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In his notes, as far as the theory of value is concerned, Sraffa states that the «delicate point», is the analysis of the relation between the wage rate and the rate of profit when wages participate in the distribution of surplus. Sraffa establishes a bridge among the ‘macro’ conception of a given surplus to be divided between the different social classes and the ‘micro’ analysis of the prices of the different commodities by equalizing the value of the net product to the labour employed in its production.

From this perspective Sraffa’s analysis can be linked to the ‘New Interpretation’ approach to the transformation of values into prices of production.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 55

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FROM «THE LOAF OF BREAD» TO «COMMODITY-FETISHISM»: A 'NEW INTERPRETATION' OF THE MARX-SRAFFA CONNECTION*

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<Per l'Autore: Pregasi, qualora non l'avesse già fatto, inviare 'abstract' di poche righe>

Sraffa's unpublished papers have attracted again the attention of different scholars on the relationship between Marx's and Sraffa's economic theories. However, the reading of these papers has not yet led to a generally accepted interpretation, but to contrasted hypotheses. This paper will focus on the role of the value of the net product and on its distribution among capitalists and workers in Sraffa's theory.

Several authors have supported Marx's theory of value as an analysis of social relationships. Sraffa seems to accept this conception. However, according to Sraffa the specific relationships Marx's theory analyses are neither the relationships among the «private producers of the different commodities», nor the competitive relationships among capitalists that lead to a general rate of profit. Rather, for Sraffa Marx's theory allows for the analysis of the relationships among the social classes of capitalist and workers. In his notes, as far as the theory of value is concerned, Sraffa states that the «delicate point», is the analysis of the relation between the wage rate and the rate of profit when wages participate in the distribution of surplus. In fact, in this case the wage rate cannot be defined as a given inventory of subsistence commodities but only in terms of a quantity of values (or as Marx puts it, «a magnitude of value»). In *Production of Commodities by Means of Commodities* the unit of measurement of price is chosen in sections 10 and 11, where the value of the net product is actually measured in terms of labour. From an analytical point of view, this unit of measurement is not arbitrary. It represents the necessary bridge among the 'macro' conception of a given

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surplus to be divided between the different social classes and the 'micro' analysis of the prices of the different commodities. Indeed, only by equalizing the value of the net product to the labour employed in its production does the ratio of aggregated wages to this net product, detected at the 'macro' level, correspond to the wage rate that appears in the 'micro' analysis of prices. Sraffa develops this non-arbitrary unit of measurement *before* the construction of the Standard commodity. This non-arbitrary unit of measurement is theoretically meaningful in itself, but at the same time it is a necessary foundation for the development of the Standard relation. The relation between the wage rate and the rate of profit cannot be defined in objective terms by applying other units of measurement. For this purpose, it is not useful to set the price of an arbitrarily chosen commodity equal to unity. On the contrary, it is necessary to start from the value of the net product in terms of labour and from this perspective Sraffa's analysis can be linked to the 'New Interpretation' approach to the transformation of values into prices of production.

1. Introduction

The interpretation of the relationship between Marx's theory of value and Sraffa's theory of prices and distribution is still a controversial issue, although Sraffa's unpublished papers now shed new light on this topic. Indeed, we discern from different passages of these unpublished papers contrasting conclusions that have been reached. For example, according to Heinz Kurz, the starting point of Sraffa's analysis in his papers of the 1920s was not Marx's labour theory of value.[1] However, in a recent essay, Gehrke and Kurz admit the influence of Marx's theory.[2] Moreover several scholars, such as Riccardo Bellofiore, Giancarlo De Vivo and Giorgio Gilibert, stress the links between Sraffa's theory of prices and Marx's analysis.[3]

In what follows I attempt to argue that an analysis of the relationship between prices of commodities and the value of the net product, similar, in several aspects, to Foley and Duménil's 'New Interpretation' of Marx's transformation of values into prices,[4] plays an essential role in the determination of the relation between the wage rate and the profit rate in *Production of Commodities by Means of Commodities*. The genesis of this idea can be traced in several passages of Sraffa's unpublished papers.[5]

[1] Kurz 2002.

[2] Gehrke and Kurz 2006.

[3] Cfr. Bellofiore 2001, 2008; De Vivo 2000, 2003, 2004; Gilibert 2004.

[4] See Duménil 1980, Foley 1982, Lipietz 1982.

[5] In what follows I will try to develop a rational reconstruction of Sraffa's theory rather than a philological study of Sraffa's unpublished papers. In this framework I will quote Sraffa's notes only from already published papers.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 57

Section 2 analyses some different interpretations of the origin of Sraffa's theory of prices based on a reading of his unpublished paper.

Section 3 discusses the three systems of equations of prices in *Production of Commodities by Means of Commodities*, respectively referring to 1. an economic system without surplus, 2. an economic system with surplus but with subsistence wages and 3. an economic system in which wages participate in the distribution of surplus. I will show that, in the latter case, certain analytical problems arise in the determination of the relationship between the wage rate and the rate of profit as well as in the definition of the wage rate as a magnitude.

Section 4 shows that Sraffa's solution to these problems consists in defining the wage rate as the share of wages in the net product. In order to obtain this result, the value of the net product is set equal to the aggregate living labour employed in the economic system. This solution is clearly suggested by several passages in Sraffa's unpublished papers, particularly where he refers to Marx's theory of value (and the so called transformation problem); and it is also developed, although not explicitly discussed, in paragraphs 10-12 of *Production of Commodities*.

In section 5, it is shown that the equality between the labour employed in the economic system and the value of the net product is necessary in order to develop the relation between the wage rate and the profits rate in the Standard system (par. 30 of *Production of Commodities*).

Lastly, in section 6, some conclusions about Sraffa's ideas on value and their connections with Marx's theory are developed.

2. The Debate on Sraffa's Unpublished Papers and the Theory of Value

Sraffa's system of prices in *Production of Commodities* is widely considered as the final refutation of Marx's theory of labour value. At the same time, several scholars believe that the starting point of Sraffa's analysis was Marx's theory of value itself. This latter contention is refuted by Heinz Kurz who argues that Sraffa's unpublished papers offer no evidence in support of this hypothesis. In a passage written in 1928, Sraffa stresses that there is no objective difference between the labour of a wage earner and that of a slave, a horse and even a machine and concludes: «it is a purely mystical conception that attributes to labour a special gift of determining value».[1] It is worth noting that a quite similar sentence appears in *Production of Commodities*, when Sraffa refers to

Per Autore: Corretto così da Marshall, come è nel suo originale (va bene?)

[1] Kurz 2002, 185. Sraffa's is here criticizing Marshall. In book vi of his *Principles*, Marshall stated: «The keynote of this book is in fact that free human beings are not brought to their work on the same principles as a machine, a horse or a slave» (Marshall 1920, 504). See Kurz and Salvadori 2005, 418-419.

the subsistence-determined wage rate: «we have up to this point regarded wages as consisting of the necessary subsistence of the workers and thus entering the system on the same footing as the fuel for the engines or the feed of the cattle».[1]

Kurz grounds his statement on sound arguments when he claims that Sraffa's starting point was not Marx's theory of value and the transformation of values into prices (although, Sraffa would have included Marx's theory in classical analysis):

> his starting point was first Marshallian and then classical analysis. He despised the subjectivist part of the former and contemplated, as we have heard, the possibility of doing away with it. But at the same time he was also critical of the labour theory of value. That theory involved, he stressed, a «corruption» of the theory of value based on the concept of «physical real cost», which he traced back to Petty and the Physiocrats and considered the right starting point.[2]

In this framework a note from 1927 becomes very clear. There Sraffa underlines the superior strength of Petty's and the Physiocrats' notion of prices and on the contrary argues that the classical theory of value of Smith, Ricardo and Marx, introducing the notion of the quantities of labour, would have encouraged the subjective notion of human efforts and Senior's theory of abstinence:

> it was only Petty and the Physiocrats who had the right notion of cost as 'the loaf of bread'. Then somebody started measuring it in labour, as every day's labour requires the same amount of food... A. Smith & Ricardo & Marx indeed began to corrupt the old idea of cost – from food to labour[3]

However, at the same time, Sraffa's stated that the ultimate result of his work would be «a restatement of Marx, by substituting to his metaphysics and terminology our own modern metaphysic and terminology... This would be simply a translation of Marx into English, from the forms of Hegelian metaphysics to the forms of Hume's metaphysics».[4]

Another interpretation focuses on a subsequent period of Sraffa's constructive work. As Giorgio Gilibert and Giancarlo De Vivo showed, the formulation of Sraffa's equations of prices has been strongly influenced by Marx's analysis of the second volume of *Capital* and its reproduction schemes rather than the third volume and the transformation of values into prices of production.[5]

Sraffa himself clearly points out the connections with the theory of labour-value. In fact, during the 1940s, he builds his equations on the hypothesis that the relationship among national income, measured by direct labour and constant capital, that is indirect labour, remains un-

[1] Sraffa 1960, 9. [2] Kurz 2002, 185.
[3] This passage is fully quoted in G. Gilibert 2004, 243.
[4] Quoted in De Vivo 2003, 7. [5] Idem 2004, 215.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 59

changed when the distributive variables change. Sraffa held this to be true also when the organic compositions of capital in the various productive sectors were different. Only subsequently did Sraffa realize that this hypothesis is not valid in general and dropped it. In formulating the strategy of exposition of the results provisionally reached on the base of the 'hypothesis', Sraffa states:

> we should proceed as follows. First by developing the 1st equations [the equations of a system without surplus], then the second (with r) [simple reproduction with surplus entirely consumed], then by introducing *w* as variable. This is the sensitive point: we must tell everything but we must not reveal the secret about the constant ratio between *C* and *V+S*: we can possibly say that the organic composition (expressed in vulgar terms) of the two groups is identical.. Finally we declare that this result is identical to that obtainable by using the Q.o.L. [quantity of labour], trace the genealogy of every commodity (by answering to the question; why *L*? why not horses or coal? The formal answer: it is the only constant quantity) and then show that the simplest method consists in substituting *S* [Surplus value], for *r* in the equation. Now, and only now, say that it is Old Moor [Marx].[2]

First of all, it must be emphasized that, according to Sraffa, the «sensitive» point is really the introduction of the wage as a variable magnitude and not as a given inventory of commodities. The problem of the relationship between the *value* of net product ($v + s$) and capital (c) appears when wages cannot be considered as a cost of production physically determined. It is precisely for this reason that, contrary to the 1928 passage quoted above, the analytical role of labour («only constant quantity») is emphasized in opposition to that of the horses and of coal. Different from the 1960 passage on the subsistence-wage, here Sraffa focuses on the role of labour, not on the role of the «loaf of bread» or the subsistence-commodities that allow its reproduction, because subsistence no longer determines the level of wages. The three different sets of equations are also maintained in *Production of Commodities*.

Recently, Kurz and Gehrke admit that in the 1940s Sraffa realised that Marx «has made some considerable progress over and above the state in which Ricado had left the theory of value and distribution»,[2] in particular in developing the concepts of circular flow, constant capital and or-

[1] The document, dated 21 August 1942, is published in Gilibert 2004, 240, and Bellofiore 2008, 89, and is in Italian: «prima sviluppare le 1e equazioni [le equazioni di un sistema senza sovrappiù], poi le seconde (con *r*) [riproduzione semplice con sovrappiù tutto consumato], poi introdurre in questo *w* come variabile. Qui è il punto delicato: dire il più possibile senza dar via il segreto del rapporto tra C e V+S: se possibile, dire che la composizione organica (usar termini volgari) dei due gruppi è identica... Finalmente dire che il risultato è identico ad avere usato la Q.d. L. [quantità di lavoro], tracciare la genealogia di ogni merce (rispondendo alla domanda; perché L? perché non cavalli o carbone? Risposta formale, unica quantità costante) e poi mostrare che il più semplice metodo è sostituire, nelle equazioni, r con S [plusvalore]. A questo punto soltanto dire che è Old Moor». The English translation is in Bellofiore 2008, 90.

[2] Gehrke and Kurz 2006, 110.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 60

ganic composition of capital. However, according to the authors, «Marx's concepts are typically not simply adopted, but are adapted to Sraffa's own non-labour-value-based approach».[1]

In my interpretation, some important analytical categories developed by Marx on the basis of the labour-value theory play a fundamental role in the determination of the relation between the wage rate and the profit rate in *Production of Commodities*. Those categories are not referred by Sraffa to the relative price of commodities but to the value of the aggregated net income and the distributive shares. It is at this 'macro' level of the analysis that value and labour are connected. Sraffa does not insist on this point in his book probably because he was very cautious in disclosing the relationships between his theory and that of Marx. When the hypothesis of a constant relation between the value of the net product and capital was dropped, these cautions increased.

As Bellofiore and Potier show, after the publication of *Production of Commodities by Means of Commodities* Sraffa always considers his Standard system as the 'solution' of Marx's procedure of transformation of values into prices. Sraffa goes back to this topic several times with reference, for example, to the review article of John Eaton, or in his debate with Claudio Napoleoni.[2] In fact, if the Standard commodity is considered a «purely auxiliary construction» as far as the analysis of the relative prices is concerned, it appears to Sraffa a fundamental analytical tool in order to make rigorous Marx's procedure of transformation.[3] In a note he stated that «Marx *assumes* that wages and profits consist *approximately* of quantities of st.[andard] com.[modities]».[4]

Surely there was an evolution in Sraffa's approach to value in the development of his theory.[5] Since the 1920s Sraffa has distinguished two aspects of the problem, that of the 'microscopic' level of the prices and the 'macroscopic' level of value.[6] In this sense, at first, Sraffa thought that human labour is the «cause» of the value of product but not in a measurable way. At the 'microscopic' level of the prices, Ricardo and Marx erroneously considered the quantities of labour proportional to the prices:

> it is the *whole* process of production that must be called 'human labour', and thus causes all product and all values. Marx and Ricardo used 'labour' in two different senses: the above, and that of *one* of the factors of production ('hours of labour' or 'quantity of labour' has a meaning only in the latter sense). It is by confusing the two senses that they [Ricardo and Marx] got mixed up to quantity of labour (in second

[1] *Ibidem*, 111.
[2] On the correspondence between Sraffa, Mattioli and Napoleoni, see Ranchetti 2004.
[3] See Bellofiore and Potier 1998, 90-91.
[4] Bellofiore 2001, 369.
[5] See for example Garegnani 2005, Kurz and Salvadori 2005.
[6] See Bellofiore 2001, 370.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 61

sense) whereas they ought to have said that it is due to human labour (in the first sense: a non measurable quantity, or rather a not q. at all).[1]

In the following pages, I will try to show how Sraffa subsequently developed an analysis of the *whole* capitalist process of production based on human labour as a *measurable* quantity.[2]

3. The Three Sets of Equation and the Nature of the Wage Rate

It is worthwhile starting our discussion from the 'first' and 'second' equations of *Production of Commodities*. The first equations refer to an economic system that does not produce surplus and the second to a system with surplus entirely appropriated by profits so that wages are determined in physical terms as an inventory of subsistence goods.

According to Sraffa, the first equations, on the one hand, show that prices are exactly proportional to the quantities of 'congealed' labour but, on the other, simply reflect the real physical costs. Moreover, it can be added that, in this case, prices are also proportional to the direct and indirect quantities of contained fuel, forage or any other commodity.[3] Therefore, in this case, the theory of labour-value does not have any significant role.

In the case of the first equations, the economic system is fully described by the matrix of the augmented coefficients of production M, where m_{ij} is the quantity of commodity j required in the production of a unit of commodity i and includes at the same time both the means of production inputs as well as the wage-commodities for the living labour employed in the production. The system of the prices (the column vector p), in the hypothesis that there is no surplus but the system is still viable, can be written choosing commodity n as unit of measure of the prices:

<Per Autore: È necessario mantenere i neretti? Se possibile li metterei in chiaro… ma decida Lei>

$$\begin{aligned} \mathbf{p} &= \mathbf{M}\mathbf{p} \\ p_n &= 1. \end{aligned} \tag{1}$$

In this case, the system of the relative prices is perfectly determined and no other information outside the data in matrix M is needed.

[1] Kurz and Salvadori 2005, 418.

[2] For a different point of view, see, Kurz and Salvadori 2005, 424, who assert that Sraffa «introduced the concept of labour as a measurable magnitude which, however, served only a single purpose: that of *providing a basis on which wage payments are made*» (my italics). The authors underline Sraffa's adoption of Ricardo's «concept of proportional wages or… Marx's equivalent concept of the rate of surplus value» (*ibidem*, 422). As it will be shown hereafter, not only Marx's rate of surplus value, but also Ricardo's «proportional wages» imply a 'social' labour-value theory, that is the valuation of the net product in terms of labour.

[3] See Perri 1997, 222-225.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 62

We now suppose that the economic system produces a surplus. In this case, it is necessary to know the social rule according to which this surplus is distributed between social classes. Nevertheless, if wages are composed of a basket determined by the subsistence, we can continue to use the matrix M and to consider the wage-goods as «the fuel or the feed of the cattle». Here, the problem of division of surplus among the social classes does not exist and the problem of distribution is simply a problem of allocation of the surplus *inside* the class of capitalists. In a competitive economy, each capitalist will receive a profit proportional to the capital invested and the system of the prices is determined, as it is well known, in the following way:

<Vedi p. prec.>

$$\mathbf{p} = (1 + r)\mathbf{M}\mathbf{p} \qquad p_n = 1. \tag{2}$$

As with the first system, in this case, there is no need for any other information. Here, the prices depend on the technical coefficients of production, the social coefficients of reproduction of labour, and the social rule of proportionality of the rate of profit. It is still possible to consider the whole process of production as 'human labour'. However, the 'micro' dimension of prices and the 'macro' dimension of value are not directly connected with each other and there is no analytical necessity to measure the value of the aggregate quantities at a 'macro level' in order to determine the prices. The given technical coefficients of production, the quantity of the wage-commodities and the rule of distribution of the profit are all we need to fully understand the system of prices.

It can be observed that almost all the discussions on 'Marx after Sraffa' have focused on the system of the prices (2), without inquiring if the concept of subsistence-wage really plays in the Marxian theory of value the role of determining the physical costs as in Sraffa's theoretical system.

However, according to Sraffa himself, the problem of the relationship with Marx's theory appears in the 'third equations'. In these equations, wages change radically both their function and nature. Here, they are not determined by the level of subsistence and, therefore, they do not serve the purpose of determining the physical costs of production but rather become part of the income or surplus.[1]

Indeed, only when labourers succeed in taking part in the distribution of surplus do they fully appear as a social subject in the 'core' of the the-

[1] Sraffa states that it would be necessary to separate the two components parts of the wage (the subsistence from the one hand and the surplus from the other hand). However he treats the whole of the wage as variable: SRAFFA 1960, 9-10.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 63

ory. According to Sraffa only when wages include a share of the surplus-product beyond the subsistence, «the quantity of labour employed in each industry has ... to be represented explicitly, taking the place of the corresponding quantities of subsistence».[1] While in the second equations the division of society in social classes influences the coefficients of production, through the socially and historically determined level of subsistence, it is in the moment of the distribution of surplus that it explicitly appears on the stage. Ironically Sraffa states: «men however (and in this they are distinguished from horses) kick».[2] Let be **A** the matrix of the technical coefficients of production, where a_{ij} is the quantity of the good j required in the production of a unit of the good i only as means of production (and not as subsistence), **l** the column vector of the quantities of labour, with l_i representing the quantity of direct labour employed in the i industry, and w the wage rate. As it is well known, the system of the prices becomes now: Cfr. p 61

$$\mathbf{p} = (1 + r)\mathbf{Ap} + w\mathbf{l}$$
$$p_n = 1. \qquad (3)$$

Contrary to systems 1) and 2), the system 3) is not determined. It is now necessary that either the wage rate or the rate of profit is determined outside the analytical 'core' of the model. However, if we decide to consider the wage rate w as a given quantity, we must define what this magnitude is. Yet, we cannot specify the wage in terms of given quantities of commodities because, in this case, we would revert to the conception of the subsistence wage and we would cancel any meaningful difference among system (2) and system (3). Alternatively, as Sraffa suggests in Paragraph 44 of *Production of Commodities*, we could consider the rate of profit as the independent variable because it «as a ratio, has a significance which is independent of any prices, and can well be 'given' before the prices are fixed».[3]

1 p5

However, also in this latter case the 'definite meaning' of the rate of wages remains a problem. In fact, w is not the price of a specific basket of goods, but is, in first place, a 'value' magnitude that can be spent on different commodities. In this sense, as Kurz and Salvadori have already noticed, «the concept of real wages conceived as an inventory of commodities was obsolete, a share concept had to be put in its place».[4] In my opinion, the share concept involves a dramatic change in Sraffa's perspective. Now, in fact, we have a relation between two values, aggregate wages and the net product, but one of the terms of this value-relation cannot be defined in physical terms before the value relation is

[1] *Ibidem*, 10.
[2] Quoted in Kurz and Salvadori 2005, 423.
[3] Sraffa 1960, 33.
[4] Kurz and Salvadori 2005, 422.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 64

established. Before facing this problem, it is appropriate to focus on another point that differentiates in essential way the systems of equation 2) and 3): the two systems involve different relationships among the prices and the 'physical real costs'.

The sequence of the three systems of equations allows us to separate, from a logical point of view, the double nature of wages in the capitalistic economy: on the one hand, they represent a cost of production while, on the other, they are part of the income. In equations 2), wages entirely appear as a physical real cost while, in equations 3), they are entirely part of the national income.

In the latter case, the division of the surplus in the two parts, from a logical point of view, takes priority to the determination of prices. Indeed, whatever the value of one of the distributive variables may be, the sum of the aggregated wages and profits must equal the surplus. This is true either if the rate of interest is determined by the monetary authorities or whether the rate of wage is determined by the wage bargaining as a share of the net income.

Moreover, it becomes essential to explain the whole set of values that potentially can be assumed by distributive variables and prices. The real distribution of the income becomes definite outside the analytical core by institutional conditions or by the decisions of the monetary authorities. In this framework, it is fundamental to determine the frontier between the wage rate and the rate of profit of the economic system. The precise point at which the system is actually positioned on this frontier is an 'empirical' datum or, at least, is external to this level of the theoretical analysis. Nevertheless, it is in the definition of this relation that the system of the prices 3) seems to be incomplete.

Since it is excluded that the wage rate is a basket composed of given quantities of commodities, the real problem is the nature of the magnitude, the purchasing power, represented by the relative price that we call wage rate. Contrary to all the other prices, which refer to specific commodities, wages are a magnitude that can be defined only in term of an abstract value, that is «their objective character as values is therefore purely social» and receive a concrete definition only when they are exchanged for the 'use-values' that labourers decide to purchase.[1]

Moreover, in the system of relative prices 3), only the generic claim that the wage rate falls when the rate of profit rises and vice versa can be stated. It is not even possible to give a precise quantitative dimension to this inverse relationship, because it substantially depends on the choice of the unit of measure of prices. It may be useful to develop this issue, although Sraffa does not directly address it. If we want to meas-

[1] MARX 1990, 138.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 65

ure the wage rates connected to a series of different rates of profit, the result is substantially different depending on the commodity whose price is arbitrarily chosen as the unit of measure of prices. As far as the 'exact' measurement of the variation of the rates of wages is concerned, the standard is not neutral. In fact, the same per cent variation in the wage rate generally results in different variations of the rate of profit if we change the standard of prices. For instance, let us choose the [illegible] of commodity n as the unit of prices, and determine in the system 3) the values assumed by the wage-rate when the rate of profit is respectively r_1 and r_2. The values of the rates of wages measured in terms of the commodity n will be $w^n{}_1$ and $w^n{}_2$. Now, let us repeat the same operation choosing another commodity as standard, for instance the commodity m. For the same values of r_1 and r_2 and in the same economy, the values of the rates of wages are $w^m{}_1$ and $w^m{}_2$. Of course $w^n{}_1 \neq w^m{}_1$ and $w^n{}_2 \neq w^m{}_2$, as the standard is changed. However, it is important to notice that the ratios between the two different rates of wages are different, or, in other words, that the per cent variations of the wage rate is different, all other things remaining the same, depending on the commodity chosen as the unit of measure. We have: $\dfrac{w^n{}_1}{w^n{}_2} \neq \dfrac{w^m{}_1}{w^m{}_2}$.
Therefore, as far as the rate of wage is concerned, the choice of the unit of measure does not simply involve a variation of scale, and we cannot switch from a scale to another applying a multiplicative constant. The reason is simple and depends from one of the central topics in Ricardo and Sraffa's discussions on prices and value. Because of a variation in the rate of profit, the relative prices of the commodities also vary. Therefore, the consequent variation of the rate of wages reflects two separate variations: that of the same wages and that of the relative price of the commodity selected as standard. Let us call $p_{n(r_1)}$ and $p_{m(r_1)}$, $p_{n(r_2)}$ and $p_{m(r_2)}$ the prices of commodity n and of commodity m, however measured, when the rate of profit is respectively r_1 and r_2. In general, it must be true that $\dfrac{p_{m(r_1)}}{p_{n(r_1)}} \neq \dfrac{p_{m(r_2)}}{p_{n(r_2)}}$. Following Sraffa, we can say that

> the necessity of having to express the price of one commodity in terms of another which is arbitrarily chosen as standard, complicates the study of the price-movements which accompany a change in distribution.[1]

Moreover the necessity to express the wage rate in terms of the price of a commodity complicates the study the movements of distributive variables. We have, in fact, an infinite number of curves expressing the relation between the rate of profit and the rate of wages in a given eco-

[1] SRAFFA 1960, 18.

nomic system, depending on the unit of measure chosen. These curves are different one from another because a different per cent variation in the rate of wages corresponds to the same variation of the rate of profit. In other words, the standard of prices affects the elasticity of the relation between the two distributive variables and thus, its choice is not neutral.

It is true that from the 'micro' analysis point of view this problem does not appear really important. The ratios at which physical quantities of commodities can be exchanged from one another and the purchasing power of wages in terms of any basket of commodities is independent of the unit of measure. However, it is somehow puzzling that physical commodities exchanges for something (the purchasing power of the wages) that apparently does not represent a determinate physical quantity.

In my interpretation the problem lies in the definition of the wage rate as a price. As long as the wage rate was determined by the subsistence level it was the price of the loaf of bread. It is thus possible to state, for example, that the real wage rate grows by 10%. When labourers participate in the distribution of surplus, the wage rate is no more the price of any ordinary commodity or basket of commodities. So the problem is: what is exactly exchanged for the potentially infinite baskets of wage commodities?

Marx would say that wages represent the value of a very special commodity, the labour-power, while Sraffa, as we will see hereafter, stresses the 'revenue' aspect of wages, i. e. their share aspect. Apparently, in the equations of prices, the wage rate is the price of a given quantity of labour, but actually the notation wl_i reflects the rule of the distribution of a determined share of surplus among labourers. What seems to be a price is indeed a revenue. In fact Sraffa does not define the wage rate as the price of a unit of labour. Labour is not a commodity.

If we measured the wage rate in terms of any arbitrarily chosen commodity, this revenue aspect would be somehow concealed and the wage rate would appear to be an ordinary price.

Moreover an unambiguous definition of the wage rate is necessary in order to develop the 'Standard relation' between the wage and the profit rates. Even in the Standard system, if we do not bring out the revenue aspect of wages, but choose an ordinary numeraire, this relation will not be linear and will not be independent of prices. I will return on this point on the last section of the paper.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 67

4. The Value of Net Product and the Relations of Distribution among the Social Classes

Sraffa's analysis focuses on the study of the connected variations of the rate of wages and the rate of profit. The choice of a commodity as the standard of price does not allow us to grasp the real nature of the wage rate and to precisely esteem the variations of the rate of wages. Thus, we must specify what kind of 'objective' magnitude the wage rate is when it exceeds the level of subsistence.

Sraffa only indirectly answers this question in *Production of Commodities*. However, it is possible to argue a rational reconstruction of his thought on this issue.

At the end of his first period of constructive work (from mid 1920s to 1931), he realised that when workers receive a share of the surplus product wages can no longer be determined in physical terms as given inventory of commodities. In fact, now workers can spend their wages over and above their subsistence in many different ways. Thus, according Gehrke and Kurz, «wages could be given only in some more or less abstract standard and their magnitude could be specified in proportion to the labour (time) performed».[1] Sraffa followed Ricardo, who had developed the concept of «proportional wages», that is «the proportion of the annual labour of the country ... devoted to the support of labourers».[2] In this framework, two important consequences follow. In fact: i. now the quantities of labour appear in the equations. Labour is no longer an immeasurable quantity and, moreover, ii. the wage rate itself is a proportion between different quantities of labour. When the term wl_i is added in the equation of the price of commodity i, l_i refers to the measured quantity of labour employed in its production.[3] However, in my interpretation, it is important to stress, as Ricardo's definition clearly states, that the same wage rate is now defined as a proportion between quantities of labour. In other words, not only the term l_i defines a determined quantity of labour, but also the term w is defined as a ratio between quantities of labour. In Marxian terms, proportional wages are the proportion between the «necessary labour», that is the «one part of the labour process» where workers produce an equivalent for the value of workers' labour-power,[4] and the whole direct labour performed by workers. In fact, it must be stressed that, according to Sraffa, Ricar-

[1] Gehrke and Kurz 2006, 104. See also Kurz and Salvadori 2005, 422.

[2] Ricardo 1951, 49.

[3] For example Kurz and Salvadori state «he [Sraffa] now assumed that wages were paid in proportion to the labour performed» (p. 423). ? 2005

[4] See, for example, Marx 1990, 324.

< Per l'Autore: Corretto così da «states» del suo orig, perché il soggetto è plur. >

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 68

do's «proportional wages» are equivalent to Marx's concept of the rate of surplus value.[1]

My interpretation is supported by Sraffa's criticism of Bortkiewicz in 1943. Here Sraffa states that the hypothesis that the wage rate is a given basket of subsistence-goods is not compatible with Marx's approach, when he considers the profits as a given proportion of the product of labour. It is therefore necessary to develop in a coherent way Marx's theory in order to resolve this contradiction. However, the way followed by Bortkiewicz, based on the definition of subsistence-wages is not satisfactory. On the contrary, a new definition of wages must be found:

> What Marx does is, on the one hand (1) to take wages as given (inventory) in commodities, for subsistence, and on the other (2) to take the mass of profits as a given proportion of the product of labour. The two points of view are incongruous, and are bound to lead to contradictions. But B. wants to solve the contradiction by bringing (2) into agreement with (1). On the contrary, the correct solution is to bring (1) into agreement with (2). For the point of view of (1) useful as it is as a starting point considers only the fodder-and-fuel aspect of wages, it is still tarred with commodity-fetishism. It is necessary to bring out the Revenue aspect of wages; + this is done by regarding them as w, or a proportion of the Revenue. This is (1) brought to agree with (2); and the conclusion that all capital must be taken into account for the rate of profit becomes true.[2]

<Per Autore: Mantenere i sottolineati?>

The change in perspective from Petty's and the Physiocrats' loaf of bread to the commodity-fetishism could not have been more significant. In fact, the «fodder and fuel aspect of wages» is now considered «tarred with commodity-fetishism», *i.e.* incorrectly presumes that only physical quantities of commodities matter and that the wage rate is the price of a given quantity of bread. But, according to Sraffa, what is really important is to consider the mass of profits as a proportion of the product of labour. This follows from the definition of proportional wages as the wage rate. In fact, here Sraffa clearly expresses the alternative definition of the rate of wages as a proportion of the revenue, that is a given proportion of the net income, formally defining the symbol w in this sense. As I will show in the following pages, the definition of the wage rate as a share of the net product is equivalent to the proportion between the 'living' labour devoted to the production of the share of the net product that remunerates workers and the annual labour of the country. As a consequence, the proportion between the mass of profits and the product of labour can be interpreted as the proportion between the surplus labour and the annual labour of the country.

[1] Kurz and Salvadori 2005, 422.

[2] On this point see Bellofiore 2001, 371; Gehrke and Kurz 2006, 142.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 69

Moreover Sraffa himself explains the real meaning of his criticism on Bortkiewicz:

> the *real* objection (though somewhat vaguer) is this: That B's point of view, for the shake of obtaining absolute exactness in a comparatively trifling matter, sacrifices (by concealing it) the *essential* nature of the question – that is, that commodities are produced *by labour* out of commodities.[1]

Thus commodity-fetishism conceals the real nature of the question, and, by assuming that all the relevant quantities are solely given quantities of commodities, Bortkiewicz achieves absolute exactness in a matter which is less important (trifling) than the essential nature of the process of production as a social process.

The rate of wages as the proportion of the wages on the net product involves the assumption that the value of the net product equals the annual quantity of labour, or, in other words, the net income per unit of labour, must be chosen as the standard of prices. Sraffa's early statement about the whole process of production «that is human labour» develops in his assumption about the value of the net product, when labour is a measurable quantity and the wage rate is no longer defined as a given specific basket of commodities.

Let $\mathbf{x}$ be the vector of the quantities of commodities produced in the economic system. Then $\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}$ is the value of the net product and $\mathbf{xl}$ the aggregate employment. The share of wages in the net income is $w\dfrac{\mathbf{xl}}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}$. Accordingly, in order to define the rate of wages w that appears in the equations of prices as «a portion of the Revenue», the following equality must be set:

$$\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p} = \mathbf{xl} \tag{4}$$

This amounts to expressing the net income per unit of labour as the standard of prices.

Moreover, as it is well known, the aggregated direct labour employed in the economic system is equal to the (direct and indirect) labour expended in the production of the quantities of commodities which constitute the net product.

< Cfr. p. 61 >

Calling λ the column vector of the quantities of congealed labour, the standard of prices can also be expressed as:

$$\frac{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}{\mathbf{xl}} = \frac{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\lambda} = 1. \tag{4.1}$$

[1] BELLOFIORE 2008, 77.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 70

Thus, the value of the net product (esteemed in prices) is set equal to its labour-value.[1]

These definitions of the rate of wages and the standard of prices are implicitly adopted by Sraffa in Paragraphs 10-12 of *Production of Commodities* where he sets equal to one the value of the surplus (that is, choosing the surplus as the standard of prices), and, at the same time, setting equal to one the labour employed in the economic system (that is, choosing as unit of measure of labour the aggregated employment).[2] Apparently, Sraffa seems to choose two different and independent units of measure. However, in reality, this is only one of the possible ways of setting the wage rate as the share of wages on the net product. In fact, the necessary and sufficient condition is to put $\mathbf{xl}$ equal to $\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}$. In formal logical terms: $(\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p} = \mathbf{xl}) \Leftrightarrow \left(w = w\dfrac{\mathbf{xl}}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}\right)$. Thus, it is clear that Sraffa does not simply choose an arbitrary unit of measure[3] but rather chooses the standard of prices in order to get a definite result.[4]

< Cfr. p. 61 >

More specifically, the unit of measure of the quantities of labour can be arbitrarily chosen in terms of the aggregate employment of the economic system, as Sraffa does, or in terms of hours of labour etc., because labour is a definite objective quantity. Yet, on the contrary, the choice of the standard of prices cannot be arbitrary. In order to give precision to the analysis of the relationship between the variations of the rate of wage and the variations of the rate of profit, and to express the revenue aspect of wages in the equations of prices, the net product per unit of labour is a necessary choice because wages are an essentially value-magnitude.

These value-quantities are, first of all, referred to the 'macro' level of the analysis, that is to the aggregated magnitudes, and have a definite meaning independent of the prices of the individual commodities. In Sraffa's analysis, the surplus can be detected in physical terms only with reference to the whole economy. Thus, the distribution of the surplus

[1] As a matter of fact, Sraffa develops his reasoning in this way in his notes. See, for example, De Vivo 2003, 226, fn. 33. It is also important to stress that he thought that the labour-value is important in the analysis of the aggregates. See Ranchetti 2004, 9 and the last section of this paper.

[2] Sraffa 1960, 10-11.

[3] *Ibidem*, 10.

[4] The wage rate is by definition the ratio between the aggregate wages and the quantity of labour employed, and the share of wages on the net product is by definition the ratio between the aggregate wages and the national product. Thus, in order to define the wage rate as the share of wages it is necessary to equate the value of the net product to the quantity of labour employed. This is not trivial, because according to Sraffa it is necessary to develop the share definition of the wage.

<Per Autore: Nel suo orig. «n. 33» è stato inteso come 'nota 33', e perciò è stato reso «fn. 33»: va bene così o è da intendersi come 'numero' 33? In tal caso, correggere 'fn.' in 'no'>

is also a process that must be detected at the macro-level. When wages exceed the subsistence level, it is no longer possible to determine them in physical terms and the 'macro' problem of value arises. Indeed, the problem becomes that of the distribution of a given value between social classes.[1]

Starting from the notion of an economic system that produces a surplus to be divided between two social classes, it is immediately evident that, given the share which is appropriated by a class, the share of the other class is also determined since the sum of the two shares is equal to the unity. If we call Π the aggregated profits, by definition we have:

$$\frac{\Pi}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}} + \frac{w\mathbf{x}\mathbf{l}}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}} = 1. \tag{5}$$

Choosing our standard of prices equation 5) becomes:

$$\frac{\Pi}{\mathbf{x}\mathbf{l}} + w = 1. \tag{5,1}$$

Equation (5) may appear as a banal truism but, nevertheless, this plain linear relationship is the foundation on which Sraffa's theory of prices rests. In order to expressly connect equation (5) with the system of prices (3), we can re-write system (3) in the following way:

$$\begin{aligned} \mathbf{p} &= (1+r)\,\mathbf{A}\mathbf{p} + w\mathbf{l} \\ \frac{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}{\mathbf{x}\mathbf{l}} &= 1. \end{aligned} \tag{3.1}$$

By setting the value of the net income equal to the direct labour (or to its labour-value), the rate of wages becomes a determined magnitude and it is perfectly reasonable to say that a definite per cent variation of the wage rate-share of wages corresponds to a determined variation in the rate of profit and an objective curve depicting the relation between the two distributive variables can be drawn. Therefore, the equalisation of the net income to its labour-value does rest on a sound analytical basis.

After the publication of *Production of Commodities*, Sraffa writes some notes that support the interpretation argued in this paper. Most of these notes refers to the Standard system, and I will return on them hereafter. Here it is important to note that Sraffa gives an explicit definition of the Marxian rate of surplus-value in his own analytical framework, in some notes on John Eton's review on *Production of Commodities*.

[1] Also in Marx's theory the «macro level» of the analysis gets priority: «the total labour-power of society, which is manifested in the values of the world of commodities, counts here as one homogenous mass of human labour-power, although composed of innumerable individual units of labour-power» (MARX 1990, 129). See FOLEY 1986, 15.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 72

When prices of commodities differ from their labour-values the value of labour-power can be defined as the labour embodied in the commodities workers purchase, or, alternatively, as the value of the share of the net product they receive. The two definitions are incongruous.

> The tiresome objector says. Suppose that (the ratio of wages to profits) the rate of surplus value is 100% *at values*, but 150% if calculated *at current prices of production. Which is the correct one?*
>
> ...*it is clear that the 'prices' rate would be the correct one*. In effect, the workers get 40% of the nat. [national] income: on what commds. [commodities] they spend it, depends on 'utility': *whether they choose to spend their 40% on high or low org. comp.* [organic composition] *commodities do not affect the degree of exploitation*. From which I should conclude that *the relevant rate of s.v.*[surplus value] *is to be taken at 'prices'*.[1]

And in fact Sraffa writes the rate of surplus value as $\frac{1-w}{w}$. 6 «Cfr. p. 61»

Sraffa wants to define the 'correct' ratio of surplus value, which is the ratio of profits to wages. It will be noted that the ratio of profits to wages can be interpreted as the ratio of surplus value only if it is considered as a ratio between quantities of labour. Sraffa plays the role of the 'tiresome objector' and thus he is extremely careful about the words he uses. But, the ratio taken at 'values' differs from the ratio taken at 'prices', because the former depends on the quantity of labour embodied in the production of a determined basket of wage commodities, while the second reflects the workers' labour employed in the production of the wage share of the net product. According to Sraffa, if w is, for example, 40% of the national value, the rate of surplus value will be 150%. Once again, Sraffa develops his argument on the basis of the definition of the wage rate as the share of wages and the consequent definition of the rate of surplus value. In this framework, the definition of the value of the national product as the quantity of the annual labour of the country is the basis of the whole argument.

It will be noted, that the same argument is developed by different authors who discuss Marx's analysis of the value of the labour power. John Eatwell, stressing the connection between Marx and Sraffa, states, that when prices are not equivalent to labour values the definition of necessary labour time as a share of net product paid out of wages is no longer equivalent to the definition of the quantity of labour embodied in the commodities purchased by the worker. According to Eatwell the share definition

> is far more flexible, encompassing as it does that the possibility that between one situation and another (and one worker and another) the composition of the bundle of commodities purchased may vary, and yet the rate of exploitation remain the same.

[1] Bellofiore 2008, 84-85.

Furthermore ... it is no longer necessary to know ex ante the commodity composition of the wage at all wage levels.[1]

There is a strict analogy between Sraffa's argument and what Gerard Duménil and Duncan Foley, interpreting Marx's theory, called «the price of net product-unallocated purchasing power labour theory of value (*PNP-UPP LTV*)».[2]

As Duncan Foley puts it:

in the case where prices are uniformly proportional to labor values, we can interpret the value of labor power interchangeably as the money wage multiplied by the value of money, as the wage share on value added, or as the labor embodied in the commodities workers purchase with the unit wage. How shall we generalize the concept of the value of labor power in the case where prices are not uniformly proportional to labor value?[3]

Foley's answer is that the value of labour power must be interpreted «as the money wage multiplied by the value of money» and it is equivalent «to the wage share in aggregate value added».[4]

An influential criticism on Marx's theory based on Sraffa's analysis maintains that the physical quantities of the outputs and the inputs, inclusive of the wage goods determined by the subsistence, are the quantities that determine the prices and the rate of profit. Yet, these data also determine the quantities of congealed labour. Thus, Marx's labour-value are simply redundant.[5]

In his criticism, Steedman clearly refers to equations (2) in which the wage is determined in terms of a basket of subsistence-goods. As we have seen, however, Sraffa believes that Marx's theory is relevant when «commodity-fetishism» is dropped. In this case, as we have seen, we must define the rate of wages as a proportion of the quantity of labour employed in the economic system.

When the problem of the distribution of surplus between the social classes does not appear, it is sufficient to know the physical quantities in order to determine the prices and the rate of profit. A complete sound theory based on the conception of Petty and the Physiocrats can be developed. However, when a problem of distribution of surplus between the social classes arises, the knowledge of the physical quantities is no longer sufficient. One of the essential magnitudes in the structure of prices, that is the rate of wages becomes a magnitude of value that does not have an immediate physical dimension. In this framework the 'macro' category of value, defined as abstract wealth, becomes essential to the solution of the 'micro' problem of the relative prices.

[1] Eatwell 1975, 553.
[2] See Duménil and Foley 2008.
[3] Foley 1982, 41-42.
[4] *Ibidem*, 42.
[5] Steedman 1977, 52.

<Tab>

The '*New interpretation*' approach to the transformation of values into prices of production of Foley, Duménil and Lipietz[1] claims that Marx's theory of value is «an accurate and powerful account of the aggregate relations of capitalist production» showing that «the value added exactly represent the total social labor time and that the surplus value exactly corresponds to unpaid labor time».[2]

5. From the Standard System to the Actual System. Further Considerations about the Marx-Sraffa Connection.

It is important to notice that the equalisation of the rate of wages to the share of wages is also necessary in order to develop Sraffa's Standard system and the consequent linear relation between the wage rate and the profit rate. As a matter of fact, if the linear relation holds there will be neither «surplus» nor «deficit» on the payments of wages and profits when distribution changes.[3]

In Sraffa's analytical scheme, the problem of the quantity of labour expended in the production of the individual commodity is not relevant. The problem of the transformation is not discussed as a procedure to determine the prices of production from the labour values but rather in connection with aggregate magnitudes. It is in this framework that the Standard commodity is developed.

Let us start from the rate of profit. From system (3) we can write:

$$r = \frac{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p} - w\mathbf{x}\mathbf{l}}{\mathbf{x}\mathbf{A}\mathbf{p}} = \frac{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}}{\mathbf{x}\mathbf{A}\mathbf{p}}\left(1 - \frac{w}{\mathbf{x}[\mathbf{I}-\mathbf{A}]\mathbf{p}/\mathbf{x}\mathbf{l}}\right). \tag{6}$$

In system 3.1) this relation becomes:

$$r = \frac{\mathbf{x}\mathbf{l}}{\mathbf{x}\mathbf{A}\mathbf{p}}(1-w). \tag{6.1}$$

Equation (6.1) expresses the relationship between the rate of profit and the rate of wages only when this latter is defined as the share of wage on the net income. However, equation (6.1) is not independent of prices because the value of the means of production must be expressed in terms of prices. Even if the standard is labour, the value of the means of production changes when distribution varies. Only when the relationship between the value of the net income and the value of capital is assumed to be invariable even with distributional changes does equation (6.1) become a linear relationship between the rate of wages-share of wages and the rate of profit. This is 'the hypothesis', largely documented by Gilibert and De Vivo, that, in the first 1940s, Sraffa formu-

[1] See Bellofiore 2001, 370-371. [2] Foley 1986, 103-104. [3] Sraffa 1960, 13.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 75

lates, which directly expresses the relevant aggregate magnitudes as quantities of contained labour. Under this hypothesis, the result of Marx's transformation of value into prices of production is shown to be fully consistent since the value of the net income must be set equal to xl and consequently the value of the capital is the labour congealed in the means of production as in Marx. In fact, the ratio of the net income on the value of capital is supposed to be invariable with changes in distribution. Let us consider this ratio when the rate of profit is equal to zero. In this case, the prices of commodities are proportional to their labour values and, consequently, we have a relation between quantities of congealed labour. Thus, when the hypothesis holds, equation (6.1) necessarily becomes:

$$r = \frac{\mathbf{xl}}{\mathbf{xA}\lambda}(1 - w). \qquad (6.2)$$

< Cfr. p. 61 >

As a matter of fact, Sraffa expressed for the first time the relationship (6.2) directly in terms of labour-values in some notes dated 1942. This relationship substantially refers to the Standard system, that is to a system in which the capital and the product are supposed to be composed by the same composite commodity. Sraffa calls C_t the total physical quantity of the standard or 'general' commodity produced. By defining the unit of a commodity as the quantity which embodies the unit quantity of labour, C_t also represents the labour embodied in this physical quantity C_t.[1]

Why does Sraffa need to express the physical quantities of a 'general' commodity in terms of apparently 'redundant' quantities of labour? Indeed, in this model, all the relevant quantities can be expressed in physical terms. However, Sraffa wants to define the relation between the wage rate, which appears in the equations of the prices of the individual commodities, the rate of profit and the 'invariable' ratio of the net income on the value of the means of production. This is possible only if the rate of wages is defined as the share of wages and, once again, this is possible only if the magnitudes are expressed as quantities of labour.

It is clear that equation (6.2) is exactly the relation between the rate of wage and the rate of profit in the Standard system, or:

$$r = R(1 - w). \qquad (6.3)$$

It is also clear that equation (6.2) can be easily derived from Marx's equation for the rate of profit. Assuming, for the sake of simplicity, that wages are paid at the end of the period of production, Marx's equation, calling as usual S the surplus-value, C the constant capital and V the variable capital, becomes the following:

[1] See De Vivo 2003, 19.

$$r = \frac{S}{C} = \frac{L - V}{C} = \frac{L}{C}\left(1 - \frac{V}{L}\right). \tag{6.4}$$

Equation (6.4) is thus the same as Sraffa's equation (6.3) and our equation (6.2). Therefore, Sraffa's hypothesis confirms Marx's conclusions about the transformation of values into prices. In fact, if equation (6.3) holds, the labour value of the whole product corresponds to the sum of the prices of production of all the commodities produced: the price of the aggregated means of production corresponds to constant capital, the total wages correspond to the variable capital, and the total profits are equal to the surplus-value. Of course, the 'hypo' does not hold in the real system but, in Sraffa's framework, the transformation problem is not a procedure of transformation of the values of individual commodities into prices of production, but the transformation of the actual economic system into the Standard system.

In a note dated 31st December 1960, Sraffa comments a review article by Claudio Napoleoni, which was published some months later in *Giornale degli economisti*. According to Sraffa, «the quantities which come into play dealing with distribution theory, the determination of the surplus and the calculation of the general profit» are «not the prices of individual commodities, but the values of big aggregates». In this framework, Marx's conclusions, reached «through the transformation of prices into values» allow him to derive the general rate of profits «as the average of the particular profit rates of the individual branches». According to Sraffa, Marx's procedure is correct, but only as an approximation.[1] In the notes commenting Eaton, already quoted in this paper, Sraffa explains:

> the proposition of M. [Marx] are based on the assumption that the comp. of any large aggr. of commodities (wages, profits. const. cap.) consists of a random selection, so that the ratio between their aggr. (rate of s. v., rate of p.) is approx. the same whether measured at 'values' or at p. of prod. corresp. to any rate of s. v.
>
> *This is obviously true*, and one would leave it at that, if it were not for the tiresome objector, who relies on *hypothetical deviations*.[2]

The hypothetical deviations cause that the ratios between large aggregates measured at prices are different form the same ratios calculated at values. While Marx's procedure was «justified in general», because «it is not intended to be applied to detailed minute differences/.../if/.../one must define which is the average to which the comp. should confirm for the result to be exact and not only approximate, it is the ST. Comm.». So, according to Sraffa, Marx's transformation of values into prices is aimed at determining the relationships between large aggregates of

[1] RANCHETTI 2004, 9. [2] BELLOFIORE 2008, 83.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 77

commodities. Although approximately correct, Marx's results are not rigorous or exact from an analytical point of view. In order to achieve exactness, Sraffa defines the aggregates in terms of quantities of the Standard commodity. In this framework, the rate of surplus value, as far its exact definition is concerned, must be measured on the basis of the «Standard wage».[1]

In the actual system the ratio between the necessary labour and the total labour is still one of the determinants of the relation. In Marxian terms, in fact, relation (6.4) becomes:

$$r = \frac{L}{K_{(r)}}\left(1 - \frac{V}{L}\right). \tag{6.5}$$

Where $K_{(r)}$ is the value of capital expressed in terms of prices of production.

The relationship between the necessary labour and the aggregate living labour can be expressed as a function of the rate of surplus s': $\frac{V}{L} = \frac{V}{V+S} = \frac{1}{(V+S)/V} = \frac{1}{1+s'}$ and equation (6.5) becomes

$$r = \frac{L}{K_{(r)}}\left(1 - \frac{1}{1+s'}\right).^{2} \tag{6.6}$$

This last equation shows why Sraffa considered Ricardo's proportional wage (V/L) a concept similar to Marx's rate of surplus value[3] and why these concepts are still essential in *Production of Commodities by Means of Commodities*. In fact, the rate of profit can be still considered as a function of the rate of surplus-value as well as the proportional wage. In this framework, the relation between the rate of profit and the wage rate (or between the rate of profit and the rate of surplus value) is no longer linear, because the value of capital depends on prices. But while at the 'micro' level, «in any one industry» the sum of profits and wages changes in order to avoid «deficit» or «surplus» on their payments when distribution changes,[4] at the 'macro' level the sum of aggregate wages and profits, *i. e.*, the surplus to be distributed, holds steady. In other words, the relation between aggregate profits and aggregate wages in the 'real economy' is linear, and from equation (6.1) we can write:

$$r\mathrm{xAp} = 1 - w \tag{6.7}$$

O <Cfr p. 61>

Or, in 'Marxian' terms:

$$rK_{(r)} = L - V \tag{6.8}$$

[1] *Ibidem*. As John Eatwell puts it: «the relation of wages to the rate of profit is the same *as if* in the standard system three quarters of the labor force was producing the *share* of net product going to the workers» (Eatwell 1975, 555).

[2] See Eatwell 1974, 555.

[3] See Kurz and Salvadori 2005, 422.

[4] See Sraffa 1960, 13.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 78

Another point deserves to be stressed here: surprisingly Sraffa does not endorse Bortkiewicz's criticism of Marx. According to Marx, the rate of profit depends on the conditions of production of all industries, while, according to Bortkiewicz, Ricardo was right when he stressed that the rate of profit only depends on the conditions of production of the industries that directly or indirectly produce wage-goods.[1] According to Sraffa, «the conclusion that all capital must be taken into account becomes true».[2] The reason for Sraffa's accordance with Marx relies on the definition of the wage rate as the share of wages and can be shown by considering equations (6.4) and (6.5). First of all, the coefficients of productions are exactly the same in both economic systems because the Standard system is constructed from the actual economic system by varying the proportions between the different industries. However, in the two economic systems, with the same proportional wage, or the same share of the wages on the net product, the rates of profit are different. This point can be explained in two ways: on the one hand, according to equation (6.4), the composition of capital changes when the proportion between all the industries varies. Thus, the same share of profit on the net product is related to different magnitudes of capital in the two systems. On the other hand, as Sraffa seems to point out in *Production of Commodities*, the composition of the net product varies in the two systems, and thus the corresponding shares of wages in the net product are different with the same rate of profit. In both cases, all the industries must be taken into account, as far as the relationship between the wage rate and the rate of profit is concerned, when wages are determined as the share on the net product.

In this framework, the distributive variable, which is taken as the given quantity, is not a problem that can be solved at an abstract and logical level. In the above developed framework, Sraffa's remarks that the rate of profit is a ratio while the wage rate is a price are somehow confusing.[3] In fact, according to Sraffa, the wage rate is also a ratio, that is the ratio of aggregate wages on the net product. The problem is grounded on more historical and institutional basis. In fact, it is possible to think that the wage rate is set on the labour market in monetary terms and it acquires a definite meaning, as a share on the net product, only when the prices of commodities are defined and workers can spend their income. So wages are expressed «in terms of a more or less abstract standard».[4] On the contrary, the Central Bank and monetary authorities can set the rate of interest from outside the system and thus

[1] See Gehrke and Kurz 2006, 135-7.
[2] *Ibidem*, 142.
[3] Sraffa 1960, 33.
[4] *Ibidem*.

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can significantly influence the rate of profit. Thus, according to Sraffa, «the only rational way to calculate is by starting with the interest rate... and to deduce from it the rate of *exploitation*».[1] Given the Maximum rate of profits R and the rate of interest r, the standard share of wages is $w = 1 - \frac{r}{R}$ and the rate of exploitation, as already shown, is the ratio between the share of profits and the share of wages, $s' = \dfrac{\frac{r}{R}}{1 - \frac{r}{R}}$.

Due to the historical and institutional conditions of the economic system, the level of the money rate of interest can be decided outside the system of prices. In the 'real' system 'the degree of exploitation' of workers adapts to allow that rate of profits to emerge.

Thus, according to Sraffa, the rate of surplus value can be calculated in a rational way in a system of «production of commodities by labour out of commodities».

6. Concluding Remarks

In the analysis I have tried to develop, it seems clear that Sraffa's approach to Marx's theory is complex and that he used in his study some of Marx's essential value-based concepts such as the rate of surplus-value and the 'new-value' or the value of the net product. The interpretative hypotheses that I have tried to justify can be synthesized in this way:

i. Throughout his theoretical activity, Sraffa presents a separation between two different levels of analysis. The microscopic level regards the definition of the prices while the macroscopic level concerns the definition of the value of the aggregated net product and the social relationships between the social classes.

ii. As far as the problem of relative prices is concerned, Sraffa is influenced by Petty and the Physiocrats. He maintains that the prices are exclusively determined by the absolute physical costs, that is the quantities of commodities necessary to the production, and the rule of division of the surplus *inside* the class of the capitalists. This analysis is developed in *Production of Commodities* in the equations of paragraph 3 (production for the subsistence) and paragraph 4 (production with surplus, but with wages entirely determined by the subsistence).

iii. Only when workers participate in the distribution of the surplus does a problem of relationships among the social classes of capitalists and workers and of value of the net product arise in the very 'core' of the model. Analytically, value becomes significant when wages become part of the net product, in the equations of the Paragraphs 10-11-12, and

[1] Cfr. Bellofiore 2008, 85.

HEI 1 2010_Impaginato 05/03/10 17:21 Pagina 80

the consequent non-arbitrary choice of the unities of measure of prices and labour.

iv. In this last topic, it is possible to see an evolution in Sraffa's approach. In the early notes, labour is considered «not a quantity at all». Next, especially in the 1940s and in *Production of Commodities*, labour assumes an essential analytical role in coordinating the two levels of the analysis. It is worth noticing that, according to Sraffa, the problem of the transformation of value into prices is important in a very particular way. It is not a 'micro' problem concerning the determination of the prices of production from the values of the different commodities. On the contrary, it is important from the 'macro' point of view, that is of the relationship between the net product and the shares of the profits and the wages. In other words, Sraffa is interested in the conclusions that Marx drew from the procedure of transformation rather than in the procedure of transformation by itself. In this picture, the aggregated dimension of value does not need to be 'micro-founded' on the analysis of prices. On the contrary, it is necessary to show that, although prices are determined at the 'micro' level, they are 'macro-founded' when the social relationship of distribution between classes comes into consideration. In fact, the problem is to see how the distribution of a *given* value of the net product causes and limits, at the same time, the movement of prices.

v. In this framework, the relationship between Sraffa and Marx must be reconstructed: the theory of (labour) value concerns the relationship among the social classes. In this sense, it could be said that Sraffa takes back a classical theme in the Marxist literature, that of the social nature of value. As Hilferding maintains in his criticism to Böhm-Bawerk, «the total product of labour presents itself as a total value».[1] Nevertheless, unlike Hilferding, the relevant social relationships are not the relationships between the private producers of different commodities, that is the problem of the relative exchange ratios, but the social relationship between classes in capitalist economy.

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[1] Hilferding 1904, 131. 1949 [?]

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