendency to change production methods, towards increasing labour productivity and, therefore, TCC/OCC, belongs to the "nature of the capitalist mode of production itself" (Marx, 1991, p. 319). Meanwhile, phenomena such as the increase in the value of means of production or wages, if they are not reduced to mere fluctuations in market prices, presuppose a drop in labour productivity. While these phenomena may have

[31] In fact, the rate of profit can fall, as we have seen, even in the event of a fall in wages (and an increase in the rate of surplus value). Marx also shows that an increase in wages could be counteracted by a simultaneous fall in constant capital, which would allow the same capital to employ more workers, so as to *raise* the rate of profit (see Marx, 1968, p. 383-384).

practical importance, from a theoretical standpoint, their significance is diminished. In fact, the tendency for the rate of profit to fall is formulated by Marx under the assumption (which is less favorable to him) of *rising* of labour productivity, both in the branches of production of means of production and in those of production of means of subsistence; therefore, under the assumption of cheapening of constant capital and increasing the rate of surplus value.

Assuming, therefore, an increase in labour productivity in those sectors (therefore, a reduction in their values), Marx proceeds to a *hierarchization* of the factors underlying variations in VCC. This serves as the basis for distinguish between tendency and countertendencies to the fall in the rate of profit. Thus, reductions in the value of the means of production (cheapening of constant capital) and/or of the means of subsistence (increase in relative surplus value) must be considered as mitigating circumstances for the fall in the rate of profit, while the tendency to fall is established based on the upward tendency of the OCC. The scope of those factors to inhibit or delay the fall in the general rate of profit is necessarily limited.

It is important to highlight that the manner in which the components of the VCC are articulated has resulted in different ways of exposing the LTFRP. Such expositions differ in terms of the assumptions adopted, whether in relation to the rate of surplus value or in relation to the composition of capital. The discussion carried out here makes explicit the role of the different elements of the VCC in the evolution of the profit rate – allowing the concepts of VCC and OCC to be distinguished – and can thus serve as a basis for evaluating the consistency of the assumptions adopted in such expositions of the law.

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