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VALUE AS CONSERVATION LAW**

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# MARX'S RATE OF PROFIT AND THE THEORY OF LABOUR VALUE AS CONSERVATION LAW

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## **Abstract**

*The paper argues that Ricardo's concern with determining the rate of profit had no central place in Marx's analysis. Marx, in fact, utilised his own version of the labour theory of value – very different from that of Smith and Ricardo – not to determine the rate of profit, but to analyse the dynamics of economic aggregates and bring to light the inner social nature of production and distribution processes.*

*The present analysis of the peculiar use of Marx's labour theory of value is also an attempt to explain the role played by it in his system, for better or worse. The final thesis of the paper is that, in his system, Marx's version of the labour theory of value plays the same role that conservation laws play in most physics theories, with significant consequences for an understanding of the dynamics of capital accumulation, business cycles and economic crises.*

**JEL classification:** B140, B240, B510, C670

**Key Words:** Labour theory of value, prices of production, rate of profit, transformation problem, conservation laws.

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## 1. Introduction

For a long time most mainstream economists, probably also because of the awkward political implications of Marx's analysis, have seen him as an odd and unimportant economist and approached him mostly as a minor Post-Ricardian (Desai, 1974). Some of them, like Marshall and his pupils, who saw themselves as Ricardo's legitimate heirs, went so far as to deny a significant connection between Ricardo and Marx, arguing that Marx's claim to have the "authority of Ricardo" on his side was unfounded (De Vivo, 1982).

Nevertheless, since Sraffa rediscovered Ricardo's surplus theory of value and distribution, the relation between Marx and Ricardo saw a revival (De Vivo, 1982), and Neo-Ricardians, like other Cambridge School fellows, started to see Marx as a major Post-Ricardian (Desai, 1974). However, for better or worse they came to view Marx's theory as a simple development from Ricardo's.

There is no question but that Marx himself, in the postface to the second edition of the first volume of *Capital*, seemed to appreciate the judgment by Sieber, a Russian economist, who had regarded his theory of value, money and capital as a "necessary sequel" to the approach of Smith and Ricardo (De Vivo, 1982), but this explicit recognition was more about the method than the contents and objectives. Moreover, in the same postface, several pages later, Marx also asserted his own dialectical method, which is "in its foundations, not only different from the Hegelian, but exactly opposite to it" (Marx, 1990).

Furthermore, *The Theories of Surplus Value*, the draft material for Volume IV of *Capital*, which was essentially devoted to critical analysis of the previous theories of the classical and "vulgar economists", show how firmly most of Marx's economic concepts were situated within the tradition of classical political economy. However, also in this field as in others, Marx developed his own ideas through a radical critique and elaboration of his predecessors (McLellan, 1973).

Marx, in fact, was not at all a simple *Ricardian socialist* and his work set out to criticise the previous classical economists on the ground of their own approach, but applying the dialectical method of his materialist conception of history (McLellan, 1973; Rosdolsky, 1977). Thus, many orthodox Marxists have always thought there is a significant break between Marx and the previous bourgeois political economy, including Ricardo's theory (Rowthorn, 1974; Mandel, 1990).

It is also true that the Neo-Ricardians themselves highlight the fact that Marx, with his critique of Ricardo, pointed out a fundamental difference between his own theory and Ricardo's, and the major elements in his criticism analysed by Steedman (1977) are the same as some of those Marxists pointed out as the real watershed between Marx's thought and the previous "bourgeois" political economy (De Vivo, 1982).

However, the Neo-Ricardians end up by linking all of Marx's major criticisms of Ricardo with his formulation of the *transformation problem* and his critique of Ricardo's analysis of the *determination of prices* and *the rate of profit*, in which Marx made some progress toward a logically coherent formulation of a surplus theory of the rate of profit (De Vivo, 1982).

Unfortunately, according to the Neo-Ricardians, Marx's major problem was that the labour theory of value, understood as meaning that real exchange-values between

commodities are proportional to the ratio between the quantities of labour incorporated in them, contradicts the possibility to have production prices that guarantee a uniform rate of profit among commodities characterised by different organic composition, as indeed is required by competition laws. Marx was aware of this problem and attempted to resolve it by means of his “transformation” process. However, he failed in this task, eventually demonstrating the inconsistency between values and prices.

In a nutshell, the Neo-Ricardians only see in Marx’s analysis their main theoretical problem and come to the conclusion that he did not solve it in the right way. Sraffa, instead, found a way to compute production prices logically consistent, with no connection with social abstract labour incorporated in commodities, which equally highlights the distributive conflict between labour and capital.

This whole line of reasoning is, of course, based on the premise that Marx’s research programme objectives were the same as those pursued by classical political economy. According to Steedman (1991), in fact, “Marx saw the rate of profit as being a key factor in the movement of capitalistic economy”. Thus, the theory of the rate of profit would be “central to his political economy”, but unfortunately he attempted to construct it by means of the labour values, with no internal consistency. Moreover, successive coherent theories of the rate of profit, developed by Dmitriev, Borkiewicz and Sraffa, showed that many Marx’s statements were invalid. (Steedman, 1991; Garegnani, 2018).

However, the problem of the rate of profit had no such priority for Marx. In fact, he analysed this subject only in the context of his critical analysis of Ricardo, but the determination of the rate of profit was no crux in his own analysis.

In particular, in Volume I of *Capital*, the only one Marx himself edited for publication, the term “rate of profit” appears only eight times, within some comments of his on other economists<sup>1</sup>. Thus, in Volume I of *Capital*, to which Marx dedicated the greatest attention during his lifetime, this concept seems to play no role at all in developing his analysis.

Of course, Marx devoted the whole of chapter 2 of his draft version of Volume III of *Capital* to the rate of profit, but this change of mind has, once again, met with various interpretations.

According to Borkiewicz, for example, a faithful follower of Ricardo, Marx “just liked Mephisto’s role. If he had, from the outset, characterized his law of value as only hypothetically effective, then all the charm of novelty and paradox would be gone”<sup>2</sup> (Borkiewicz, 1906). However, it is rather odd that Marx simply saved the best for last!

On the contrary, Ernest Mandel, a famous orthodox Marxist, whilst commenting on Joan Robinson’s preface to the second edition of her *An Essay on Marxian Economics* (1966), noted that she did not understand that Volumes I and III of *Capital* “are at different levels of abstraction, deal with different questions, and make different assumptions” (Mandel, 1990). In fact, according to Mandel, in Volume I “Marx examines the relations between Capital and Labour in general” and consequently abstracts from the problem of redistribution of surplus-value among competing capitalists – i.e. the problem of a single,

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<sup>1</sup> This term appears on page 327, in a comment on Carey, on page 652, in a quotation of Mill, five times on page 660, commenting on some of Ricardo’s statements, and on page 678, in the context of analysis of the classical economists’ theories of wage (Marx, 1990).

<sup>2</sup> Our translation from the original German text: “Er gefiel sich eben in der Rollen des Mephisto. Hätte er sein Wertgesetz von vornherein als nur hypothetisch wirksam charakterisiert, dan wären aller Reiz des Neuen, des Paradoxen dahin”.

uniform rate of profit – in order to focus on the laws of capitalist commodity production and circulation in their “purest” forms and to reveal the origin of surplus-value in the aggregate process of production. In Volume III, instead, Marx examines the effects of capitalist competition upon the redistribution of surplus-value among capitalists (Mandel, 1990).

Of course, the crucial issue in Mandel’s argument is whether or not the reasoning in terms of labour values can be adopted regardless of reasoning in terms of production prices.

Thus, to better understand the different degree of attention Marx paid to the rate of profit in Volumes I and III of *Capital*, in the following pages we will refer to the original outline and “the making” of Marx’s *Capital*” (Rosdolsky, 1977), but also, and above all, we will have to examine whether Marx’s measurement of economic aggregates by means of incorporated labour, regardless of production prices, is legitimate or not.

Furthermore, it is fundamental in the first place to observe that in Marx’s system, contrary to Sraffa’s schemes, the rate of profit plays no role in determining distribution of physical social product, which Marx measured in terms of incorporated labour, between capitalists and workers, because this distribution was only determined by subsistence wages, governed by competition among workers in the labour market, and he takes absolutely no account of systematic surplus wages. The only distributive role the rate of profit plays, in fact, is in distributing surplus-value among capitalists.

In Marx’s work, moreover, there is no evidence that the rate of profit is a subjective incentive for accumulation of capital (Scarano, 2018). According to Marx, in fact, the average rate of profit plays a major role only in capitalist competition, stimulating movements of capital from one productive branch to another. The average rate of profit, therefore, can influence the composition of investment in term of use values and is the objective upper limit to the rate of accumulation, but these functions do not need to pass through the producers’ minds.

In any case, once again the Neo-Ricardians’ criticisms raised the suspicion that most of Marx’s reasoning could be invalidated by an erroneous theory of value. In fact, unfortunately, the labour theory of value was, in fact, laid down by Marx as the foundation of his entire explanation of the capitalist mode of production (Vicarelli, 1981). And its legitimacy has historically been the main object of attack against Marxism by its enemies (Pilling, 2012), although most of the enemies’ criticisms have shown that they had no better logical foundations than those shown more than a century ago by Bohm-Bawerk’s criticisms, which proved to be totally specious. Thus, as any criticism of this theory could have the consequence of questioning the entire theoretical construction of Marxism, many Marxists have seen the Neo-Ricardians’ criticism as yet another attempt to discredit the scientific bases of Marx’s analysis and undermine many of his arguments that were originally formulated in terms of labour values (Mandel, Freeman, 1984; Freeman, Carchedi, 1996).

Thus, to unravel the great complexity of this issue, the major question is: why did Marx show so much obstinacy in dealing with capitalist dynamics in terms of labour values, even though, as we shall see, he well knew that real exchange-values of commodities were not actually proportional to the ratio between the labour incorporated into them?

To answer this question, in section 2 we preliminarily examine the original objectives of Marx’s research programme. In section 3, then, we shall focus on two major issues that

we believe form the crux of the question. The first is what was the real meaning and role of Marx's labour theory of value in his thought. The second is whether or not Marx's labour theory of value is legitimate from an epistemological viewpoint, regardless of whether it is useful or not in explaining capitalist dynamics. In section 4 we will present our own interpretation of what is known as the "transformation problem", in line with the theses argued in the previous sections.

In conclusion, we shall argue that Marx's version of the labour theory of value plays the same role in his system that conservation laws play in most physics theories, with significant consequences for an understanding of the dynamics of capital accumulation, business cycles and economic crises.

## 2. *Marx's research programme*

The main problem in approaching Marx from an economic viewpoint, as Blaug observes, is that he "created a system that embraced all the social sciences and we can only consider his economics on its own by doing an injustice to his philosophical, sociological and historical ideas" (Blaug, 1985). However, when we are forced "to carve out Marxian economics from Marxism" (Blaug, 1985), we are not only doing injustice to the other components of his system, but also risk losing sight of the original objectives of his reasoning.

Marx was, in fact, primarily a classical German philosopher, who applied his "acquired 'materialist' - interpretation of history in the crucial field of 'social economy'" (Rosdolsky, 1977).

Engels, in his short biography of Marx, identified German idealist philosophy, French socialism, and English political economy as the three major components of Marx's thought (Engels, 1989), and in a letter to Marx, Lassalle defined him as "a Hegel turned economist, a Ricardo turned socialist" (McLellan, 1973). Moreover, according to Lenin, Marx actually produced a consistent *synthesis* of the three main theoretical currents of the 19th century previously identified by Engels (Lenin, 1914; Pilling, 2012). In a nutshell, according to his closest friend and faithful followers, Marx was no run-of-the-mill classical economist, but a socialist thinker who applied his version of Hegelian dialectics to the critique of classical political economy.

In fact, as representatives of the rising bourgeoisie the classical economists before Marx had as their main objective to explain the rules of the functioning of the new bourgeoisie economy, underlining its merits in improving the wealth of Nations. Marx's objectives, by contrast, were those of a leader of a revolutionary movement who wanted to contribute to a political programme to revolutionise and regenerate this economy.

In his preface to Volume I of *Capital*, Marx states that his work aims to examine "the *capitalist mode of production*, and the *relations of production and forms of intercourse* [Verkehrsverhiiltnisse] that correspond to it"<sup>3</sup> (Marx, 1990). Thus, Marx's interest in classical political economy derived from his own *materialist conception of history*, according to which *every mode of production* is only a transitory moment in the history of humankind (McLellan, 1973). Consequently, also the capitalist mode of production

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<sup>3</sup> Our italics



has to have its origin, rise, development, decline and disappearance (Mandel, 1990). Marx, therefore, was not seeking *universal laws of functioning* of economic systems, as the classical economists did, and his main objective was to discover and analyse the *laws of motion* of the prevailing mode of production in his age, in order to forecast the main turning points in its evolutionary path and probable end.

In his preface to *A Contribution to the critique of political economy*, moreover, Marx says that the objective of his work is to examine “the *economic conditions of existence* of the three great classes into which modern bourgeois society is divided” (Marx, 1858). Of course, this claim would be very unusual for any present economist, because, in the context of the present division and specialisation of intellectual work, it would appear to be more a sociological objective than an economic one. However, it would also have been a very peculiar task for classical economists, who dealt with classes only as agents of production of the wealth of Nations, which was the real objective of their analysis.

Throughout his life, Marx traced out two successive and different outlines for his main economic work: the first in 1857 and the second in 1866 (Rosdolsky, 1977). The first outline, according to his original research programme, was very ambitious in extent and included six books: the first on capital, the second on landed property, the third on wage-labour, the fourth on the state, the fifth on foreign trade and the sixth on the world market and crises. Successively, he spent about nine years writing a substantial set of draft notes, which today form what is known as the *Rough Draft* or *Grundrisse*, in which, however, only the first three sections of the first book on the capital were actually covered. Thus Marx decided to change his first outline radically, narrowing down the research field but, at the same time, expanding the part about “capital in general” – i.e. the analysis of production and circulation processes of capital made by abstracting from competition between capitals and the relations between industrial and monetary capital. This part would in the end form Volumes I and II of *Capital*, while the third book would gather all the analyses of the “forms of the process as a whole”, including competition and credit (Rosdolsky, 1977).

The reasons for this change, according to Rosdolsky, are closely related to the method of Marx’s work, which is clearly set out in his famous *Introduction* to the *Grundrisse*, which was to deal with the universal, abstract characteristics that all social production processes show, but which he decided, by the turn of 1858, to give up, because “it seems to me confusing to anticipate results which still have to be substantiated” (Marx, 1858, p. 261).

In this text Marx argues that the method of “ascending from the abstract to the concrete” is the only scientific way of “appropriating the concrete and reproducing it as the concrete in thought”. According to him, “the concrete is concrete because it is the synthesis of many determinations, hence the unity of the diverse”. Therefore, it can only be fully understood by means of thought as a “process of synthesis” – i.e. “by means of the progressive reconstruction of the concrete from the most simple, abstract, definitions of the concrete itself” (Marx, 1973; Rosdolsky, 1977). Thus, scientific analysis of political economy must ascend “from the simple, such as labour, division of labour, need, exchange-value ... to the state, exchange between countries and the world market” (Marx, 1973), in order to grasp the *development of the capitalist mode of production* in its totality.

According to Rosdolsky, this observation, which has been quoted so often, provides an explanation of the structure of the first Marx’s outline as a “path from abstract

definitions to the concrete” – the same procedure we find in *Capital* – where Marx begins with “capital in general” in order to reach, by examining competition and the credit system, capital in its most developed form – i.e. *share-capital*.

Thus, Rosdolsky’s reconstruction of *the making of Capital* supports Mandel’s opinion, which we quoted in the previous section, that Volumes I and III of *Capital* are at different levels of abstraction and deal with different issues. From this viewpoint, Volume III is really the “close of Marx’s system”, as Bohm-Bawerk sensed with no understanding, in which Marx meant to show “the manufacturer” and “the Vulgar Economist” how the *real essence of the economy*, discovered and analysed by means of abstract forms in Volumes I and II, was connected to “*the immediate form of appearance of relations reflected in their brains*” (Marx, 1867). Thus, in Volume III profit and the rate of profit are systematically dealt with for the first time as “visible surface” forms of the invisible essence – i.e. surplus-value and the rate of surplus-value – discovered by means of logical investigation in Volume I. The rate of profit, therefore, is not the final key concept achieved by means of reasoning in terms of values, as Steadman and Garegnani held, but the “historical starting point” of analysis, which can only be understood in its real social essence by means of analysis in term of values – i.e. in terms of abstract social labour incorporated in commodities. This empirical starting point of the logical analysis, of course, consistently with a dialectical exposition, is dealt with in *Capital* only at the end of the reasonings, summarising the previously identified abstract forms.

In fact, answering a letter by Engels (1867), who underlined some possible objections by “the manufacturer” and “vulgar economist” to his analysis in Volume I of *Capital*, Marx (1867) wrote:

Regarding the objection that you mentioned the philistines and vulgar economists will infallibly raise [...] it amounts, in scientific terms, to the following question: How is the value of the commodity transformed into its price of production, in which

1. the whole of the labour appears paid for in the form of wages;
2. the surplus-labour, however, or the surplus-value, assumes the form of an addition to the price, and goes by the name of interest, profit, etc., over and above the cost-price (= price of the constant part of capital + wages).

Answering this question presupposes:

- I. That the transformation of, for example, the value of a day’s labour-power into wages or the price of a day’s labour has been explained. This is done in Chapter V of this volume.
- II. That the transformation of surplus-value into profit, and of profit into average profit, etc., has been explained. This presupposes that the process of the circulation of capital has been previously explained, since the turnover of capital, etc., plays a part here.

This matter cannot therefore be treated prior to the 3rd book [...]. Here it will be shown how the philistines’ and vulgar economists’ manner of conceiving things arises, namely, *because the only thing that is ever reflected in their minds is the immediate form of appearance of relations, and not their inner connection*. Incidentally, *if the latter were the case, we would surely have no need of science at all*<sup>4</sup>.

Now if I wished to refute all such objections in advance, *I should spoil the whole dialectical method of exposition*. On the contrary, the good thing about this method is that it is constantly setting traps for those fellows which will provoke them into an untimely display of their idiocy (Marx, 1867).

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<sup>4</sup> Our italics.

The final part of this letter, of course, might even justify Bortkiewicz' feeling that Marx liked to play a Mephistophelian role. Yet in fact, it shows once again how much his method of "ascending from the abstract to the concrete" influenced the inner articulation of his outline.

However, what role did Marx's labour theory of value play within this outline and what epistemological validity and analytical utility can it have for today's economics?

### 3. *The relevance of Marx's labour theory of value*

Much has been said about the significance Marx attributed to the labour theory of value and the role this played in his system, for better or worse. According to most orthodox Marxists, of course, the concept of value is essential for Marx's most important insights about the capitalist economy (Saad-Filho, 1997). However, there is no general agreement on the reasons why it is relevant, because different scholars hold different ideas of value.

According to some authors, for instance, Marx's value system is only a useful and convenient approximation of the price system and there is no mathematical relation between them (Miconi, 1981). According to others, it is relevant to understanding capitalist exploitation of wage-workers.

However, in the following pages we will focus only on the relevance of Marx's labour theory of value from a strictly economic viewpoint.

We agree with Mandel in holding that in Marx's economic theory the *law of value* plays a triple role (Mandel, 1990). Firstly, it *governs* – and *does not determine* – the exchange-values of commodities, "in so far as reduction or increase in the labour-time needed for their production makes the price of production rise or fall" (Marx, 1991). Secondly, and more importantly, it determines the relative proportions of total abstract social labour – i.e. total material resources of society – over different branches of production, according to the social "effective demand" for different kinds of commodities. Thirdly, *it rules economic growth*, by determining what we may call *Marx's average rate of profit*<sup>5</sup> and directing investment towards those sectors where the *price rate of profit* is above average, and away from those sectors where this rate of profit is below average.

Marx's labour theory of value is only partly a development of the labour theory of value utilised by Ricardo, because the latter was radically changed by Marx in both meaning and function. Marx, in fact, unlike Ricardo, states that "labour which creates exchange value is [...] *abstract general labour*" (Marx, 1990)<sup>6</sup>, so that, according to Mandel, he cannot be in any way seen as an "advanced Neo-Ricardian" (Mandel, 1990). According to Ricardo, labour is a numeraire that enables an evaluation of production costs. For Marx, labour is "substance of value" – i.e. simply that proportion of the total human production capacity existing in a given society in a certain period, which is used to produce a given commodity at the average social labour productivity, divided by the

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<sup>5</sup> This "rate of profit", in truth, should be more simply defined as *the ratio between surplus value and total capital*, because, as we shall see, it can differ from the *price rate of profit* (Shaikh, 1984).

<sup>6</sup> According to Foley (1986), this concept of abstract labour is the most difficult of Marx's ideas for economists.

total number of the commodities produced (Eatwell et al., 1990). Thus, labour quantities as “substance of value” are quite different from labour quantities as numeraire (Mandel, 1990).

As we can read in the above cited *Introduction to Grundrisse* (Marx, 1973), the starting point of Marx’s analysis is *material production* by “individuals producing in society” – i.e. individuals who, wittingly or not, are within an actual system of social division of labour. This objective, of course, automatically placed social labour at the centre of his analysis and caused him to see exchange-values only as occurrences of the impersonal and unconscious social division of labour within a commodity-producing society.

Thus, Marx’s labour theory of value is certainly not reducible to Ricardo’s idea that commodities are exchanged according to the quantity of homogeneous labour required for their production. Of course, in Volume I of *Capital* Marx often developed his arguments in terms of “exchange of equivalents”, in accordance with alleged “immanent laws of the exchange of commodities”. However, in this volume the postulate of exchange of equivalents served as an initial approximation to show that capitalist exploitation was not based on any uneven exchange, but precisely on the payment of the “right value” of labour force, which is different from the value its labour produces.

Yet Marx also took pains to specify, in the footnote 24 of chapter 4, that:

If, therefore, he [the manufacturer] were at all interested in disinterested thinking, he would formulate the problem of the formation of capital as follows: How can we account for the origin of capital on the assumption that prices are regulated by the average price, i.e. ultimately by the value of the commodities? *I say ‘ultimately’ because average prices do not directly coincide with the values of commodities, as Adam Smith, Ricardo, and others believe* (Marx, 1990)<sup>7</sup>.

Of course, we might wonder why Marx hid something so significant in a footnote, reserving his explanation of the mystery only for Volume III of *Capital*, which he never published. And once again the answer can be found in his method and idea that “any anticipation of yet-to-be proved results would be a distraction” (Rosa Luxemburg, 1977).

In fact, Marx took over the concept of value of the classical economists which was in his time still the most commonly accepted by his potential socialist readers, but used it to draw very different conclusions (McLellan, 1973). Ricardo’s concept of labour value, elaborated for other objectives, proved a useful “determined abstraction”<sup>8</sup> for Marx to analyse the historically determined “system of bourgeois economy”. In this regard, Engels, in his preface to Volume II of *Capital*, offered a parallel with the history of chemistry, saying that “Marx is related to his predecessors in the theory of surplus-value as Lavoisier was to Priestley and Scheele”, who were the unintentional discoverers of oxygen. Thus, to Engels’ eyes, Ricardo had the merit of having unintentionally discovered the concept of labour value that Marx successively developed to usher in a new social science. However, according to Engels:

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<sup>7</sup> Our italics.

<sup>8</sup> In general, abstraction is a product of the mind, but a *determined abstraction* is a product of the mind accordant with the real and concrete, where, according to Marx’s method, the concrete is such “because it is a synthesis of many determinations, thus a unity of the diverse” (Marx, 1858).

First and foremost, Ricardo's theory of value itself had to be subjected to criticism. Marx therefore investigated labour from the point of view of its value-forming quality, and established for the first time what labour, why, how it formed value, and that value in general is *nothing more than congealed labour* of this kind<sup>9</sup> (Engels, 1992).

Thus, according to Engels Marx took up Ricardo's concept of labour value to utilise it in the context of a totally different research programme and consequently transformed it.

Marx had his new insight into labour value by means of "the power of abstraction", by analysing "the commodity-form of the product of labour, or the value-form of the commodity" – i.e. "the economic cell-form" – from a philosophical viewpoint (Marx, 1990)<sup>10</sup>. But – and above all – in order to show that capitalism is merely a historically relative system of class exploitation, he developed Ricardo's analysis by introducing the idea of surplus-value, defined as the difference between the value of the products of labour-power and the cost of producing that labour-power – i.e. the labourer's subsistence (McLellan, 1973)

To those who raised doubts about the advisability of using the labour theory of value, like his friend Kugelmann, Marx answered:

And every child knows, too, that the amounts of products corresponding to the differing amounts of needs demand differing and quantitatively determined amounts of society's aggregate labour. It is *self-evident* that this necessity of the distribution of social labour in specific proportions is certainly not abolished by the specific form of social production; it can only change its form of manifestation. Natural laws cannot be abolished at all. The only thing that can change, under historically differing conditions, is the form in which those laws assert themselves. And the form in which this proportional distribution of labour asserts itself in a state of society in which the interconnection of social labour expresses itself as the private exchange of the individual products of labour, is precisely the exchange value of these products (Marx, 1868).

Thus, for Marx, the *law of value* was simply the impersonal mechanism, in certain respects rather similar to Smith's *invisible hand* that is at work within a commodity-producing society, whereby social labour is distributed in proportions that correspond to the different social needs (Pilling, 2012). This law lies simply in the fundamental insight that the total amount of commodities exchanged in a commodity-producing society, during a certain period of production, is the "crystallised" quantity of abstract social labour which is *necessary* to produce them. Consequently, abstract social labour is the *real social substance* of exchanged commodities, and labour time<sup>11</sup> is the measure of aggregate production. And behind the empirical "appearance" of a commodity exchange,

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<sup>9</sup> Our italics.

<sup>10</sup> However, according to Marx, this kind of abstraction "is made every day in the social process of production" (Marx, 1990), basically by means of money and monetary prices of commodities. This idea of Marx's is crucial in the "macro-monetary" interpretation of his logical method, which leads its advocates to measure embodied labour directly by means of money values (Foley, 1986; Bellofiore, 1989; Moseley, 2010; Moseley, 2016). However, in our opinion, this approach raises the problem of how we must measure the money value (Fine et al, 2004) and reintroduces all the distortions connected to a non-invariable unit of measure.

<sup>11</sup> "Just as motion is measured by time, so is labour by labour time" (Marx, 1990).

*apparently independent producers are really socialising the labour incorporated in their private products.*

However, exchange is a *zero-sum game* and cannot change the quantities involved. Some people could receive more than they give, while others could receive less, but, on average, exchange-values, which ultimately are governed by values, have to equal the ratio between the labour quantities embodied in commodities. This does not mean that the exchange-value of every commodity symmetrically oscillates around its value, but that the positive differences between exchange-values, measured in labour time, and values of some commodities are balanced by the negative differences of others. In other words, *the sum of commodity exchange-values, measured in labour time<sup>12</sup>, has, by definition, to equal the total labour incorporated in social production.* In doing so, Marx brought about a ground-breaking change in the meaning of the labour theory of value, locating it at the level of the aggregate production of commodities or the average commodity (Foley, 1986).

Moreover, according to Marx's dialectical method, no relation between parts can be understood without understanding whole-part relations – i.e. the *totality* or the *dialectical synthesis*, which is the only *form* in which all the contradictions can coexist. Thus, *Marx's labour theory of value* is simply the *form of closure* of his system – i.e. the *general constraint* that alone gives real meaning to all the *determined abstractions* he utilised to explain capitalist dynamics. From this viewpoint, as we will show in the next section, the significance of Marx's *law of value* is the same as that of *conservation laws* in physics.

Furthermore, in accordance with his research programme, Marx was essentially interested in discovering the *laws of motion* of the economic systems in which *prevails* the capitalist mode of production. Consequently, he was primarily interested in analysing the historical dynamics of the main aggregates that describe these systems and his major objective undoubtedly was analysis of the *movement of their aggregate magnitudes*. And, once again, these dynamics could substantially be described in terms of value – i.e. incorporated labour – which had the additional advantage of being an “invariable” unit of measure<sup>13</sup>.

Consequently, we agree with Morishima (1973) in holding that Marx actually utilised his labour theory of value, wittingly or not, to aggregate the large number of real industries, characterised by heterogeneous physical products in a single macroeconomic system or in a small number of departments. Marx was, in fact, the first real macroeconomist in the history of economic thought before Keynes<sup>14</sup>, in the sense that he first dealt with macroeconomic aggregates and their laws of motion (Morishima, 1973).

In short, regardless of Marx's method and the philosophical paths he took to arrive at his fundamental insight with his *law of value*, from a modern epistemological viewpoint

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<sup>12</sup> “To measure the exchange values of commodities by the labour time they contain, the different kinds of labour have to be reduced to uniform, homogeneous, simple labour, in short to labour of uniform quality, whose only difference, therefore, is quantity” (Marx, 1990).

<sup>13</sup> The desirability of an “invariable measure” of exchange-values has often been emphasised in economic literature, because expressing the relative prices in terms of a numeraire makes it impossible to distinguish the effect of any change of the technical features of the commodity itself from that of changes in technological features of the numeraire (Bellino, 2004).

<sup>14</sup> Loria, for example, in his critique of Marx's theory of value, claimed that value is simply the ratio in which one commodity is exchanged for another and very idea of an absolute value is nonsense (Engels, 1992), thus showing total misunderstanding of every macroeconomic approach.

this insight can legitimately be interpreted as a *principle* – i.e. a preliminary theoretical assumption, on the basis of which some logical statements can successively be developed. This assumption, which, in accordance with Borkiewicz’ opinion, can also be taken into account as only “hypothetically effective”, equals that of a homogeneous product utilised to develop some macroeconomic models abstracting from the problems of structure, coordination and price determination (Solow, 1992).

Moreover, measuring economic aggregates in terms of incorporated homogeneous labour is totally legitimate as well as possible on the basis of the necessary labour calculated by means of labour coefficients in an input-output model, as was well demonstrated by Morishima (1973), and this is possible with no reference to exchange-values or production prices. Therefore, from this viewpoint all of Marx’s assertions contained in Volumes I and II of Capital are based on sound science, regardless of the problem of consistency between the system of values and the system of production prices which emerged in Volume III. Furthermore, incorporated abstract labour is an “invariable” measure of social product that is easier to calculate on an empirical basis than other kinds of possible theoretical invariable measures, like Sraffa’s standard commodity.

Of course, Morishima’s interpretation of Marx’s labour theory of value as a twofold problem of production prices and embodied labour coefficients certainly risks losing sight of the theory’s roots in the philosophy of historical materialism<sup>15</sup> (Foley, 2000). However, it highlights the scientific legitimacy of measuring aggregate social product in terms of *simple* and *necessary*<sup>16</sup> labour even outside this philosophical context, although, of course, the latter explains the original reasons for Marx’s choice.

However, some might reasonably argue that there is no need to measure economic aggregates precisely in this way. Shibata (1939), for example, while recognising that the Marxian assertion that different products can be reduced to some common entity, like social abstract labour, cannot be denied, pointed out that there is equal logical justification in asserting they could also be reduced to some other common entity, like social utility. Of course, any Marxist could object to this assertion observing that social abstract labour, as quantity of homogeneous substance, is merely the result of a *determined abstraction* from concrete reality. Utility, instead, as homogeneous substance itself, presupposes an ideal assumption – that is: all human sensations and feelings generate a homogeneous psychological effect (cardinal utility), or, according to more modern interpretations, the social preference ordering is single-peaked.

Yet ultimately, the real issue is whether a legitimate way of measuring economic aggregates has some advantages others lack. Thus, the utility of measuring economic

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<sup>15</sup> According to Foley, the so called “new interpretation”, which identifies the monetary expression of labour time with the ratio between money value added and living productive labour expended in its production, approaches this problem and opens the way to a new research programme more consistent with Marx’s original programme (Foley, 2000). However, we believe that the warning highlighted in footnote 10 applies in this case too.

<sup>16</sup> Necessary labour calculated according to Morishima’s model, moreover, emerges from a system of simultaneous equations and avoids utilising dated labour inputs, which some economists had done (Dimitriev, 1974; von Weizsacker, 1971; Vicarelli, 1981; Garegnani, 2018). Dated labour inputs, in fact, are more consistent with Smith’s approach of labour commanded than with Marx’s concept of necessary labour, based on the labour technically and potentially necessary at the time in which commodity is exchanged.

aggregates in terms of incorporated abstract labour ultimately depends on the opinion that each of us has of the originality and significance of Marx's analysis as compared with other approaches.

In addition, according to Marx what determines the magnitude of the value of a commodity is "socially necessary labour-time" – 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 prevalent in that society" (Marx, 1990, p. 129). However, the technological meaning of this concept coexists in Marx's work with the meaning that labour incorporated in every commodity is recognised as 'socially necessary' if and only if it corresponds to the aggregate demand for every commodity by society (Rosdolsky, 1977). Thus, *Marx's law of value* contemporary brings into play exchange-values and quantities really exchanged.

In conclusion, Marx dealt with aggregates in terms of values because he basically considered prices of production as "accidental" as market prices, in the sense that they are merely the result of accidental technical conditions that influence the organic composition of the different departments of economic system. However, prices are the surface evidence for agents involved in capitalist production and circulation. Thus, Marx's analysis ultimately had to account for prices, too. Yet for him the relation between values and prices was simply a relation between "substance" and "forms of appearance". And, of course, substance can change form, but form can never change substance. And this is the core of Marx's "transformation".

#### **4. *The real objective of Marx's "transformation" and Bortkiewicz's solution***

Debate on the role of the so called "transformation problem" in Marx's theory, as we know, has gone on for over a hundred years (Desai, 1988). It started in 1885 with Engels' announcement, in his preface to the second volume of *Capital*, that Marx, as opposed to Rodbertus and his pupils, had solved Ricardo's problem of reconciling the labour theory of value with the uniform rate of profit imposed by competition. This solution – namely the possibility of deriving prices of production from labour values, at the same time showing that total profits equal surplus value – was precisely the core of Marx's transformation procedure (Desai, 1988).

According to Engels, this logical procedure was relevant, showing how logically superior Marx's labour theory of value was to other contemporary popular versions, like that proposed by Rodbertus, even though it was not the major objective of Marx's work. However, Engels was over-optimistic in thinking that the publication of the third volume of *Capital* would solve the issue, and once he was aware, on editing this volume, of the shortcoming in Marx's "transformation", he decided to launch his famous "Prize Essay Competition" in the theory of value, to mobilise the brightest Marxist minds of his age to complete Marx's draft (Howard, King, 1987; 1989). However, in doing so he was in reality only preparing the main battleground between Marxists and their opponents over the following century (Desai, 1988).

In the draft notes for Volume III of *Capital* Marx argued that a uniform rate of profit is possible only if we give up the postulate of equal exchange and allow production prices of commodities to be higher or lower than the amount of labour directly and indirectly



embodied in the commodities. However, in this case, too, he saw the labour theory of value as remaining valid in the sense that *the sum of production prices have to equal the aggregate social labour time* (Foley, 1986). Thus, as he saw it, production prices merely redistribute the surplus value among capitalists. In fact, Marx, claimed that it was possible to calculate production prices that equalized the rate of profit for all sectors while maintaining all of the results of the labour theory of value for the economy as a whole.

However, Marx's attempt to explain the transformation of values into production prices, as we know, was wrong or incomplete, according to different interpretations<sup>17</sup>, because it breaks his own schemes of simple reproduction (Sweezy, 1946). Marx was fully aware of this problem, as is evident from some notes to the main text, but was also confident that it could be technically solved without affecting his entire theoretical framework. And it was precisely this firm belief of Marx's that encouraged Engels to promote his "Prize Essay Competition". Engels' intention, in fact, was to correct the transformation procedure, as well as Marx would have if he had had the time and opportunity, to close his circle from *abstract* to *concrete* – from the *determined abstractions* dealt with in Volume I of Capital to the *forms of appearance* that sound so familiar to "manufacturers" and "vulgar economists".

However, since publication of Volume III of Capital, correct solution of the transformation problem has often been regarded as vital to the logical consistency of Marx's entire system and every failure in this task has been taken as symptomatic of the failure of the entire Marxist approach (Laibman, 1973-74).

Of course, there have been a number of different attempts at solutions over the last century, following different approaches and assumptions. However, here we will focus only on the *Bortkiewicz's* solution, which is usually taken as the first step in what has come to be known as the *Bortkiewicz-Sraffa-Steelman tradition* (Giussani, 1998-1999) and is the most consistent approach with the controversy between Marxists and Neo-Ricardians.

Bortkiewicz's solution (1907, 1949) was largely accepted by orthodox Marxists for a long time<sup>18</sup> (Sweezy, 1946). In fact, production price calculation applying his method causes no disturbance to the equilibrium of simple reproduction. However, this method of transforming values into prices does not leave the total magnitudes unchanged.

The problem turns on the organic composition of capital in the numeraire industry compared with that of the total social capital, evaluated in terms of incorporated labour. In fact, one hour of labour incorporated in one physical unit of the numeraire will be equivalent, in terms of production prices, to more or less one hour of social abstract labour, depending on whether its price is greater or less than its value. However, no significant theoretical issues are involved in this divergence of total value from total price, because it is simply a question of change of unit of account during the transformation

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<sup>17</sup> It is wrong according to supporters of the "fundamental Marxian theorem" (Morishima, 1973) but only incomplete according to supporters of iterative solutions (Panizza, 1981).

<sup>18</sup> Of course, this is not the case for Marxists, who today agree with the "new solution" and "new interpretation" approaches (Giussani, Vale, 1991; Fine et al., 2004). However, this solution avoids the difference between profits and surplus value because it measures surplus value as the difference between value added and variable capital in terms of money prices and, in doing so, transfers the difference between profits and surplus value, measured in terms of incorporated value, into the difference between the value of money and its production price.

process, moving on from the unit of labour time to the physical unit of the numeraire (Sweezy, 1946). Furthermore, calculation of production prices in terms of a numeraire is merely a way to solve the system of equations more simply, by substitution. There is, however, no need to do so. And utilising the same unit of account in both the value and the price schemes, the totals would be the same!

Bortkiewicz (1949), following a suggestion by Tugan-Baranowsky, put together the five spheres of production in the original example by Marx into just three departments of production: means of production (department I), workers' consumption goods (department II) and capitalists' consumption goods (department III).

Marx's simple reproduction conditions in this simplified system are expressed by the following system of equations:

$$\begin{aligned} c_1 + v_1 + s_1 &= c_1 + c_2 + c_3 \\ c_2 + v_2 + s_2 &= v_1 + v_2 + v_3 \\ c_3 + v_3 + s_3 &= s_1 + s_2 + s_3 \end{aligned} \tag{1}$$

where  $c_i$ ,  $v_i$  and  $s_i$  are, respectively, constant capital, variable capital and surplus value in  $i$ th department, with  $i = 1, 2, 3$ .

Of course, this system of equations, in which magnitudes are measured in terms of incorporated labour, shows the equilibrium conditions of the economic system in terms of homogeneous social "physical" units – i.e. incorporated abstract social labour – but not of exchange values. They are only conditions for physical viability. However, exchange values have to be consistent with both these viability conditions and the competitive condition of a uniform rate of profit.

The correct transformation from values to production prices, according to Bortkiewicz, is as follows:

$$\begin{aligned} (1 + \rho)(c_1x + v_1y) &= Cx \\ (1 + \rho)(c_2x + v_2y) &= Vy \\ (1 + \rho)(c_3x + v_3y) &= Sz \end{aligned} \tag{2}$$

where:

$\rho$  is the rate of profit;

$C = c_1 + c_2 + c_3$ ;

$V = v_1 + v_2 + v_3$ ;

$S = s_1 + s_2 + s_3$ ;

$x$ ,  $y$  and  $z$  are, respectively, production price to value ratio of the products in departments I, II and III. They are the actual percentage of the real value of any kind of commodity acquired in the exchange by their producers, according to production prices.

Now, we have three equations with four unknowns ( $x$ ,  $y$ ,  $z$ , and  $\rho$ ), and we are therefore at a crossroad. On one hand, in accordance with Marx's approach - according to which production prices can only redistribute total value among the departments – we can introduce a fourth equation to impose the following constraint on the system:

$$Cx + Vy + Sz = C + V + S \quad (3)$$

On the other hand, we can choose a numeraire among the products of the three departments. In this case, for example, we can put  $z$  equal to 1.

Bortkiewicz chose the latter way in order to reduce, as he said, the number of equations and simplify the solution procedure. However, he probably made this choice also because, as a Ricardian, he was not able to conceive of an exchange value as anything other than a relationship between things. And, in fact, this was also the way followed by Garegnani (2018), even though he presented it as an alleged logical necessity.

To achieve the simplest formulas, Bortkiewicz also transformed the equation system as follows:

$$\begin{aligned} (1 + \rho)(x + f_1y) &= g_1x \\ (1 + \rho)(x + f_2y) &= g_2y \\ (1 + \rho)(x + f_3y) &= g_3z \end{aligned} \quad (4)$$

where:

$$f_i = \frac{v_i}{c_i} \quad i = 1,2,3 \quad (5)$$

$$g_i = \frac{c_i + v_i + s_i}{c_i} \quad i = 1,2,3 \quad (6)$$

By the way, we can also observe that both  $f_i$  and  $g_i$  are decreasing functions of the *organic composition* of capital in department  $i$ , which, according to Marx's definition, is given by:

$$q_i = \frac{c_i}{c_i + v_i} \quad (7)$$

In fact, we can write  $f_i$  and  $g_i$  respectively as follows:

$$f_i = \frac{1 - q_i}{q_i} \quad (8)$$

$$g_i = \frac{1 + \sigma(1 - q_i)}{q_i} \quad (9)$$

where  $\sigma$  is the rate of surplus value, which is, according to the surplus value theory, assumed to be the same in all the departments:

$$\sigma = \frac{s_i}{v_i} \quad i = 1,2,3 \quad (10)$$

From the first equation of system (4) we get:

$$x = \frac{f_1 y (1 + \rho)}{g_1 - (1 + \rho)} \quad (11)$$

Now, by substituting this value in the second equation, we get:

$$(f_1 - f_2)(1 + \rho)^2 + (f_2 g_1 + g_2)(1 + \rho) - g_1 g_2 = 0 \quad (12)$$

which is a quadratic equation in the *upright*.

This equation yields one and only one significant solution in economic terms (Bortkiewicz, 1949). Therefore, it follows that the uniform rate of profit is as follows:

$$\rho = \frac{-(f_2 g_1 + g_2) + \sqrt{(f_2 g_1 + g_2)^2 + 4(f_1 - f_2)g_1 g_2}}{2(f_1 - f_2)} - 1 \quad (13)$$

At first sight, this uniform rate of profit seems to be a function of the “technological” parameters of departments I and II alone, but it is in fact also an increasing function of the *rate of surplus value*, because both  $g_1$  and  $g_2$  are increasing functions of the latter. Yet, contrary to Marx’s belief, the rate of profit depends solely on the organic compositions of departments I and II and not on the organic composition of total social capital. This feature is also consistent with Sraffa’s finding that the rate of profit is determined only by the equations related to basic products.

However, in this solution the uniform rate of profit does not depend on prices of production, but only on the organic compositions of the different departments and the rate of surplus value, all measured in terms of values. Thus, the rate of profit is totally within the system of values!

Moreover, this specification of the rate of profit does not overturn Marx’s entire system, even though it forces us to correct some observations of his.

In fact, from the second equation of system (4), by means of simple transformations, it emerges that:

$$\rho < \sigma \quad (14)$$

Thus, the uniform rate of profit finds the rate of surplus value, which is Marx’s real key concept, as its upper limit.

Moreover, from the first equation of system (4) we get:

$$\rho < \frac{c_2 + c_3}{c_1} \quad (15)$$

Now, since from the first equation of system (1) we can get:

$$c_2 + c_3 = (1 + \sigma)(V - v_2 - v_3) \quad (16)$$

the growth of constant capital in departments II and III finds a limit in the value of  $\sigma$  and in the size of the total disposable variable capital, which in turn is constrained by the quantity of labour that society has at its disposal in a given economic period. Thus, with a given  $\sigma$  and a given quantity of variable capital, an “unlimited growth of constant capital cannot take place without producing a decline in the rate of profit” (Bortkiewicz, 1949). In this way, also the general tendency towards a falling rate of profit, if there is a tendency towards an increasing organic composition of social product, is confirmed, in total accordance with Marx’s analysis.

Moreover, if the organic composition of production processes were the consequence of general technological trends, the average organic composition of total social capital could in any case be assumed as a proxy of the tendencies that prevail in the sectors of means of production and wage goods, too. This issue, however, ultimately depends on what really drives technological change and how we explain the choice of techniques.

Returning to the transformation scheme, from the second and third equations of the system (4) we get:

$$y = \frac{g_3 z}{g_2 + (f_3 - f_2)(1 + \rho)} \quad (17)$$

Now, from equation (3) we can obtain the value for  $z$  as follows:

$$z = 1 + (1 - x) \frac{C}{S} + (1 - y) \frac{V}{S} \quad (18)$$

By substituting the value of  $x$  in equation (11) for the value of  $x$  into equation (18), we get:

$$z = 1 + \left(1 - \frac{f_1 y (1 + \rho)}{g_1 - (1 + \rho)}\right) \frac{C}{S} + (1 - y) \frac{V}{S} \quad (19)$$

and by substituting this value for  $z$  into equation (17), we obtain the value for  $y$  as follows:

$$y = \frac{g_3 \left(1 + \frac{C + V}{S}\right)}{g_2 + \frac{V}{S} g_3 + \left[f_3 - f_2 + \frac{C}{S} \left(\frac{g_3 f_1}{g_1 - (1 + \rho)}\right)\right] (1 + \rho)} \quad (20)$$

Thus,  $y$  is a function of the “technological” parameters  $f_i$  and  $g_i$  and the uniform rate of profit  $\rho$  – and consequently of the rate of surplus value too – but also of *Marx’s rate of profit* – i.e. the ratio between surplus value and total capital measured in terms of abstract social labour.

At this point, we can also calculate the value of  $x$  and  $z$ , which will in turn be functions of the technological parameters  $f_i$  and  $g_i$ , the uniform rate of profit, the rate of surplus value and *Marx’s rate of profit*.

In this scheme, in fact, it turns out that two different “rates of profit” play simultaneously a role in transforming values into production prices: the uniform rate of

profit that is usually dealt with by economists – i.e. the *price rate of profit* (Shaikh, 1984) – and *Marx’s rate of profit*, which is simply the ratio between surplus value and total capital measured in terms of incorporated abstract social labour. However, both these rates are exclusively determined within the system of values.

If we apply this transformation procedure to the numerical example in table 1 – which was originally utilised by Bortkiewicz (1949) – we obtain the magnitudes shown in table 2.

Table 1 – Value calculation

	Constant Capital	Variable Capital	Surplus Value	Total
I	225	90	60	375
II	100	120	80	300
II	50	90	60	200
Total	375	300	200	875

Table 2 – Price calculation

	Constant Capital	Variable Capital	Profit	Total
I	252	84	84	420
II	112	112	56	280
II	56	84	35	175
Total	420	280	175	875

In this transformation, contrary to Bortkiewicz’s original one, the sum of total prices of production equals the sum of total values. Of course, also this scheme confirms that the two fundamental equations of Marx’s original transformation – i.e. total prices equal total values and total profits equal total surplus value – can no longer be valid simultaneously. Thus, if prices have to equal total values – according to *Marx’s law of value* – profits cannot equal surplus values.

However, on explicitly imposing the constraint that the total magnitudes concerned – in terms of incorporated labour – cannot be changed by their price form, the question of what happens to the difference between profits and surplus value looms even larger. In this example, in fact, this difference is utilised to restore the amount of constant capital measured in terms of prices of production!

To better understand this point we have to keep in mind that the transformation scheme does not involve value distribution between capitalists and workers, but only surplus value distribution among capitalists. In fact, in the competitive exchange ruled by production prices - i.e. by a uniform rate of profit – capitalists that produce commodities whose production prices are greater than their value will get part of surplus produced in the departments that produce commodities whose production prices are less than their value. Thus, production prices only redistribute surplus among capitalists, but not

between this social class and the working class. The workers, on the basis of the postulate of subsistence wages, always get the same part, in terms of incorporated labour, of the social product<sup>19</sup>.

In fact, the transformation scheme only shows, for every department, the breakdown of the total social value, obtained by capitalists on the basis of production prices, between restoring the working capital and profits. Thus, in general, the difference between total profits and total surplus value is spread over the two components of the working capital – i.e. constant capital and variable capital – according to the differences between their values and prices of production.

Once again, an analogy of Marx's helps us to better understand this crux. According to him, in fact:

The various different capitals here [in the economic system as a whole] are in the position of shareholders in a joint-stock company, in which the dividends are evenly distributed for each 100 units, and hence are distinguished, as far as the individual capitalists are concerned, only according to the size of the capital that each of them has put into the common enterprise, according to his relative participation in this common enterprise, according to the number of his shares (Marx, 1991, p. 258).

Thus, if different private capitals are like shareholders in a social joint-stock company, the total surplus value can be appropriated by them in two ways: *as distributed profits and capital gains* (or *capital losses*). And capital gains or capital losses, in this case, are exactly the *differences between the price of production of capital components and their actual value in terms of incorporated labour*.

Of course, the *general uniform rate of profit* that governs prices of production can no longer be calculated from values as Marx did, but values, like *Marx's rate of profit*, do not cease to play any role in the way production prices redistribute surplus value among capitalists.

Therefore, as noted by Mattick, Samuelson's position – that Marx developed two separate systems (Samuelson, 1971) – paradoxically comes closer to Marx's theory than all the previous attempts to tackle the transformation problem (Mattick, 1972). What Samuelson did not understand was that, according to Marx's conception, the two systems have to be forced to equal each other to have a real understanding of the actual social nature of prices and profits. From Marx's viewpoint, in fact, "there is no way of understanding price formations except by way of the value concept" and "this has little to do with the value-price transformation problem as posed by Samuelson and his appointed adversaries, because the positions of both are based on a common misunderstanding of Marx's theory of value and surplus value" (Mattick, 1972).

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<sup>19</sup> Of course, the Marxists who support "macro-monetary" interpretation of Marx's method do not agree on this point, because they assume that money wages remain constant during the transformation (Foley, 1986; Moseley, 2010; Moseley, 2016).

## 5. Conclusions

In conclusion, as we interpret his thought, Marx did not deal with prices of production and the rate of profit as key concepts for his analysis of capitalist economies, as Steedman claimed. Nor, indeed, was Ricardo's problem a theoretical priority for Marx. His "transformation" of values into prices of production was simply a corollary aiming to close the circle from the determined abstractions he discovered by means of his dialectical analysis to surface forms of appearance, but by no means the crux of his system.

Furthermore, *Marx's law of value* was completely different from Ricardo's. According to Marx, labour was no numeraire and his *law of value* did not mean that commodities are exchanged according to the quantity of homogeneous labour required for their production. He took Ricardo's labour theory of value as an initial insight and radically changed it in both meaning and task. The essence of Marx's labour theory, as we see it, lies simply in the insight that, behind the empirical "appearance" of commodity exchange, *apparently independent producers are in reality socialising their labour incorporated in their private products*. Values exchanged in a commodity-producing society, therefore, are simply "crystallised" quantities of abstract social labour.

For Marx, however, abstract social labour, as *real social substance* congealed in products, was in fact also a way to measure economic aggregates and analyse their dynamics on the basis of an invariable unit of measure, and this feature of it has been confirmed as a legitimate and useful means to measure economic aggregates on the basis of input-output approaches.

Furthermore, Marx's *law of value*, from a modern epistemological viewpoint, can legitimately be interpreted as a *principle* much like the principles utilised in physics – for instance, the law of energy conservation. These *laws* are no logical consequence of other previous assumptions and can never ultimately be demonstrated by means of empirical evidence. They are merely original insights, consistent with previous experience or analyses, serving as a basis for further deductions, which must then be verified (or falsified) by means of empirical evidence (Feynman, 1967; Reddy, 2010).

From an economic viewpoint, in addition, Marx's law of value inextricably put together exchange values and quantities produced, interconnecting them within the whole of social production. Thus it also involves the relation between supply and effective demand and all the circumstances of disequilibrium useful to analyse economic crises and the different phases of expansion and recession that characterise economic cycles in a capitalist economy, creating analytic schemes unusual for the equilibrium approaches of mainstream economics, schemes that drove Joan Robinson to distraction (Robinson, 1966, 1979).

Furthermore, the transformation of values into prices, which has so often been utilised to cast doubts on the internal consistency of his thought, was merely sketched out in his draft notes and certainly led him to some incorrect generalisations. However, his original insight was right and his approximations were nonetheless robust. Bortkiewicz's solution sounds good and, associated with the right interpretation of Marx's law of value, confirms that prices of production and the price rate of profit can be explained on the basis of the system of values, connecting them to the rate of surplus value, which was the real key concept in Marx's system.



Of course, Marx's labour theory of value is not absolutely necessary to calculate prices of production consistent with a uniform rate of profit, but it is at best useful to better understand their social nature and the real social source of profit for people who are interested in understanding them.

Finally, *Marx's labour theory of value* is theoretically compatible with any pricing rule, even rules that do not provide for a uniform rate of profit, because of the uneven spread of technical change, barriers to entry and other possible causes.

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