

THE MONETARY EXPRESSION OF LABOUR: MARX'S TWOFOLD MEASURE OF VALUE*

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ALEJANDRO RAMOS M.

ABSTRACT

Recent articles have begun to break down the traditional approach to the transformation of values into production prices. Eliminating the dualistic conception that values and prices are two completely separate spheres, some authors have shown that Marx's results are correct. Yet, a fundamental link has not been elucidated: the relation between the magnitudes measured in social labour-time and those measured in money. This article tackles this problem by following a non-dualistic approach. The monetary expression of labour (MEL) is defined as the quantity of money in which one unit of socially necessary labour time is objectified. The MEL is grounded in the categories of substance and form of value; in fact, it is the twofold relation between the extrinsic and the intrinsic measures of value. The MEL is calculated under the general condition that prices = prices of production, an assumption that neither Marx nor the literature explicitly consider. A general method to determine the past and the total labour contained in the commodities is presented. The resulting MEL is uniform and endogenously determined by the reproduction process. Moreover, it is argued that the interpretations of the MEL as "value of money" and as the quotient between the sum of wages and profits and living labour are correct only in particular cases.

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* This article deals with some issues raised during the Editorial Conference of the book MARX AND NON-EQUILIBRIUM ECONOMICS (Amsterdam, May 24-27, 1994). Guglielmo Carchedi, Werner de Haan, Alan Freeman, Andrew Kliman, Adolfo Rodríguez, Alfredo Saad-Filho and the author of this article attended this meeting. Discussions and the reading of drafts and articles by these authors have been particularly important to develop this paper. However, the usual caveat applies.

[Ricardo] does not grasp the connection of [...] labour with money or that it must assume the form of money.

Theories, II, p. 164

There is also a confusion [of ideas]: in so far as [Smith] confuses the measure of value as the immanent measure which at the same time forms the substance of value, with the measure of value in the sense that money is called a measure of value.

Theories, I, p. 150

INTRODUCTION

At the beginning of this century, Tugan-Baranowsky and Bortkiewicz¹ framed the orthodox reading of Marx's theory of the price-value relation, creating the so-called transformation problem. The main feature of this interpretation is its methodological dualism, i.e. the conception that values and prices are separate spheres linked only externally². On this basis, Bortkiewicz attempts to demonstrate that the double equality maintained by Marx in Vol. III is erroneous. As an immense literature shows, this result would seem to weaken the foundations of Marx's theoretical construction.

However, in recent years a set of articles has begun to show the failure of the orthodox approach to the transformation procedure³. From different points of view, it has shown how it is possible to obtain Marx's double equality. These contributions propose a reading of the transformation different from that imposed as the common-sense paradigm for many years.

¹Tugan-Baranowsky [1905], Bortkiewicz [1906], [1907a], [1907b]. An ignored author, Komorsynski [1897], contributed decisively to this conception. See, Ramos and Rodríguez [1995].

²On dualism, see Ramos [1991] and Ramos and Rodríguez [1995].

³Wolff, Roberts and Callari [1982], [1984], Carchedi [1984], Roberts [1987], Kliman and McGlone [1988], Giussani [1991], Ramos [1991], Freeman [1993], Moseley [1993], Rodríguez [1994]. Moseley (p. 171) mentions Mage [1963, Appendix A] and Mattick Jr. [1981] as supporters of this conception. See also the contributions by Freeman, McGlone and Kliman, Ramos and Rodríguez, Rodríguez, Carchedi and de Haan in Freeman and Carchedi (Eds.) [1995].

This article deals with a problem which has been scarcely discussed by the authors of the emergent non-dualistic approach. In effect, although it has been demonstrated that Marx's double equality is correct, a fundamental link has not been elucidated: the relation between the magnitudes measured in social labour-time and those measured in money⁴. In particular, there exists no systematic interpretation within the non-dualistic approach, of the many examples spread throughout in Marx's main writings in which he directly relates quantities measured in terms of labour and quantities measured in terms of money.

The first section of this article presents an interpretation of the meaning of Marx's examples. They are illustrations of the *monetary expression of labour* (MEL)⁵, a concept grounded in the category of value understood as the unity of substance and form, i.e. as the unity of social labour and money. On this basis, the fact that value has not a unilateral measure but a twofold measure can be explained: value is *simultaneously* measured in terms of social labour and money. The quantitative relation between these two aspects is the MEL.

There are two attempts to generalise the MEL: Firstly, it has been adduced that this coefficient is equal to the inverse of the so-called "value of money", i.e. the amount of social labour contained in one unit of gold. Secondly, some authors maintain that the MEL is equal to the quotient between the sum

⁴A pioneer non-dualistic contribution (Wolff, Roberts and Callari [1982], [1984]) neglects the problem, considering that Marx's measure of value is limited to labour-time [1982, pp. 577-9]. Kliman and McGlone [1988], [1995] acknowledge that there is a twofold measure: "We assume that the value of money equals 1; every number in our illustration therefore signifies both a price and an amount of value" [1988, p. 72]. However, the authors do not deal systematically with the problem and, in this respect, they follow the dualistic tradition assuming that the relation between the two measures is given by the "value of money". Rodríguez [1994] and Carchedi and de Haan [1995] propose a generalisation which will be critically discussed in section 3. See also Freeman [1994a], [1994b].

⁵Aglietta [1979] proposes this designation: "the monetary expression of one hour of labour indicates to how many monetary units is equivalent to the quantity of abstract labour, the homogeneous element of the total social labour" (p. 25). This designation correctly emphasises the meaning of this relation. See also De Vroey [1981, p. 190-1]. As will be shown below, the usual designation "value of money" is erroneous. To call this relation "monetary expression of value" is imprecise because it reduces value to its substance, labour. In his examples, Marx relates magnitudes measured in *money* with magnitudes measured in *social labour*.

of wages and profits and the living labour⁶. In this article it will be shown that both interpretations are not generalisations of the MEL because they implicitly assume that all capitals have the same composition; in other words, that the transformation of values into production prices does not change the method to calculate the MEL. In both attempts the MEL is conceived as a coefficient determined previously to the calculation either the money magnitudes or the social labour magnitudes.

The second section presents a general method to calculate the MEL. However, it is assumed simple reproduction, no fixed capital and no technical change. After determining values and production prices by applying a non-dualistic approach, a system of equations is presented which permits one to calculate the labour congealed in the commodities. Based on the results of this system, the MEL is generalised and the composition of social total labour is analysed. Additionally, the rate of surplus-value and the rate of profit are calculated both in terms of money and in terms of social labour.

The last section critically discusses other attempts to generalise the MEL.

1. WHAT IS THE MONETARY EXPRESSION OF LABOUR?

In several passages Marx establishes a direct relation between quantities of socially necessary labour-time and their monetary expression. Frequently, this relation is presented between the *value-product* and the *living labour*. For instance, he says:

The working day of 12 hours is represented in a monetary value of, for example, 6 shillings.⁷

[o]n our assumption, the total social working day is represented by a money value of 3000.⁸

⁶Bortkiewicz [1907a], p. 15-6 and Foley [1982]. These approaches will be discussed in section 3. Bortkiewicz sets out the dualistic traditional interpretation of this relation. According to him, Marx's examples are analogous to the conversion coefficients between physical units of measurement, for instance 1 lb. = 460 g. Sweezy [1942, p. 131] develops this vision, calling this coefficient the "value of money". Foley and other authors maintain the second approach.

⁷*Capital I*, p. 676.

⁸*Capital II*, p. 502.

In some passages, Marx also sets a relation between *constant capital* and *past labour*, between *variable capital* and *necessary labour* and between *surplus-value* and *surplus-labour*:

a machine, or other means of production ... cost £150 or, say, 500 days of labour.⁹

If, for example, the necessary labour amounts to 6 hours a day, expressed in a quantity of gold equal to 3 shillings, then 3 shillings is the daily value of one labour-power, or the value of the capital advanced to buy one labour-power.¹⁰

the product of unpaid labour embodied in the 165 quarters amounts to 15 quarters, which equals £30, representing 30 labour-weeks.¹¹

Finally, Marx also relates the *whole commodity value* with the *total social labour* materialised in it:

five days of labour are objectified in ... 20 lb. of yarn; four days are due to the cotton and the lost steel of the spindle, the remaining day has been absorbed by the cotton during the spinning process. Expressed in gold the labour of five days is 30 shillings.¹²

In this article, this relation is defined as the *quantity of money in which one unit of socially necessary labour-time is objectified* or as the *monetary expression or representation of one unit of socially necessary labour-time*; in brief, it is called the *monetary expression of labour* (MEL). The inverse of the MEL defines the quantity of social labour-time *represented* by one unit of money.

It is obvious that this relation has an enormous importance in Marx's theory. It links magnitudes measured in terms of social labour with those measured in monetary terms. In fact, in his examples Marx passes smoothly from one type of magnitude to the other¹³.

⁹*Capital* I, p. 314. In *Theories*, II, pp. 474-5 there is an interesting example where Marx relates constant capital and past labour.

¹⁰*Capital* I, p. 417.

¹¹*Theories*, II, p. 46.

¹²*Capital* I, p. 301.

¹³Marx presents a great deal of examples. In *Theories* III, p. 225, there is a puzzling case: In a table the "labour added" is measured in £.

Notwithstanding this, Marx's presentation of this concept is not systematic. On a first reading, one may think that this relation is a mere auxiliary tool raised to illustrate other aspects of the theory. Also commentators –perhaps induced by this textual evidence– present the MEL as an auxiliary relation which is almost arbitrarily determined. There is neither a complete presentation of how this relation is determined by the reproduction process of capital as a whole, nor a clear and uniform designation for it. It is convenient, thus, to ask: What is the meaning of this relation in Marx's theory of the price-value relation? How is it related with other, more completely presented categories? The following sections present a hypothesis of the meaning of the MEL.

1.1 VALUE AS THE UNITY OF SUBSTANCE AND FORM

At the beginning of *Capital*, Marx affirms that the commodity has two aspects: use-value and value. Use-value is the *natural* aspect of the commodity in opposition to its *social* aspect, value.

After this, Marx makes an additional distinction within the social aspect of the commodity, i.e. in its value. He argues that value has a substance (*Wertschance*) and a form (*Wertform*)¹⁴. As crystallisations of a specific substance, commodities are values. This substance is abstract social labour. Yet, given the atomised structure of commodity production, this social substance cannot be directly expressed. It needs a *form* which, in the simplest level of analysis, is the use-value of any other commodity. Further analysis shows that, eventually, the function of representing social labour is isolated in one use-value: gold; the analysis of value-form culminates in the money-form of value.

The category of value analytically covers, then, both the substance and the form of value. In fact, it is the category framed by Marx to understand the fundamental link in capitalist society between social labour and money. Value is, simultaneously, social labour and money. Therefore, it is not limited to one or another of these aspects¹⁵.

¹⁴German words show more clearly that the substance and the form of value are inseparable aspects of value.

¹⁵"Value is at the same time the exponent of the relation in which the commodity is exchanged with other commodities, as well as the exponent of the relation in which it has already been exchanged with other commodities (materialised labour time) in production." "Although exchange value is = to the relative labour time materialised in products, money, for its part, is =

Let us suppose that 4 hours of socially necessary labour are used in commodity A and that A is exchanged for 2 units of commodity B. The 4 hours employed in A are the substance of its value but, in principle, they are only 4 hours of *concrete and individual* labour. Actually, their effective objectification as abstract social labour requires that A be a use-value produced under average conditions. This realisation can only happen through circulation which is, thus, a necessary phase in social reproduction. Therefore, the substance of value must assume a form, in this case 2B. When this form is the money form, the substance of value is actually realised and expressed as a definite amount of gold. Money counts as the form of existence of value: 4 hours of social labour exist and are expressed as, for example, 4 ounces of gold.

Usually, the literature reads the category of value as a unilateral concept. Value is not understood as a complex concept—unity of substance and form— but as reduced to its substance. For example,

Value is labor, its measure is labor time.¹⁶

Values are quantities of labour and have nothing to do with the money prices as such.¹⁷

The value of a commodity consisted of the labour embodied in the means of production that were used up in the production of the commodity (dead labour) and the labour expended in the current production period (living labour).¹⁸

In this approach, value is conceived only as "labour". Marx, however, clearly distinguishes between labour and value: "human labour creates value but is not itself value. It becomes value in its coagulated state, in objective form."¹⁹ Furthermore, Marx had already criticised Ricardo for this:

Ricardo starts out from the determination of the relative values ... of commodities by "the *quantity of labour*". ... The character of this "labour" is not further examined. If two commodities are equivalents ... then it is obvious that regarded as exchange-values, their

to the exchange value of commodities, separated from their substance." *Grundrisse*, pp. 140-1 and p. 160.

¹⁶Duménil [1983], p. 441.

¹⁷Mandel [1981], p. 27.

¹⁸Hunt and Glick [1987], p. 356.

¹⁹*Capital* I, p. 142.

substance must be the same. Their substance is labour. That is why they are "values". ... But *Ricardo does not examine* the form—the peculiar characteristic of labour that creates exchange-value or manifests itself in exchange-values—the *nature* of this labour. Hence he does not grasp the connection of *this labour* with *money* or that it must assume the form of *money*. Hence he completely fails to grasp the connection between the determination of the exchange-value of the commodity by labour-time and the fact that the development of commodities necessarily leads to the formation of money.²⁰

The main defect of Ricardo's theory of value is, thus, the incomprehension of the connection between the substance and the form of value, of the link between *social labour* and *money* in capitalist society. In particular, Ricardo does not understand that value has a specific substance—abstract social labour—which must be expressed through a money-form. Instead, Marx conceives value as the unity of substance and form. The analysis of value as unity of substance and form—i.e. the superseding of Ricardian one-sided approach in which value is "labour"—permits Marx to discover the specific character of value-forming labour, formulating the category of *abstract labour*, the substance of value.

Abstract labour arises from the reproduction of capital as a whole, in which circulation—competition and price formation—is a necessary phase of mediation. The fact that the substance of value must be expressed as money implies that it is not "labour", but abstract labour; this aspect of labour arises from the equalisation of commodities against money. Instead, in the Ricardian interpretation of Marx's theory, "labour" and value (presented as the same thing) are conceived as one-sided categories, unilaterally determined in production.

The substance of value can only be expressed, therefore, through its opposed aspect, namely the use-value, the commodity's natural aspect; substance must assume a form. Jointly, substance and form constitute the value nature of the commodity. Value is not only substance and, thus, it is not *directly* reducible to labour-time.

1.2 THE MEL IS THE RELATION BETWEEN THE EXTRINSIC AND THE INTRINSIC MEASURES OF VALUE

Interpreting value as the unity of substance and form makes it possible to comprehend Marx's conception of the measure of

²⁰*Theories*, II, p. 168.

value as a twofold measure. In *Capital* Vol. I, Ch. 1, Marx says that the substance of value has a quantitative determination, the *magnitude of value*. He then asks how is it measured:

How, then, is the magnitude of this value to be measured? By means of the quantity of the 'value-forming substance', the labour, contained in the article. This quantity is measured by its duration, and the labour-time is itself measured on the particular scale of hours, days etc.²¹

Labour which constitutes the measure of the magnitude of value is the socially necessary labour, i.e. the labour-time

required to produce any use-value under the conditions of production normal for a given society and with the average degree of skill and intensity of labour prevalent in that society.²²

Yet, social labour is only one facet of the measure of value. Criticising Gray—who maintained that value can be directly measured in labour—Marx asks:

Since labour-time is the intrinsic measure of value, why use another extraneous standard as well? Why is exchange-value transformed into price? Why is the value of all commodities computed in terms of an exclusive commodity, which thus becomes the adequate expression of exchange-value, i.e. money?²³

Since in commodity production labour is not directly socialised, commodity values cannot be measured in terms of labour without any mediation. Value must assume a "second" measure, an external measure, namely, money. Therefore,

money as a measure of value is the necessary form of appearance of the measure of value which is immanent in commodities, namely labour-time.²⁴

Although labour is the immanent measure of value—i.e. an internal or intrinsic measure—money is also a measure, but an extrinsic, external measure. It is clear that this twofold measure is founded on the polarity of value itself, on the

²¹*Capital* I, p. 129.

²²*Capital* I, p. 129.

²³*Contribution*, p. 84. On Marx's critique of Gray, see Saad-Filho's article [1993].

²⁴*Capital*, I, p. 188.

twofold nature of value as substance and form, aspects which cannot be separated.

Put rigorously, social labour and money are *not two mutually exclusive measures* of value but two aspects of the same measure. Value is *simultaneously* measured in both social labour and money. In this sense, value has a twofold measure: the MEL. The MEL is a result of the total social labour spent in production and the amount of money in which this labour is objectified as value and realised as value-form. The MEL is, hence, the amount of money in which one unit of socially necessary labour-time is objectified.

Since the MEL is a twofold measure, it is not analogous to the physical units of measurement. The relation between social labour and money is not the same as that existing, for instance, between pounds and kilograms. A certain mass can be expressed *either* in pounds or in kilograms; value, however, must be *simultaneously* expressed in social labour *and* money. This is the importance of the determination of the MEL.

In Marx's examples, the MEL is given as the result of the capital reproduction process. Usually, these examples assume that the composition of capitals is the same and that prices = values²⁵. The following section shows how is the MEL calculate when values has been transformed into prices of production.

2. A PROPOSAL TO GENERALISE THE MONETARY EXPRESSION OF LABOUR

From now on, commodities are aggregated in three departments and their prices and the MEL are calculated as the result of the reproduction of social capital. Simple reproduction, no fixed capital, and no technical change are supposed throughout.

The calculation of the MEL has three steps. Firstly, the problem of the determination of the quantity of social labour contained in the commodities (the substance of value) is presented. After this, commodity prices (the money-form of value) are calculated. Lastly, the MEL is determined and its main properties are discussed.

2.1 THE SUBSTANCE OF VALUE: HOW IS THE LIVING AND THE PAST LABOUR CONTAINED IN COMMODITIES DETERMINED?

²⁵In *Theories II*, pp. 388-90 there is an exception. Marx assumes that 4 individual capitals in a branch have different compositions and that all commodities are exchanged at their prices of production. However, the branch as a whole has an average composition.

2.1.1 THE PROBLEM

Let us assume the following physical scheme of reproduction:

Scheme of Reproduction #1				
(in thousands of physical units)				
	a_{1j}	a_{2j}		Q_j
I	67	80	→	96
II	23	30	→	120
III	6	10	→	100
Σ	96	120		

Social capital consists of 3 departments: means of production, wage-goods and gold. The last is both the luxury-good and the means of circulation. The 3 departments have different technical compositions.

Scheme #1 shows the conditions of capital reproduction in terms of the amounts of use-values produced and consumed during a year. The amount of commodity i consumed by department j is expressed as a_{ij} , and the total amount produced and consumed of commodity j is Q_j . All the figures are expressed in *thousands* of conventional units (for instance, x thousand machines, y thousand tons of wheat, z thousand ounces of gold).

These use-values are the objectification of social labour; as such, they are commodities. It has already been said that value has a twofold measure. The *substance* of value (social labour) is the internal measure of value. Yet, this substance cannot be directly expressed in the process of exchange. It must be expressed through a money-form, namely gold, the extrinsic measure of value. The MEL is the relation between the two quantitative determinations of value. The MEL is the amount of money in which one unit of social labour is represented. It is a relation between the form and the substance of value, between the two aspects of the measure of value. The calculation of these two quantitative aspects of value and their relation –the MEL– will be illustrated with Scheme #1.

Firstly, in order to determine the quantity of "value-forming substance" (social labour-time), it is necessary to know the quantity of living labour exploited by capital (LL). It can be assumed that, during a year, the social capital employs 180,000 working days (w.d.) of simple and average-intensity labour. This defines a real wage $W = Q_2/LL = 120/180 = 2/3$ wage-good per w.d.

Given W , it is easy to redefine the column corresponding to wage-goods in terms of living labour. In effect, the living labour exploited by department j is $LL_j = a_{2j}/W$.

Scheme of Reproduction #2			
(in thousands of physical units and of w.d.)			
	a_{1j}	$LL_j = a_{2j}/W$	Q_j
I	67	120	→ 96
II	23	45	→ 120
III	6	15	→ 100
Σ	96	180	

In Scheme #2 the means of production are still expressed in terms of use-values while the wage-goods are converted into amounts of living labour, LL .

However, the total objectified social labour consists of living labour *and past labour* (PL). The *main problem* in calculating the MEL *is to determine the quantity of past labour* contained in the means of production. In order to tackle this problem, it is necessary to present some general relations between *social labour* and *value*.

2.1.2 RELATIONS BETWEEN SOCIAL LABOUR AND VALUE

According to Marx, the total value of commodities is the crystallisation of the total social labour:

$$\sum OSL_j \rightarrow \sum VA_j = OSL_1 + OSL_2 + OSL_3 \rightarrow VA_1 + VA_2 + VA_3 \quad [1.]$$

(OSL_j stands for the social labour objectified in commodity j expressed in social working days (w.d.); it corresponds to the multiplication of Q_j by l_j , the unit social labour contained in j . VA_j stands for the value of j expressed in money (gold) units; it corresponds to Q_j multiplied by v_j , the unit value of j .)

The objectification of social labour as value is carried out under three concrete forms: production of means of production, of wage-goods and of gold. However, social labour is the substance of value insofar as it is abstract labour, i.e. a homogeneous substance in which the kind of concrete labour carried out is irrelevant. Moreover, as it will be seen, it is also irrelevant whether labour is performed in the present year or comes from past cycles. As substance of value, a *past* working day should count exactly the same as a *present*, living working day.

There are some fundamental proportions between the fractions of social labour and the different concrete forms in which this labour is congealed as value:

Firstly, there is a *general* proportion between social labour and value which can be expressed as follows: *Total social labour* is broken down into the same proportions in which the *social production* is divided according to the value of its components²⁶. If, for instance, the value of gold (VA_3) represents a proportion ψ_3 of total value, then, the social labour objectified in gold (OSL_3) also amounts ψ_3 of total social labour. In general, this proportionality is:

$$\psi_j = \frac{OSL_j}{\sum OSL_j} = \frac{VA_j}{\sum VA_j} \quad [2.]$$

From general relation [2.], two particular proportions – involving specific aggregates of social labour and value– can be deduced. One concerns to the relation between past and living labour and the other to the composition of living labour:

(i) Total social labour is composed by *past labour* (PL) and *living labour* (LL). Although the value of each *individual* commodity is formed by past and living labour, from the social point of view, *past labour* corresponds to the social labour crystallised as value in the consumed means of production and *living labour* corresponds to the social labour congealed as value in the means of consumption namely, wage-goods and gold. Between past and living labour there is the following proportion:

$$\mu = \frac{PL}{LL} = \frac{OSL_1}{OSL_2 + OSL_3} = \frac{VA_1}{VA_2 + VA_3} = \frac{VA_1}{VP} \quad [3.]$$

VA_1 is the value of the consumed means of production, a magnitude which corresponds to the objectification of past labour (OSL_1). On the other hand, the sum of the value of wage-goods and the value of gold (VA_2+VA_3) is the *value-product* (VP),

²⁶“The value of a commodity is related to the value of any other commodity as the labour-time necessary for the production of the one is related to the labour-time necessary for the production of the other.” *Capital* I, p. 130. “What matters in the determination of value is the overall social labour-time, the total amount of labour which society has at its disposal and whose relative absorption by the different products determines, as it were, their respective social weight.” *Capital* III, p. 1022; emphasis added.

which corresponds to the objectification of living labour ($OSL_2 + OSL_3$). It is important to stress that value-product is equal to the *value* crystallised in the material elements of revenue.

Equation [3.] shows that the same proportion exists between the past and living labour, one the one hand, and between the *value* objectified in the means of production and the *value-product*, on the other.

It has been already said that labour OSL_j is expressed in social working days and values VA_j –which correspond to the actual realisation of this substance through the price-form– are expressed in money units (ounces of gold); μ is a pure number.

Now then, it is clear that μ permits one to determine the amount of past labour because

$$PL = \mu LL = \frac{VA_1}{VA_2 + VA_3} LL \quad [4.]$$

(ii) Living labour can be broken down into two components: One part corresponds to the social labour embedded as value in wage-goods (OSL_2) and the other corresponds to social labour embodied as value in gold (OSL_3). The proportion ω_j ($j = 2, 3$) between each component and total living labour is the same existing between the *value* of the respective commodity and *value-product*:

$$\omega_j = \frac{OSL_j}{LL} = \frac{OSL_j}{OSL_2 + OSL_3} = \frac{VA_j}{VP} = \frac{VA_j}{VA_2 + VA_3} \quad j = 2, 3 \quad [5.]$$

Relations represented in equations [2.], [3.], [5.] and the definition of value-product (*value* objectified in the material elements of revenue) are *general*, i.e. it is irrelevant for them whether or not capital composition is uniform and whether or not prices = values.

If all capitals have the same composition and prices = values, OSL_2 corresponds with *necessary labour* and OSL_3 corresponds with *surplus-labour*. However, as it will be shown, this is not the general case.

Now then, thanks to the above-presented relations, the problem set in subsection 2.1.1 can be reformulated. Through [4.] the first column of Scheme #2 could be expressed in terms of past labour. In effect, once PL is known, it could be proportionally distributed according to the consumption of means

of production by the three departments. On the other hand, through [5.] it is possible to divide living labour, showing the amounts of social labour objectified as value in wage-goods and in gold.

However, these relations indicate that the quantity of past labour contained in the commodities, as well as the composition of living labour, are not independent of the *value objectified* by the three departments, figures which are expressed in ounces of gold. In particular, it is clear that past labour was crystallised in a past year and, thus, it is affected by the amount in which this *substance* was actually realised as a *money-form*.

Therefore, in order to determine these magnitudes, it is necessary to know commodity prices. When capitals have different compositions, prices tend to be equal to production prices and differ from values. *Value* is the amount of money representing the social labour *contained* in commodities and *production price* is the amount of money representing the social labour *appropriated* by capitalists. The following subsection shows how both production prices and values are determined.

2.2 THE FORM OF VALUE: DETERMINATION OF COMMODITY PRICES

The unit production prices P_1^p are determined by the following system of equations:

$$\begin{aligned} Q_1 P_1^p &= (a_{11} P_1^p + a_{21} P_2^p)(1 + \pi) \\ Q_2 P_2^p &= (a_{12} P_1^p + a_{22} P_2^p)(1 + \pi) \\ Q_3 P_3^p &= (a_{13} P_1^p + a_{23} P_2^p)(1 + \pi) \end{aligned} \quad [6.]$$

where π is defined as

$$\pi = \frac{Q_3 P_3^p}{Q_1 P_1^p + Q_2 P_2^p} \quad [7.]$$

The equations of the basic sectors (I+II) can be divided on both sides by Q_j order to express them using a matrix of Leontief coefficients $q_{ij} = a_{ij}/Q_j$:

$$\mathbf{P}^p = \mathbf{Qp}^p(1 + \pi)$$

$$\begin{bmatrix} P_1^p \\ P_2^p \end{bmatrix} = \begin{bmatrix} q_{11} & q_{21} \\ q_{12} & q_{22} \end{bmatrix} \begin{bmatrix} P_1^p \\ P_2^p \end{bmatrix} (1 + \pi) \quad [6. ']$$

where $(1+\pi)$ is a scalar. It is widely known that the maximum eigenvalue of matrix \mathbf{Q} equals $1/(1+\pi)$ and that its eigenvector is equal to the vector of production prices \mathbf{P}^p . Once π , P_1^p and P_2^p are obtained, they are replaced in III's equation. Then, the complete vector of prices can be divided by P_3^p , so that $P_3^p = 1$, expressing prices in gold-units.

The rate of surplus-value σ is defined as follows:

$$\sigma = \frac{Q_3}{Q_2 P_2^p} \quad [8.]$$

The unit values v_j can be obtained by substitution in the following system:

$$\begin{aligned} v_1 &= [a_{11}P_1^p + a_{21}P_2^p(1+\sigma)]/Q_1 \\ 0v_2 &= [a_{12}P_1^p + a_{22}P_2^p(1+\sigma)]/Q_2 \\ v_3 &= [a_{13}P_1^p + a_{23}P_2^p(1+\sigma)]/Q_3 \end{aligned} \quad [9.]$$

With the data of Scheme #1, the following matrix of Leontief coefficients is obtained:

$$\begin{bmatrix} q_{11} & q_{21} \\ q_{12} & q_{22} \end{bmatrix} = \begin{bmatrix} 0.698 & 0.833 \\ 0.192 & 0.250 \end{bmatrix}$$

The maximum eigenvalue is equal to 0.93208 and thus $\pi = 7.2864\%$. The eigenvector is [3.558702 1.0]. Replacing these figures in III's equation gives $P_3^p = 0.336367$. Normalising all prices by P_3^p implies the following prices of production: $P_1^p = 10.57983$, $P_2^p = 2.97295$ and $P_3^p = 1.0$. The rate of surplus-value is $\sigma = 28.03\%$ and unit values are $v_1 = 10.55574$, $v_2 = 2.97937$ and $v_3 = 1.015418$. Both P_j^p and v_j are expressed in gold units.

Now, it is possible to calculate the magnitude of value, as it is expressed through its external measure, gold. Using the data of Scheme #1, the above numerical results and calling one ounce of gold as £ -i.e. if it is assumed a 1:1 proportion between the ounce of gold and the £, the standard of price- the following Scheme in monetary terms is easily worked out:

Scheme of Reproduction #3							
(in thousands of £)							
	C	V	SV	VA	PR	PP	π
I	708.9	237.8	66.7	1013.4	69.0	1015.7	7.28%

II	243.3	89.2	25.0	357.5	24.2	356.7	7.28%
III	63.5	29.7	8.3	101.5	6.8	100.0	7.28%
Σ	1015.7	356.7	100.0	1472.4	100.0	1472.4	7.28%

2.3 DETERMINATION OF THE PAST AND THE SOCIALLY NECESSARY LABOUR-TIME. THE MEANING OF ABSTRACT LABOUR

With the data of Scheme #3, the past labour and the composition of living labour can be obtained through proportions μ , ω_2 and ω_3 :

$$\mu = \frac{Q_1 v_1}{Q_2 v_2 + Q_3 v_3} = 2.207418$$

$$\omega_2 = \frac{Q_2 v_2}{Q_2 v_2 + Q_3 v_3} = 0.7788 \quad \omega_3 = \frac{Q_3 v_3}{Q_2 v_2 + Q_3 v_3} = 0.2212 \quad [10.]$$

Since there are 180,000 living working days and $\mu = 2.207418$, past labour contained in the means of production is $2.207418 \times 180,000 = 397,335$ w.d. Past labour per unit is $l_1 = 397,335/96,000 = 4.1389$ w.d. Total social labour is $397,335 + 180,000 = 577,335$ w.d.

Total living labour employed by each department is equal to $LL_j = a_{2j}/W$ (Scheme #2). The composition of living labour is given by the coefficients ω_2 and ω_3 set in equation [5.]. According to [10.], these proportions are: $\omega_2 = 0.7788$ and $\omega_3 = 0.2212$. These coefficients define the amounts of the living labour employed by department j which correspond, respectively, with the labour objectified in the value of wage-goods consumed by j 's workers and the labour crystallised in the value of gold constituting the material-form of the surplus-value exploited from these workers.

Table 1
(in working days)

	$PL_j = a_{1j} l_1$	$LL_j = a_{2j}/W$			$PL_j + LL_j$
		Total	$LL_j \omega_2$	$LL_j \omega_3$	
I	277,307	120,000	93,457	26,543	397,307
II	95,195	45,000	35,046	9,954	140,195
III	24,833	15,000	11,682	3,318	39,833
Σ	397,335	180,000	140,185	39,815	577,335

The first column of Table 1 depicts the past working days contained in the means of production and the second column presents the living labour employed in each department. The third and fourth columns shows the decomposition of living

labour. The fifth column of Table 1 –the sum $PL_j + LL_j$ – does not represent, however, the abstract social labour contained in j 's commodities.

In effect, the quantity corresponding to department I ($277,307 + 120,000 = 397,307$ w.d.) differs from the labour contained in the means of production ($\Sigma PL = 397,335$ w.d.). At the same time, the sum of departments II and III ($140,195 + 39,833 = 180,028$ w.d.) differs from the total living labour employed ($\Sigma LL = 180,000$ w.d.). The difference of department I ($397,307 - 397,335 = -28$ w.d.) is offset by the difference of the aggregate II+III ($140,195 + 39,833 - 180,000 = 28$ w.d.).

This result arises from the fact that capitals have different compositions. Now, a hypothesis about how the abstract social labour contained in commodities is determined will be presented. This method covers the general case in which capital compositions are different.

Columns 1 and 2 of Table 1 represent concrete labour used up by capitalists either in objective form –past labour– or in fluid form –living labour. These amounts are aliquot parts of social labour but they are not, in themselves, abstract social labour.

In the circuit of money capital $M-C...P...C'-M'$, the figures of Table 1, column 5, correspond to phase P. They are the quantities of labour with which capitalists operate in their concrete productive process. Yet, they have not leapt "from the body of the commodity into the body of the gold"²⁷ and is only by means of this *salto mortale* $C'-M'$ that concrete labour actually becomes abstract social labour.

Concrete labour employed by capitalists only becomes social labour through the mediation of the market and, in particular, through the money-form and, thus, through the prices arising in competition process. When prices equal production prices, the objectified social labour in each commodity does not –as a general rule– coincide with concrete labour mobilised by capitalists. Objectified abstract labour is only determined through the mediation of the prices corresponding to commodity production as a whole. This process will be illustrated for Department I²⁸.

²⁷Capital I, p. 220.

²⁸"Individual values are the *potential*, no yet realised, social values and the prices of production are the *realised* social values, the form taken by the individual values through, and at the moment of, exchange." Carchedi [1984], p. 439.

I's value is composed by constant capital, variable capital and surplus-value. According to Scheme #3, I's value is equal to $\pounds 708,849_c + \pounds 237,836_v + \pounds 66,667_{sv} = \pounds 1,013,351$. This is an amount of *money*. Now then, what is the amount of abstract social labour which is objectified in this money? How many working days are represented by each component of I's value?

Department I uses up $a_{11} = 67,000$ machines which contain $PL_1 = 277,307$ past working days. Value representing this labour is $a_{11}v_1 = 67,000 * \pounds 10.55574 = \pounds 707,235$. Yet, in order to replace their consumed machines, I's capitalists have to lay out $a_{11}P^p_1 = 67,000 * \pounds 10.57983 = \pounds 708,849_c$. This *money* is the constant capital determined by the production price of consumed machines. It represents an amount of *abstract* social labour greater than the labour contained in the means of production. In this example, thus, since $P^p_1 > v_1$, the quantity of social labour transferred by the means of production to I's value is greater than the quantity of labour crystallised in them. The replacement production price of the means of production is the *social form* of the labour which they contain, a social form which does not directly express its content.

How, then, does one calculate the amount of abstract social labour actually transferred? Social labour transferred by the means of production to the value of commodity j (TL_j) is a proportion δ_1 of past labour (PL_j) contained in them. This proportion is given by the relation between the price of production and the value of the means of production:

$$TL_j = PL_j \delta_1 = a_{1j} l_1 \delta_1 \quad [11.]$$

where $\delta_1 = P^p_1/v_1$. In this example, because $P^p_1 > v_1$, $\delta_1 > 1$ ($\delta_1 = 1.002282$). Therefore, social labour actually transferred to I's value through the money-form of production prices, is $a_{11}l_1\delta_1 = 277,307 * 1.002282 = 277,940$ w.d. This is the amount corresponding to the machines used up which actually composes the *abstract* labour congealed in I's commodities and, thus, "in its coagulated state", becomes *value*. In the general case, thus, *transferred labour* is not equal to the labour contained in the means of production but to the labour represented by constant capital.

Analogously, living labour employed by I's capitalists (120,000 w.d.) is *not directly social labour*. Although these 120,000 w.d. are part of social labour, they are *concrete* labour employed by I's capitalists. In order to propose how does living labour become abstract social labour, it is necessary to consider separately each component of I's living labour.

The first component of I's living labour is formed by, $LL_1\omega_2 = 93,457$ w.d. (Table 1) an amount equal to the labour embodied in the wage-goods purchased by I's workers. Value representing this labour is $a_{21}v_2 = 80,000 * \pounds 2.979371 = \pounds 238,350$. However, wages –and, then, variable capital– is given by the production price of wage-goods, which differs from their value. So, I's capitalists pay $a_{21}P_2^p = 80,000 * \pounds 2.97295 = \pounds 237,836_v$. This money represents an amount of abstract labour less than the amount contained in the wage-goods consumed by I's workers. This difference is given by the relation $\delta_2 = P_2^p/v_2 = 0.997844$. Therefore, the amount of social living labour actually objectified in the value of I's commodities –as the corresponding part to variable capital– is given by $LL_1\omega_2\delta_2 = 93,457 * 0.997844 = 93,255$ w.d. This magnitude is the necessary labour carried out by I's workers. In the general case, thus, *necessary labour* is not equal to the labour contained in the wage-goods but to the labour represented by variable capital.

As regards the second component of I's living labour ($LL_1\omega_3 = 26,543$ w.d.), it is a part of the labour objectified as the value of gold. According to system [9.], I's surplus-value is equal to $a_{21}P_2^p\sigma = a_{21}(Q_3/Q_2) = \pounds 66,667$. The material-form of this surplus-value is constituted by 66,667 ounces of gold in which an amount of social labour equal to $LL_1\omega_3$ is contained. Value materialised in this mass of gold is $[a_{21}(Q_3/Q_2)]v_3 = 66,667 * \pounds 1.015418 = \pounds 67,695$. However, these 66,667 ounces of gold are represented by a different sum of money – $\pounds 66,667$ – which is actually crystallised as the surplus-value in I's value. This sum of money represents a magnitude of social labour less than that contained in the mass of gold being the material-form of surplus-value. Therefore, the concrete 26,543 w.d. are realised as abstract social labour in a magnitude less than it. This divergence is given by the relation $\delta_3 = P_3^p/v_3 = 0.984816$. Abstract social labour corresponding to the second component of I's living labour is, thus, $LL_1\omega_3\delta_3 = 26,543 * 0.984816 = 26,140$ w.d. This is the magnitude of surplus-labour exploited in I. In the general case, thus, *surplus-labour* is not equal to the labour contained in the gold being the material-form of surplus-value, but to the abstract social labour represented by the money-form of this surplus-value²⁹.

²⁹“Necessary labour and surplus-labour do not correspond with social labour-time necessary to produce wage- and luxury-goods but with the socially necessary labour-time represented by their prices.” Rodríguez [1994, pp. 68-9; my translation]. On the distinction between the labour *contained* in gold and the labour *represented* by it, see also Rodríguez [1994].

So, as regards the whole living labour of department j , it becomes *abstract social living labour* (SL_j) according to the following equation:

$$SL_j = LL_j \delta_{LL} = (a_{2j}/W) \delta_{LL} \quad [12.]$$

where,

$$\delta_{LL} = \omega_2 \delta_2 + \omega_3 \delta_3 \quad [13.]$$

Replacing ω_j (equation [10.]) and δ_j in [13.] it can be shown that $\delta_{LL} = (PP_2+PP_3)/(VA_2+VA_3)$. Since, in the example $P^P_2 < v_2$ and $P^P_3 < v_3$, then $\delta_{LL} < 1$ ($\delta_{LL} = 0.994962$). Therefore, social living labour is $120,000 * 0.994962 = 119,395$ w.d. in Department I³⁰.

Following the same procedure for Departments II and III, the amounts of objectified abstract social labour (OSL) can be obtained. The results are presented in Scheme #4:

Scheme of Reproduction #4 (in working days)									
	Past Labour			Living Labour			Total Labour		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PL	TL	Div	LL	SL	Div	PL+LL	OSL	Div
I	277,307	277,940	-633	120,000	119,395	605	397,307	397,335	-28
II	95,195	95,412	-217	45,000	44,773	227	140,195	140,185	9
III	24,833	24,890	-57	15,000	14,924	76	39,833	39,815	19
Σ	397,335	398,242	-907	180,000	179,093	907	577,335	577,335	0

Column 1 shows the labour *contained* in the means of production used up by each department, i.e. the labour materialised as the *value* of the machines. Column 2 presents the transferred labour to commodities' value; this labour is equal

³⁰Wolff, Roberts and Callari [1982] consider that value is only measured in terms of labour. Even assuming this position—which neglects Marx's twofold measurement—the definition of "value" proposed by the authors is only partially correct: In their equation (3) (p. 578) the value of any commodity—which in their terms is equal to the social labour congealed in it—is defined as the sum of transferred labour and *concrete living labour*. They, thus, correctly establish the magnitude TL_j of [11.] but do not consider that living labour is not directly social labour. In other words, they do not consider—as done by [12.]—that living labour must also be mediated by δ_{LL} .

to that *represented* by the sum of money being constant capital, which is determined by the *price of production* of the machines, instead of by their value.

Column 4 is the sum of (i) the labour *contained* in the wage-goods consumed by the workers of each department and (ii) the labour *contained* in the gold corresponding to the material form of the surplus-value exploited from these workers; i.e. it depicts the labour *objectified* as value in wage-goods and gold. Instead, column 5 is the sum of (i) the necessary labour and (ii) the surplus-labour of each department, i.e. it shows the labour *represented* by the sums of money being variable capital and surplus-value, which are determined by the *production price* of wage-goods and gold, instead of by their values.

Column 7 shows the sum of *concrete* labour mobilised by each department, i.e. it is equal to the sum of labour *contained* into the machines consumed, wage-goods bought by workers and gold corresponding with the material-form of surplus-value. This sum is not equal to the labour objectified as value because it has not been mediated by the form of value –prices– and, thus, it is not *abstract* labour.

Column 8 depicts the abstract social labour objectified by each department (OSL_j). It is equal to the sum of transferred labour and social living labour, i.e. to the labour *represented* by constant capital, variable capital and surplus-value. This is the actual mediation carried out by prices which brings out the *abstract* characteristic of social labour.

I's social labour, obtained as the sum of TL_1+SL_1 , is equal to past labour ($\Sigma PL = 397,335$ w.d.) and social labour objectified by II and III, obtained as the sum of $(TL_2+SL_2)+(TL_3+SL_3)$, is equal to living labour ($\Sigma LL = 180,000$ w.d.). How could be interpreted these equalities? These equalities clearly depict the "twofold nature of the labour contained in commodities"³¹. In effect, concrete aspect of social labour is obtained through the vertical sum of columns 1 (concrete labour under objective form) and 4 (concrete labour under fluid form). On the other hand, abstract labour crystallised in each department is the result of the horizontal sum of transferred past labour and social living labour, i.e. of past and living labour mediated by the value-form of production prices. Both aspects of social labour –concrete and abstract– are quantitatively equivalent.

The divergence between past labour (ΣPL) and the labour transferred by the means of production (ΣTL), i.e. total of

³¹Capital I, p. 132.

column 3: -907 w.d., is balanced out by the divergence between concrete (ΣLL) and abstract social living labour (ΣSL) i.e. total of column 6: 907 w.d.

In Department I there is a divergence of -28 w.d. between the past and living labour employed (column 7) and the objectified social labour (column 8). This is the same difference presented in Table 1. This divergence is offset by those existing between concrete and abstract labour in II and III (9+19 w.d.). In the production as a whole there is no divergence between concrete and abstract social labour. In an average-composition commodity m , the divergence $PL_m - TL_m = SL_m - LL_m$, i.e. in such a commodity the total divergence between concrete and abstract labour is nil.

In Scheme #4, living and past labour count as a homogeneous quantity of social labour. Circulation, where the equivalence between commodities is expressed, carries out an actual mediation –given by δ_1 and δ_{LL} – in the determination of social abstract labour. As Marx says in Vol. I, Ch. 1:

*It is only the expression of equivalence between different sorts of commodities which brings to view the specific character of value-creating labour, by actually reducing the different kinds of labour embedded in the different kinds of commodity to their common quality of being human labour in general.*³²

Certainly, this is the consequence of the critique of Ricardo's notion of value, commented on in paragraph 1.1³³.

When capitals have the same composition, past labour contained in the means of production coincides with the labour transferred to the commodities ($\Sigma PL = \Sigma TL$), i.e. every figure in column 3 would be equal to zero. Instead, in Scheme #4 it is clear that a portion of *transferred* labour corresponds to *living* labour (907 w.d.).

On the other hand, when all capitals have the same composition, the whole used living labour ΣLL (which, as always, is materialised as the value of the elements of revenue) counts *directly* as social labour ($\Sigma LL = \Sigma SL$). Instead, in Scheme #4 a portion of living labour only *indirectly* becomes social labour, through its transference as a part of the social labour represented by I's production price.

³²Capital I, p. 142; emphasis added.

³³See *Theories*, II, p. 168.

This procedure can be done through a system of equations. The solutions for l_j , -unit social labour objectified in commodity j- will be directly obtained. To work out Scheme #4, two mediations have been taken into account, one in respect to past labour PL_j and, other, in respect to living labour LL_j .

Firstly, the social labour transferred by the means of production is a proportion $\delta_1 = P^P_1/v_1$ of the concrete past labour contained in them. Secondly, the social living labour is a proportion $\delta_{LL} = (PP_2+PP_3)/(VA_2+VA_3)$ of the concrete living labour. Hence, the following system is obtained:

$$\begin{aligned} Q_1 l_1 &= a_{11} l_1 \delta_1 + LL_1 \delta_{LL} \\ Q_2 l_2 &= a_{12} l_1 \delta_1 + LL_2 \delta_{LL} \\ Q_3 l_3 &= a_{13} l_1 \delta_1 + LL_3 \delta_{LL} \end{aligned} \quad [14.]$$

Evidently, if $\delta_1 = \delta_{LL} = 1$ -i.e. if all capitals have the same composition- this system is equal to the so-called "system of values" usually presented by the literature³⁴. It is important to stress that, under this particular situation, such a system permits one to obtain the substance of value, i.e. abstract social labour but not, as affirmed by many authors, to obtain "value".

Matrix expression of [14.] is:

$$\mathbf{B} \mathbf{l} = \mathbf{L}$$

$$\begin{bmatrix} Q_1 - a_{11} \delta_1 & 0 & 0 \\ -a_{12} \delta_1 & Q_2 & 0 \\ -a_{13} \delta_1 & 0 & Q_3 \end{bmatrix} \begin{bmatrix} l_1 \\ l_2 \\ l_3 \end{bmatrix} = \begin{bmatrix} SL_1 \\ SL_2 \\ SL_3 \end{bmatrix} \quad [14. ']$$

where element j of vector \mathbf{L} was defined in [12.].

Solving $\mathbf{B}^{-1} \mathbf{L}$ gives the solutions of l_j

$$l_1 = \frac{LL_1 \delta_{LL}}{Q_1 - a_{11} \delta_1} \quad l_2 = \frac{a_{12} l_1 \delta_1 + LL_2 \delta_{LL}}{Q_2} \quad l_3 = \frac{a_{13} l_1 \delta_1 + LL_3 \delta_{LL}}{Q_3} \quad [15.]$$

According to the data of Scheme #1, $l_1 = 4.13891$, $l_2 = 1.16821$ and $l_3 = 0.398146$. The multiplication of these figures by

³⁴For instance, Morishima [1973], Ch. 1.

Q_j gives the total amount of social labour embodied in the commodities of each department (column 8, Scheme #4).

3.3 THE MEL UNDER GENERAL CONDITIONS

After value and social labour have been calculated, it is possible to obtain the MEL with the data of Schemes #3 and #4.

Table 2			
	VALUE (£)	OSL (w.d.)	MEL (£/w.d.)
	$Q_j v_j$	$Q_j l_j$	v_j / l_j
I	1,013,351	397,335	2.55037
II	357,524	140,185	2.55037
III	101,542	39,815	2.55037
Σ	1,472,417	577,335	2.55037

According to Table 2, each socially necessary working day is objectified as £2.55037. In its general form, the MEL establishes a quantitative relation between the form and the substance of value. The latter, objectified social labour (Σ OSL), counts as a homogeneous quantity of abstract labour. It is a matter of indifference whether labour is performed in the present year or it was performed in previous periods, i.e. it is irrelevant whether it is past or living labour. The MEL is the relation between the total objectified and realised value and the labour employed by the capital as a whole. This relation is common to every commodity. Each commodity is a social object insofar as the relation between its value and the social labour embedded in it is the same as the relation corresponding to the capital as a whole. Every commodity is a crystal of a homogeneous substance (social labour) which is expressed through a homogenous form (money, gold). This is expressed as follows:

$$MEL = \frac{\sum Q_j v_j}{\sum Q_j l_j} = \frac{\sum Q_j P_j^p}{\sum OS L_j} = \frac{v_j}{l_j} \quad [16.]$$

Yet, the MEL can also be obtained from the components of social production. Firstly, the MEL corresponds to (a) the relation between the value of the elements of constant capital and the past labour contained in them and (b) the relation between the value-product—the sum of the value materialised in wage-goods and gold—and living labour:

$$MEL = \frac{Q_1 v_1}{PL} = \frac{Q_2 v_2 + Q_3 v_3}{LL} \quad [17.]$$

PL and LL are, respectively, the labour *contained* in the means of production and in the means of consumption.

Secondly, the MEL is equal to (a) the relation between the *constant* capital and the *labour transferred* by the means of production and (b) the relation between the revenues appropriated by workers and capitalists and the *social living labour*:

$$MEL = \frac{Q_1 P_1^p}{TL} = \frac{Q_2 P_2^p + Q_3}{SL} \quad [18.]$$

TL and SL are, respectively, the labour *represented* by total constant capital and total revenues (variable capital is equal to wages and surplus value is equal to profits).

It is clear that equations [17.] show the *objectification* of social labour and equations [18.] show the *appropriation* of this labour through the means of production and the elements of revenue.

It is important to note that, if Department I has an average composition, abstract social labour can be calculated with a "system of values", i.e. a system like [14.] with $\delta_j = 1$. When I has an average composition ($P_1^p = v_1$), II and III –taken as a whole– also have an average composition. In other words, if $P_1^p = v_1$, *a fortiori* $PP_2 + PP_3 = VA_2 + VA_3$, which implies that $\delta_1 = \delta_{LL} = 1$.

Now then, under any condition the means of production contain the whole past labour ($PL \equiv Q_1 l_1$) and the elements of revenue contain the whole living labour ($LL \equiv Q_2 l_2 + Q_3 l_3$). If $P_1^p = v_1$, concrete used past labour directly coincides with transferred (i.e. social) labour ($PL \equiv Q_1 l_1 = TL$) and, on the other hand, concrete employed living labour is directly social living labour ($LL \equiv Q_2 l_2 + Q_3 l_3 = SL$).

Yet, when $P_1^p \neq v_1$, neither is the labour contained in the means of production equal to the labour which they transfer to the commodities ($PL \equiv Q_1 l_1 \neq TL$), nor does the labour contained in the elements of revenue coincide with social living labour ($LL \equiv Q_2 l_2 + Q_3 l_3 \neq SL$). There is a *quantitative contradiction* (a divergence) between the labour contained in commodities ($Q_j l_j$) and the social form of this labour (TL and SL). This contradiction exists for the labour contained in any individual commodity ($PL_j + LL_j \neq OSL_j$) and for both components of social labour, namely past and living labour: $\Sigma PL \neq PL_1 + LL_1$ and $\Sigma LL \neq PL_2 + LL_2 + PL_3 + LL_3$. However, it is under this condition that it can actually be

affirmed that social labour is abstract labour; only under this circumstance is the characteristic of labour as dead or living labour abstracted.

3.4 COMPONENT PARTS OF THE TOTAL SOCIAL LABOUR

In this subsection, the break-down of the total social labour into its elements will be considered. Equation [16.] shows that the MEL –obtained *after* determining l_j – is common to every commodity. So, social labour objectified in commodity j (OSL_j) –presented in Scheme #4 column 8– could be obtained as follows:

$$OSL_j = \frac{Q_j v_j}{MEL} \quad [19.]$$

However, since capitals have different compositions, equation [19.] does not represent the amount of social labour *appropriated* by department j . Social labour appropriated is not represented by values but by production prices. Social labour appropriated by department j (ASL_j) is, thus,

$$ASL_j = \frac{Q_j P_j^p}{MEL} \quad [20.]$$

With these formulas a Table showing the component parts of social labour can be worked out:

	Concrete Labour	Abstract social Labour		
		Objectified	Appropriated	Divergence
I	397,307	397,335	398,242	907
II	140,195	140,185	139,883	-302
III	39,833	39,815	39,210	-605
Σ	577,335	577,335	577,335	0

Concrete labour mobilised by capitalists is equal to column 7 in Scheme #4. It is formed by the sum of the labour contained in the means of production ($PL_j = a_{1j}l_1$) and the employed living labour ($LL_j = a_{2j}/W$). *Objectified social labour* is equal to column 8 in Scheme #4 ($OSL_j = Q_j l_j$); it can also be obtained from formula [19.]. *Appropriated social labour* is calculated with formula [20.].

It is clear that I's capitalists –whose capitals have a composition greater than the average– appropriate an amount of social labour (907 w.d.) greater than that contained in their commodities. This labour is objectified in departments II and III but appropriated by department I.

The break-down of social labour in Table 3 clearly shows the magnitudes of *necessary labour* and *surplus-labour*. Necessary labour is the fraction of social labour appropriated by workers. This labour is represented by $Q_2P_2^p$, i.e. it is $Q_2P_2^p/MEL = 139,883$ w.d.³⁵. *Surplus-labour* is the part of social labour appropriated by capitalists as gold and, thus, it is represented by $Q_3P_3^p$, i.e. it is $Q_3P_3^p/MEL = 39,210$ w.d. Together, necessary labour and surplus-labour are equal to the sum SL of Scheme #4: $139,883+39,210 = 179,093$ w.d.

In the particular case when $P_1^p = v_1$ (and, of course when $P_j^p = v_j$) total living labour is resolved into necessary labour and surplus-labour. Instead, in Table 3 appropriated by workers and capitalists does not cover all living labour ($180,000-139,883-39,210 = 907$ w.d.). This difference is objectified in the means of production. The melting of living labour and past labour actually makes both components of social labour one homogeneous mass of human labour in the abstract.

According to Table 3, the rate of surplus-value σ and the rate of profit π , measured in social labour terms are:

$$\sigma = \frac{Q_3}{Q_2P_2^p} = \frac{ASL_3}{ASL_2} = \frac{39210}{139883} = 28.03\% \quad [21.]$$

$$\pi = \frac{Q_3}{Q_1P_1^p + Q_2P_2^p} = \frac{ASL_3}{ASL_1 + ASL_2} = \frac{39210}{538125} = 7.28\% \quad [22.]$$

These rates coincide with those obtained by means of system [6.].

3. CRITIQUE OF OTHER ATTEMPTS TO GENERALISE THE MEL

³⁵Necessary labour matches labour objectified in wage-goods only when II has an average-composition. Foley [1982, p. 43] calls *necessary labour* as "value of labour power": "The value of labor power is the claim on abstract labor time workers receive for their labor power in the form of a money wage".

According to the method followed in this article the MEL is a result arising from the determination of v_j –through system [9.]– and l_j –through system [14.]. The MEL is a *final* result and, thus, it is not determined *previously* to the calculation either v_j (a monetary amount) or l_j (a social-labour amount). In contrast, other attempts to generalise the MEL determine it *before* the calculation of either monetary magnitudes or social labour magnitudes.

There are, thus, two attempts to generalise the MEL which will be discussed. The first suggests that this "previous coefficient" is equal to the so-called "value of money", proposed by Bortkiewicz³⁶. In this case, a "system of values" measured in "labour-units" is first presented and, then, it is "converted" into "gold-units", dividing all magnitudes by $A\gamma$, "the working days contained in one shilling".

The second proposal is advanced by the "new solution" and other authors who maintain that the coefficient is equal to the quotient between the sum of revenues (wages and profits) and living labour³⁷. In this case, the authors present, first, amounts measured in money and, then, they "convert" these figures into amounts of social labour through the proposed coefficient³⁸.

As it will be shown, both attempts are not generalisations of the MEL.

3.1. THE MEL \neq THE SO-CALLED "VALUE OF MONEY"

When all the capitals have the same composition, the MEL is equal to the inverse of the socially necessary labour-time required to produce one ounce of gold. In effect, in this case, the solution of system [6.] gives both unit prices and unit values; for gold this solution is equal to 1. Therefore, according to [16.], the MEL can be written as $1/l_3$. Scheme #4,

³⁶Bortkiewicz [1907a], pp. 15-6. See also Sweezy [1942], p. 131.

³⁷Foley [1982, pp. 41, 38]: "I propose to generalize the concept of value of money by defining it as the ratio of aggregate direct labor time to aggregate value added. ... *Value added* ... is ... equal to the sum of wage cost and profit"; Duménil [1983, p. 442]: "The great insight ... of the labour theory of value is the linking of the total labour expended in a given period with the production associated with it, i.e. the net product. The price of this net product is equal to the total income of the period [i.e.] the sum of wages and profit."

³⁸Foley [1982], p. 42: "The value of labor power [is] the money wage multiplied by the value of money". Foley's "value of labor power" designates necessary labour.

column 8, shows that this relation is not generally fulfilled. To produce one ounce of gold needs 0.398146 working days (39,814.6 w.d./100,000 ounces). This is l_3 , the "value of money". Its inverse is:

$$\frac{1}{l_3} = \frac{1}{0.398146} = 251164 \neq MEL \quad [23.]$$

Therefore, the MEL is no longer equal to the inverse of the "value of money". In general, only if Department III has an average composition, the MEL coincides with the inverse of the "value of money". The false idea that the MEL is *always* equal to the inverse of the so-called "value of money" vanishes. The MEL is not a coefficient given solely by the gold production conditions but by the whole reproduction conditions.

On the other hand, inequality [23.] may be expressed as:

$$l_3 \neq \frac{1}{MEL} = \frac{l_3}{v_3} \quad [24.]$$

The amount of social labour *contained* in one ounce of gold is $l_3 = 0.3981$ w.d. which differs from the amount of social labour *represented* by one ounce of gold $l_j/v_j = 0.3921$ w.d.³⁹.

When all capitals have different composition, the money form of value acquires a new determination: Whereas

the quantity of labour necessary to produce one unit of money-commodity ... depends on its productive conditions ... the quantity of labour which is represented by money is the result of the relation between the total social labour and the amount in which this labour is objectified ... this relation arises from the social function of gold.⁴⁰

This "specific contradiction of the money-form of value [is] a contradiction between the value and the exchange-value of gold⁴¹", which makes impossible to conceive gold as a simple *numéraire*, as done by the Neo-Ricardian tradition.

3.2 THE MEL \neq THE RELATION BETWEEN THE SUM OF WAGES AND PROFITS AND LIVING LABOUR

³⁹See Rodríguez [1994] and also Foley [1982].

⁴⁰Rodríguez [1994], p. 26.

⁴¹Rodríguez [1994] p. 27-8.

It has been already said that when all capitals have the same composition, *value-product* is equal to the *sum of revenues*. Under this particular condition, the MEL is equal to the quotient between the sum of wages and profits and living labour. Some authors maintain that this is a *general* expression of the MEL. It will show why this attempt fails to generalise the MEL. There are two variants of this proposal which will be discussed.

3.2.1 FIRST VARIANT

The first group of authors define the MEL as the following relation⁴²:

$$\tau = \frac{Q_2 P_2^p + Q_3}{LL} \quad [25.]$$

Relation τ differs from the MEL as it is presented in equation [17.] because it establishes that the money representation of living labour is the sum of *wages* and *profits* and not of the *value* of the elements of revenue (wage-goods and gold). According to the example of section 3, $LL = 180,000$ and the the sum of revenues is £456,754 (Scheme #3); therefore, $\tau = £2.5375/w.d. \neq MEL$.

Now then, if the MEL is equal to τ , how would be determined the past labour contained in commodities? It would be calculated through the relation between constant capital and τ :

$$PL^* = \frac{C}{\tau} = \frac{Q_1 P_1^p}{\tau} \quad [26.]$$

(Note that an asterisk is used to distinguish the quantities derived from τ in [25.] from those calculated with the method proposed in the present article.) Replacing τ in [26.] gives the corresponding expression of the proportion μ , defined in [3.]:

⁴²Rodríguez's proposal is followed: "Value-product [is] the sum of wages and profits ... If the magnitude of value-product is *Y thousand ounces of gold* and in total production *L thousand units of living labour* are consumed, then one unit of socially necessary labour is represented in $\tau = Y/L$ ounces of gold." [1994], p. 67; my translation. Notation has been adapted to that of the present article.

$$\mu^* = \frac{PL^*}{LL} = \frac{PP_1}{PP_2 + PP_3} \quad [27.]$$

μ^* establishes that the relation between past and living labour is the same that the relation existing between I's *production price* and the sum of *production prices* of II and III. Using the data of Scheme #3, μ^* would be equal to 2.223656, $PL^* = 400,258$ w.d. and $OSL^* = 580,258$ w.d., quantities which, evidently, differ from those obtained in paragraph 2.2.

Expression [27.] is not a valid method to calculate total past labour because production prices (PP_j) are amounts of money which represent the labour *appropriated* by j ; they do not represent the labour objectified in each department. Labour is objectified as *value* and not as production price, which is a "modified form of value" allowing capitalists to proportionally share the total value exploited. Production price is, thus, a category of *distribution* whereas value is a category of *production*, the sphere where the objectification of labour is carried out.

On the other hand, if τ were a generalisation of the MEL, how would the materialised social labour in each department be determined? This method assumes that objectified labour in department j ($Q_j l_j^*$) is the sum of the past labour and living labour, i.e.:

$$Q_j l_j^* = PL_j^* + LL_j = \frac{a_{1j}}{Q_1} PL^* + LL_j \quad [28.]$$

Introducing PL^* (equation [26.]) into equation [28.], and taking into account the definition of $Q_j v_j$ (system [9.]) and that $LL_j = a_{2j}/W$, it is shown that objectified labour in j would be equal to:

$$Q_j l_j^* = \frac{Q_j v_j}{Q_2 P_2^p + Q_3} LL = \frac{Q_j v_j}{\tau} \quad [29.]$$

According to [29.] labour objectified in j is a result of τ , a *previously determined* coefficient. It can be demonstrated that τ is not a generalisation of the MEL.

In effect, according to [26.] past labour PL^* —objectified in period $t-1$ in Q_1 machines *consumed* in the period t — is equal to $Q_1 P_1^p / \tau$. Yet, on the other hand, according to [29.], social

labour objectified in the same Q_1 machines *reproduced* in period t is equal to Q_1v_1/τ . This means that

$$PL^* = \frac{Q_1P_1^p}{\tau} \neq \frac{Q_1v_1}{\tau} = Q_1l_1^* \quad [30.]$$

In the example of Scheme #3, the past labour *contained* in the 96,000 machines *consumed* would be $PL^* = 400,258$ w.d. whereas the social labour materialised in the same 96,000 machines *reproduced* would be equal to $Q_1l_1^* = 399,347$ w.d. Since simple reproduction and no technical change are assumed, there is no reason for that divergence. Therefore, according to this method, it is impossible to determine the social labour objectified in Q_1 . Neither PL^* nor $Q_1l_1^*$ correspond with this magnitude. It is clear that $PL^* = Q_1l_1^*$ only if $P_1^p = v_1$.

Additionally, if the generalisation of the MEL as τ is followed, living labour does not correspond with social labour objectified in the production of the means of consumption. Using [29.], objectified social labour in II+III is equal to:

$$Q_2l_2^* + Q_3l_3^* = \frac{Q_2v_2 + Q_3v_3}{\tau} = \left[\frac{Q_2v_2 + Q_3v_3}{Q_2P_2^p + Q_3} \right] LL \quad [31.]$$

Expression [31.] is equal to LL only if $v_2 = P_2^p$ and $v_3 = P_3^p$. According to τ , in the production of 120,000 tons of wheat and 100,000 ounces of gold are objectified 180,000 w.d. but, according to equation [31.], $Q_2l_2^* + Q_3l_3^* = 180,911$ w.d. As in the case of the means of production, there is no reason for that difference between LL and $Q_2l_2^* + Q_3l_3^*$. Therefore, this method does not permit to determine the social labour contained in the means of consumption.

These two results show that τ is a valid formula for the MEL only when all capitals have the same composition or, when $P_1^p = v_1$ and, *a fortiori*, $PP_2 + PP_3 = VA_2 + VA_3$.

3.2.2 SECOND VARIANT

A second variant of this attempt⁴³ firstly establishes that total social labour is determined by the quotient between total value and coefficient β :

⁴³Carchedi and de Haan [1995 (draft)], pp. 11-14. Notation has been adapted to that of the present article.

$$\sum OSL_j = \frac{\sum VA_j}{\beta} \quad [32.]$$

In order to determine β , it is adduced that the same proportion exists between, on the one hand, total value and the sum of wages and profits and, on the other, between total labour and living labour; this proportion is called α ⁴⁴:

$$\alpha = \frac{\sum VA_j}{Q_2 P_2^p + Q_3} = \frac{\sum OSL_j}{LL} \quad [33.]$$

Proportion α is easily transformed into proportion β :

$$\beta = \frac{\sum VA_j}{\sum OSL_j} = \frac{Q_2 P_2^p + Q_3}{LL} = \tau \quad [34.]$$

Therefore, this variant proposes that total social labour is calculated applying a previously determined coefficient, defined as the relation between the sum of revenues and living labour⁴⁵, namely τ . As already said, this is not a generalisation of the monetary expression of labour.

5. CONCLUSIONS

In this article the concept of monetary expression of labour has been discussed. This analysis has provided the following results:

Firstly, Marx's examples, where he directly relates quantities measured in social labour and quantities measured in money can be explained as cases of the monetary expression of labour. This concept arises from Marx's conception of the measure of value as a twofold measure and, in the last instance, from his analysis of value as unity of substance and form.

⁴⁴Carchedi and de Haan [1995, draft, p. 13]: "The proportion between total quantity of money in circulation [total value contained in commodities] on the one hand and wages and [profits] on the other, i.e. α ... is equal to the proportion between total labour contained and new labour contained."

⁴⁵Carchedi and de Haan [1995, draft, p. 13]: "Money wages (of productive workers) and profits [are] the money representation of the new homogeneous labour added."

Secondly, a general method to calculate the social labour contained in commodities has been presented. The so-called "system of values" is a particular case of this method. On its basis it has been possible to obtain a generalisation of the monetary expression of labour and to analyse the composition of total social labour.

Thirdly, the concept of abstract labour has been discussed in the light of the above results. Social labour is *abstract* in so far as it is a substance in which is irrelevant not only the concrete activity performed but whether labour is past or living labour.

Lastly, it has shown that the widely known interpretation of the above-mentioned Marx's examples as cases of the so-called "value of money" is, in general, erroneous. The monetary expression of labour corresponds with the inverse of the "value of money" only when capitals have the same composition or when the value and the production price of gold are equal. A similar situation occurs in respect of the attempt to generalise the monetary expression of labour through a coefficient defined as the quotient between the sum of revenues (wages and profits) and living labour.

All these results are fully coherent with Marx's theoretical project. Further analysis should consider more concrete situations as technical change, fixed-capital and so on.

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