

The so-called Problem of Transforming Values into Prices*

by
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I. Introduction

1. This paper deals with the *so-called* problem of transforming values into prices and on the one hand shows the inherent limits of the quantitative (i.e., traditional) approach to the problem, and on the other, formulates its solution.

The aforesaid quantitative approach has been adopted by many Marxists and all neoclassical and neo-Ricardian analysts: the former, one century after the pioneering work¹ of Mühlfort (1893), Dmitriev (1898), Bortkiewicz (1906) and nearly half a century after the work of Sraffa (1960) and Johansen (1963), stubbornly insist on comprehending and presenting the marxian theory of value as a theory of *determination* of prices in the capitalist mode of production, while the latter content themselves with formulating models of price determination, within the framework of which, on the one hand the marxian theory of value (taken as a quantitative theory of prices) is considered to be useless and erroneous, while on the other, the question of *interpreting* prices (not of mapping the factors which shape their magnitude) and money (not of mapping its various functions) is not even raised, and nor can it be (for the relevant criticism of neoclassical and neo-Ricardian theory: Stamatis (1979), (1984), Ch. IV, V, (1988), (1990), Mariolis (1996), (1998), (1998a)).

As is known, the so-called «transformation problem» consists in investigating the quantitative relations between the prices of commodities (theoretical, i.e. determined within the framework of models, or real) and the quantities of total (i.e. direct and indirect) labour required for their

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1. For the detailed presentation of this work: Stamatis (1995), vol. 2. In particular regarding the contribution of V. K. Dmitriev: Mariolis (1996).

production² (quantities of labour embodied à la Sraffa (1960), Ch. VI), which are also considered (according to traditional, prevailing conceptions) to be the values of commodities. However, as has been proven:

- A. Prices *cannot* be determined and/or interpreted on the basis of these quantities.
- B. Any such attempt to determine and/or interpret prices is *meaningless*.
- C. The said quantities of labour embodied *do not constitute* the values of commodities³. In reality, the values of commodities are (in line also with the marxian conception in general) the quantities of *social, abstract labour* required for their production, which cannot be determined prior to and independently of the social process of exchange of commodities and which –as is proven– are always equal to the prices of the said commodities applying at any time. Consequently, at this point, all discussion of «transformation» comes to an end.

2. The *second part* of the paper briefly sets out the quantitative relations between values (*considered as quantities of labour embodied à la Sraffa*) and prices of production of a single production system in a state of steady growth, which has at its disposal just one technique à la Leontief - Sraffa, while the *third part* investigates the corresponding relations (values-prices) within the framework of the simplest possible system of joint production⁴. The overall investigation proves the aforesaid *points A and B*, and consequently constitutes an *intrinsic criticism* of any quantitative approach to the problem of «transformation».

Lastly, the *fourth part*, having as its starting point the neoclassical version of the Ricardian model of foreign trade, presents: the marxian theory of value, the solution to the problem (aforementioned *point C*) and the general conclusions of the paper.

2. As is known, the said quantities of labour are defined and determined, exclusively by the technical data of production.

3. *However, we shall consider them (in agreement with prevailing conceptions) initially (i.e. in the second and third part of the present paper) as the values of commodities, in order to show the inherent limits of the quantitative approach to the so-called «transformation problem».*

4. Single (joint) production is the case in which each branch of the system produces one and only one commodity (at least one branch of the system produces more than one commodity).

II. The Quantitative Relations between Values and Prices of Production in Single Production Systems

3. The in-depth investigation of the quantitative relations between values and prices of production in a single production system (with homogeneous labour) in a state of steady growth, which has at its disposal only one technique à la Leontief - Sraffa, concludes with the following results (for the relevant mathematical proofs which, for reasons of brevity, are not presented here: Egidi (1975), Parys (1982), (1986), Stamatis (1984), Ch. I, (1988), (1997), Bidard (1991), Ch. II-VI, Kurz and Salvadori (1995), Ch. 2-6, Mariolis (1998a), Part II).

The values of commodities are determined, on the basis of the technical data of production, unambiguously, while the determination of the prices and quantities of produced commodities requires: a) the exogenous setting of one of the variables of distribution (: rate of profit, real or nominal wage rate) or of growth (: rate of growth, workers' consumption, capitalists' consumption) of income, b) The introduction to the model of a normalization equation of relative prices, with which the price of any bundle of produced commodities (: normalization commodity) is set (exogenously) equal to a positive constant. The dimension of the said constant, obviously, is: units of *fictitious* money per unit of normalization commodity⁵.

Consequently:

- i. The determination of prices does not require beforehand the determination of values, while at the same time, to one and the same vector of values correspond infinite vectors of relative prices. There is, of course, a matrix (linear operator) with which we can multiply the vector of values in order to arrive at the vector of absolute prices (see Pasinetti (1977), Ch. 5, Appendix, Reati (1986)), but: *firstly*, the elements of the said matrix depend on the exogenously given variables of the model, which are arbitrarily selected (height of variable of distribution or of growth of income, normalization commodity, height of positive normalization constant) and *secondly*, there are matrices with which we can multiply the directly or indirectly expended quantities of *any* (if the production

5. Through the price normalization equation, money is introduced (i.e. mapped) to the model as a medium of expression of exchange values of commodities. For a detailed presentation: Stamatis (1984), Ch. II, V.

- technique is irreducible) commodity (i.e. not only values, and therefore not only the directly and indirectly expended quantities of the labour-power commodity) in order to arrive at the vector of absolute prices.
- ii. Prices are never proportional (or equal) to values. Exceptions: the case in which the rate of profit is equal to zero and the case in which the capital intensity in price terms is equal in all branches of the system (in which case the system is a quasi single-branch system).
 - iii. The celebrated «marxian double equality» (: the sum of prices is equal to the sum of values and profits are equal to surplus value) is verified only by chance.
 - iv. In cases which are not infrequent, the following applies: the positive values of commodities and the rate of profit in value terms of the system are «transformed», respectively, into zero, negative, indeterminate, tending to infinity prices of commodities and into alternative, expressed in price terms, rates of profit. Indeed, it is this arbitrarily selected composition of the normalization commodity which determines –if it is to be expressed in line with the logic of a quantitative approach– the «transformation»: *ceteris paribus*, a variation in the composition of the normalization commodity changes (for example) zero prices and prices which tend to infinity into positive ones.

4. Clearly, all the above *points* (i-iv) directly and irreversibly affect all attempts to present the marxian theory of value as a price determination theory. In other words, they prove that any attempt to determine and/or interpret prices on the basis of values *is not possible* and *is meaningless*.

More specifically, it is *meaningless*⁶ precisely because the magnitudes in question are incommensurable: the substance of values is labour, while the substance of empirically observed prices is real money and substance of theoretical prices is the money arbitrarily set by the normalization equation (and for this reason: fictitious). Thus, in line with the quantitative approach to the problem, that *constant*, which characterizes the capitalist mode of production and restores the dimensional dissimilarity between values and prices, must be determined and subsequently interpreted (similar to the process, for example, of formulating the law of universal gravitation). Naturally, even if we were to ignore the fact that infinite vectors of relative

6. Clearly, it is unnecessary for us to dwell on why *it is not possible*.

prices correspond to the same vector of values, this quest would fail precisely because it begins from a system of determination in which prices are, with the exception of the technical data of production, determined by prices: the system of prices is linearly homogenous with respect to the price of the labour-power commodity (this «vicious circle» was not unknown to Ricardo (1951), Ch. I, Parts IV-VI nor to Marx (1968), Ch. V).

On the other hand, *point iv* in particular also correspondingly has a bearing on *the point of each quantitative determination* of production prices, and thus, in its entirety, the conception of neoclassical analysts and neo-Ricardians, who tackle the problem of interpreting prices and money (i.e. what are the relative or absolute prices determined within the model and what do they express?) as a metaphysical one. Put differently, neoclassical analysts and neo-Ricardians are, on the basis of their own logic, forced to raise the question of the interpretation of prices (if not real, at least theoretical prices) and of money, precisely because *point iv* proves that: a) the fictitious money introduced to the model by means of the normalization equation is not neutral as a medium for expressing the exchange values of commodities, and consequently, b) the theoretically determined prices (even if we disregard the fact that they are not always economically significant⁷) do not constitute one, albeit approximate, isomorphous mapping of real prices, because they are expressed in terms of fictitious and (above all) non-neutral money⁸.

III. The Quantitative Relations between Values and Prices of Production in Joint Production Systems

5. As is known, a prerequisite for the determination of values is knowledge of the technical data of production. Unlike the case of single production however, in the case of joint production the determination of the technique actually used is an issue even when the multitude of available production methods coincides with the multitude of commodities produced⁹ (i.e. in the so-called square systems). This happens precisely because the final demand of the

7. We mean the appearance of prices which are zero, negative, indeterminate and tending to infinity.

8. For an in-depth investigation of this issue: Stamatis (1984), Ch. I, IV (who first identified it).

9. In the real world, joint (and not single) production constitutes the rule. For its empirical significance: Steedman (1984), Mariolis (1997).

system may be satisfied by the operation of only some (of the total available) production methods.

Below, it will be shown that the case of joint production further strengthens the conclusions already drawn: The prices of commodities are known (unambiguously determined), while their values are always unknown (ambiguously determined). Thus, all discussion of their quantitative correlation becomes theological in nature.

6. So, assuming the simplest possible linear system of joint production, which¹⁰ is: a) square, b) produces two commodities, c) does not use material inputs, but only direct, homogeneous labour, d) is characterized by a uniform, endogenously defined nominal wage rate, and by a uniform, exogenously defined (and invariable) rate of profit, and e) does not grow. Lastly, we symbolise with:

- B**: the positive 2x2 output matrix of the system, of which the element b_{ij} ($i, j=1,2$) represents the quantity of commodity i produced by the method j , when it operates at the unit activity level.
- X**: the 2x1 positive output vector of the system, of which the element X_i represents the output in commodity i .
- ℓ** : the 1x2 positive vector of inputs in direct, homogeneous labour, when the system operates at the unit activity level. The element ℓ_j represents the quantity of labour entering the branch j . Without the prejudice of generality, we assume that the following holds¹¹:

$$b_{21}/b_{22} < \ell_1/\ell_2 < b_{11}/b_{12} \quad (1)$$

- w**: the nominal wage rate.
- r**: the rate of profit.
- p**: the 1x2 vector of commodity prices, of which the element p_i represents the price of commodity i . In the event that both methods are used (as will be seen, this does not always happen), p clearly constitutes the solution of the system:

$$pB = w\ell(1 + r) \quad (2)$$

10. For the general case, which does not reverse the conclusions drawn: Autume (1988), Bidard (1991), Ch. 16-18, Kurz and Salvadori (1995), Ch. 8.

11. Clearly, this entails that the two production methods are not classifiable with respect to the average productivity of labour in material terms. The significance of this will be fully understood subsequently (compare with conditions (4) below).

Given that: a) the system is in a position to produce any relative output X_1/X_2 , which ranges from b_{12}/b_{22} (only the second method operates) to b_{11}/b_{21} (only the first method operates), b) in a state of competitive equilibrium the extra profits of each of the two methods will be zero or negative and c) in a state of competitive equilibrium, a method, which shows negative extra profits will not be used, it follows that the supply curve of the system will have the step-like form shown in *Diagram 1* (where: $p^* \equiv (p_1/p_2)^*$ is the solution of the system (2)).

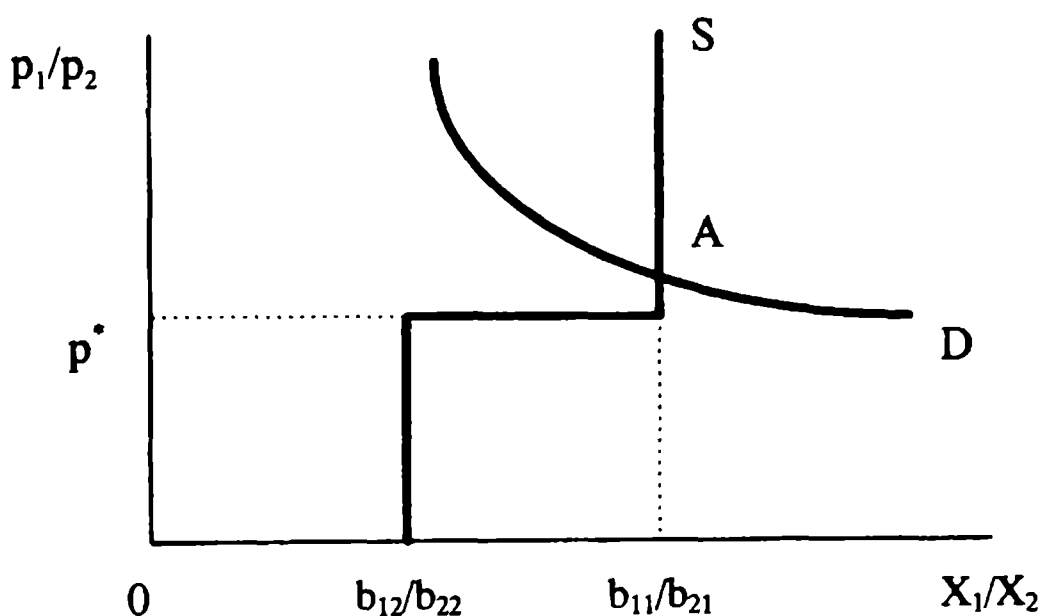


Diagram 1

Consequently, the determination of the technique actually used and of prices presupposes the introduction of «demand» to the model. However, its introduction (irrespective of the theoretical approach on which it is based) does not resolve the problem in its entirety, because the «supply-demand interaction» may entail the use of one (and only one) of the two methods (see point *A* in *Diagram 1*). In such a case, the values of commodities will remain unknown (in contrast with prices) and the only thing which could be said is the following: the value of the net output of the system is equal to the direct labour which was required to produce its gross output.

It should moreover be stressed that the hypothesised introduction of the condition (1) does not contribute only to making the investigation more specific (allowing the deduction of one of all the possible supply curves). Above all: it ensures the positiveness of p^* and, consequently, the positiveness of values, as these are calculated, *in the usual manner*, by the system:

$$\omega B = \ell \Rightarrow \omega = \ell B^{-1} \quad (3)$$

where: $\omega = [\omega_1, \omega_2]$, the 1x2 vector of values. The condition (1), therefore, creates the impression that if the «supply - demand interaction» eventually leads to the co-existence of the two methods, it will also lead to the determination of values. However, the aforesaid *usual manner* of determining values is, in the case of joint production, incorrect (in detail: Stamatis (1979), Ch. I, (1983)), because it groundlessly presupposes that the values of each separate commodity in both production methods are equal¹². If, however, the values of the separate commodities are differentiated according to production method, then the system for determining values will present 2 degrees of freedom (in general $n^2 - n$, where n is the multitude of commodities), and thus values will remain unknown.

The groundlessness of the aforementioned assumption is clearly shown in the case where the two methods are classifiable with respect to their average productivity of labour in material terms and, therefore, the following holds:

$$[b_{11}/\ell_1, b_{21}/\ell_1] \geq (\text{or } \leq) [b_{12}/\ell_2, b_{22}/\ell_2] \quad (4)$$

In this case, the equation of corresponding productivity in value terms which is included in the system (3) cannot fail to be satisfied by a *non-positive* vector of values.

Lastly, as may be ascertained, when by construction the conditions (4) apply in their strong form, only one method operates (that which has the highest average productivity in material terms) and consequently values *cannot be determined even in the, incorrect, usual manner*¹³.

In general, this means that even in the simplest possible system of joint production: a) the production methods actually used and prices are determined «simultaneously» through the «supply-demand interaction», b) values are always unknown (ambiguously determined).

As is known, some Marxists maintain (at the same time dismissing bourgeois science as superficial, because it contents itself with measurements which are based on prices) that calculations in value terms reveal the long-

12. One might perhaps counter that we presuppose precisely the same with respect to prices. However, this presupposition is well founded, because in a state of equilibrium, the so-called «law of one price» holds.

13. The reader will see that the validity of the conditions (4) in their weak form does not overturn the conclusion.

standing dynamics of the capitalist system. However, as was seen, these calculations are on the one hand unattainable (both practically and theoretically¹⁴), and on the other, it is not possible to assert that values determine (in the initial, medium or final analysis) prices.

IV. Marxian Theory of Value

7. It is certain that the contemporary theory of prices (neoclassical and neo-Ricardian) includes as a special instance that which is perceived as the quantitative theory of determining prices through values marxian theory of value. It is equally certain however that the contemporary theory of prices does not even comprehend the issue which Marx placed at the centre of his own theory of value: because money constitutes the substance of prices, the interpretation of prices presupposes the interpretation of money.

For this theory in particular (i.e. the Marxian), which interprets prices and their substance, money, respectively, as forms of appearance of value and its substance, abstract labour: a) there is no issue of «transforming values into prices», b) the deviations of prices from the quantities of labour embodied à la Sraffa – not only do not raise any problem, but are entirely interpretable, c) the fact that in joint production systems the quantities of labour embodied cannot be calculated is of no importance (on this point, see also Duménil/Lévy (1987)).

8. Our position is that the starting point for the accurate presentation of the marxian theory of value¹⁵ can be (however strange it may sound) the neoclassical version of the very simple Ricardian model of foreign trade, as set out in Chapter VII of *Principles*. As is known, within the framework of this model, the existence of two countries¹⁶ is hypothesised –A and B– which in conditions of autarky produce two commodities through (only) direct labour: with ℓ_j^A (ℓ_j^B) we symbolise the quantity of labour required to produce one unit of

14. But even if they are feasible (case of single production), it can be proven that they are not in a position to reveal anything (Steedman (1977), pp. 105-9, Ch. 13).

15. Naturally, in that which follows we shall not refer to issues pertaining to the theory of value (e.g. content of value, reification, commodity fetishism) which (in our view) have already been resolved.

16. In that which follows, instead of «countries» the reader may read: «producers» or «branches of production», within the framework of a closed economy (nothing changes). See, for example, Simpson (1975), Ch. 14.

the commodity j ($j=1,2$) in country A (B). It is also hypothesised that the entire quantities of labour available (in each country) are exogenously given and constant, and (contrary, of course, to Ricardo's hypothesis) the existence of capitalists is ignored: $p_j^A = w^A \ell_j^A$ ($p_j^B = w^B \ell_j^B$). Lastly, it is hypothesised that country A has a comparative advantage in the production of commodity 1 (for example).

As may be proven (see, for example, Krugman/Obstfeld (1994) Ch. 2), the two countries will undoubtedly form an international economy, within the framework of which the pattern of specialisation, the quantities of commodities produced and their relative prices are determined by the «interaction of international supply - international demand». Let us assume that the aforesaid «interaction» leads both countries to a situation of complete specialisation (which is one of three possible situations) and, consequently, determines a ratio of international exchange of commodities p^* , for which the following holds:

$$(\ell_1/\ell_2)^A < p^* \equiv (p_1/p_2)^* < (\ell_1/\ell_2)^B \quad (5)$$

Thus, while for the production of commodity 1, country A uses up ℓ_1^A units of labour and for the production of commodity 2, country B uses up ℓ_2^B units of labour, the two countries exchange their commodities at the ratio determined by the relative price p^* (and only by coincidence does $p^* = \ell_1^A/\ell_2^B$).

The logic of the prevailing approach to the «transformation problem» entails, purely and simply, the putting forward of a pointless (and in fact meaningless, because the labour is by construction heterogeneous) question: to what extent does p^* deviate from the ratio (ℓ_1^A/ℓ_2^B) ? A question which, due to the simplicity of the model, is answered without much ado.

However, in line with the marxian theory of value, the following should be stated: *If the commodities are exchanged as they indeed are (i.e. as products of labour)*, then one unit of commodity 1 would be exchanged with (ℓ_1^A/ℓ_2^B) units of commodity 2. *Through this exchange*, ℓ_1^A units of labour of country A would be equated with $[(\ell_1^A/\ell_2^B) \ell_2^B]$ units of labour of country B, and thus, would constitute one (by convention) unit of *international (social), abstract labour*. Consequently, the value of commodity 1 would be one (by convention) unit of abstract labour and the value of commodity 2 would be (ℓ_2^B/ℓ_1^A) units of abstract labour.

Here (i.e. within the framework of the model already constructed), however, the commodities are clearly not being exchanged as they indeed are,

but –for given: technical conditions of production, total available quantities of labour, consumer preferences– so that the mass of use-values available in each country is maximised. This requirement, as may be ascertained, leads to the shaping of a ratio of exchange p^* , the comparison of which with the ratio (ℓ_1^A / ℓ_2^B) is meaningless, quite simply because they correspond to two different, non-coexisting situations. *Through the exchange* of commodities in the ratio p^* , ℓ_1^A units of labour of country A are equated with $(p^* \ell_2^B)$ units of labour of country B and, thus, constitute one (*by convention*) unit of international, abstract labour. Consequently, the value of commodity 1 is one (by convention) unit of abstract labour, the value of commodity 2 is $(1/p^*)$ units of abstract labour, and, thus, the values are (always) proportional to the prices in effect¹⁷.

Assuming, now, that the prices (as is the case in reality) are given as absolute prices, and that, for example, the following holds: $p_1 = \alpha$, $p_2 = \beta$ (clearly the dimension of p_j is: units of money per unit of commodity j). This means that the α (β) units of money express the ℓ_1^A (ℓ_2^B) units of labour of country A (B) or, equivalently, that the homogenised –through exchange– ℓ_1^A units of labour of country A and ℓ_2^B units of labour of country B are represented by (appear as) α and β units of money, respectively. Therefore, the ℓ_1^A units of labour of A are equivalent to (they have –through the exchange quantitatively determined by the relative prices¹⁸ in effect– become equated with) $[(\alpha/\beta) \ell_2^B]$ units of labour of country B and, thus, the quantities ℓ_1^A , ℓ_2^B , have been transformed into commensurate quantities (whether equal or unequal is of no consequence) of a «new» quality: of abstract labour. If we select (for example) as a unit of measurement of abstract labour the Ψ units of labour embodied in one unit of commodity 1, then the value of commodity 1 is equal to (ℓ_1^A/Ψ) units of abstract labour, while that of 2 to $[(\ell_1^A/\Psi)(\beta/\alpha)]$ units of abstract labour. *However*, the selection of the measure of value and of the unit of measurement of abstract labour is a meaningless act, because this act has «already» been performed in economic reality itself: the exchange is mediated by money, and consequently money constitutes the measure of value (and the unit of money constitutes the unit of measurement of abstract labour). Lastly, values are always equal to the prices in effect at any time, while prices are only by way of exception

17. The reader will see that in implementing the approach followed in the models of Parts II and III of the present paper, the only thing that changes is the relative complexity of calculations.

18. Relative prices, which we have already interpreted in the immediately preceding examples (i.e. within the given model).

proportional to quantities of labour embodied. Therefore, at this point, all discussion of «transformation of values into prices» comes to an end.

9. So, by generalising in a logical manner the conclusions drawn from the previous model, we may sum up our overall analysis in the following points (for a thorough investigation, see Mariolis (2000)):

A. Through the exchange of commodities, exchange which is mediated by money and is determined quantitatively by the relative prices in effect at any time, also exchanged are the quantities of corresponding –required for the production of the commodities– private, concrete labour. So, through this social process, the said quantities are homogenised, transformed into quantities of social, abstract labour and appear as different, commensurate, quantities of one and the same thing: money. Consequently, the prices of commodities on the one hand distortedly represent (certainly from a qualitative viewpoint and possibly from a quantitative one) the quantities of private, concrete labour required for their production, and on the other –and precisely because money constitutes the measure of value– they are equal to the quantities of abstract labour required for their production (i.e. to their values).

B. Prices are proportional to the quantities of labour embodied in the various commodities if, and only if, the said commodities are exchanged (as they indeed are, i.e. :) as products of private, concrete labour (in which case they are equal). Consequently, in the capitalist mode of production (where commodities are exchanged as products of capital (Marx)) prices represent the quantities of private, concrete labour required for the production of the commodities in a distorted manner also from a quantitative viewpoint. In certain cases (theoretical or real) the «quantities embodied» can be calculated, while in others they cannot. Neither of these categories of cases means anything: the marxian theory of value does not suggest that we make calculations in terms of «quantities embodied» and subsequently compare our results with actual magnitudes (i.e. to compare imaginary situations with real ones), but simply explains the economic forms which specifically correspond in capitalist reality (: price, profit, wage). Thus, the inability to calculate «quantities embodied» in the case of joint production is of no significance for the marxian theory to the extent that the said theory has beforehand understood that: a) the –known– prices of commodities represent (albeit distortedly) the quantities of concrete labour required for their production, b) the money (as

the substance of prices) constitutes the measure of value and the unit of money constitutes the unit of measurement of abstract labour, and, therefore, c) the prices of commodities are always equal to the quantities of abstract labour required for their production.

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