

# Sraffa and the Labour Theory of Value

## A Few Observations

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### 1. Introduction

In his influential book *Marx after Sraffa* Ian Steedman chastised those Marxists who advocated the view that the labour theory of value was indispensable in an attempt to develop a ‘materialist account of capitalist society’ (1977, p. 14; see also Steedman, 1982). Sraffa (1960), he argued, had provided a ‘definitive solution of certain issues which had long been debated by Marxists’ (pp. 13-14). While designed to lay the foundation for the criticism of marginalist theories of wages, profits, rents and prices, a criticism which, according to Steedman, had by then ‘been carried out successfully’ (p. 13), Sraffa’s analysis had also important implications with respect to Marxist economic theory. These implications Steedman sought to draw out in his book, focusing attention on the determination of the general rate of profits. He expounded:

The Sraffa-based theory of the rate of profits starts, it must be noted, from *objective* data, referring to elements which might be expected to figure

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centrally (not, of course, exclusively) in any materialist analysis of history. The latter, it need hardly be said, is crucially important *but it does not stand or fall with the analysis of capitalist society based on value magnitudes*. On the contrary, the development of a materialist understanding of the history of capitalist economies is now seriously hampered by the continued attention paid to such theory, with all its flaws and all the attendant confusions which they engender so prolifically. (p. 67)<sup>1</sup>

The motivation of developing a coherent materialist analysis of history is repeatedly stressed in the book. Prices, the rate of profits and the rents of land are said to depend on the ‘physical conditions’ of production and the real wage rate, whereas ‘many of Marx’s value based propositions are false’ (p. 66). The situation is even worse for those advocating a value based reasoning, since ‘the physical analysis is actually the only possible foundation for value analysis’ and since therefore all value magnitudes ‘are merely derivatives of the physical conditions’ (pp. 66-7). He concluded:

Since ... Marx’s additive value magnitudes are completely irrelevant to the determination of the profit rate (and prices of production), there appears to be no good reason for not abandoning all references to such magnitudes, it being clearly understood that such an abandonment in no way leads to the rejection of a materialist account of capitalist economies and their working. The physical data concerning production conditions and *real* wages can explain anything explicable in terms of value magnitudes, which are merely their derivatives, and can indeed explain far more. Marxists should therefore concentrate on developing the materialist account of why production conditions and real wages are what they are, leaving the discussion of ‘value magnitudes’ to those concerned only with the development of a new Gnosticism. (p. 162; emphasis added)

Interestingly, he presented some of his results as a defence of Marx against those who were unwilling to draw the lessons from Sraffa’s analysis and whom he dubbed ‘obscurantists’. He emphasized: ‘Marx showed only contempt for those who sought to evade the ruthless criticism of ideas; no-one can “defend” Marx by refusing to follow him in this regard.’ To this

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<sup>1</sup> Unless otherwise stated, all emphases in passages cited are to be found in the originals.

statement he appended a footnote saying: ‘To suggest that Marx would not have been concerned with “mere details of logic” would, of course, be both false and demeaning.’ (p. 15) He also did not fail to point out ‘that Sraffa’s *Production of Commodities by Means of Commodities* presents no criticisms of Marx.’ (p. 14, fn. 3)

Ever since Piero Sraffa’s hitherto unpublished papers kept at Trinity College Library, Cambridge, can be studied by scholars, interpretations of Sraffa’s work such as the one by Ian Steedman may be confronted with what Sraffa had actually written but not published on the issues under consideration. In this paper we shall reflect upon the elements of Steedman’s interpretation cited above against the background of some of Sraffa’s constructive and interpretative work in the period of 1927-1931 and at the beginning of the 1940s. During the ten years or so that elapsed between the end of the first and the beginning of the second period Sraffa’s energy, as is well known, was absorbed by preparing the Ricardo edition on behalf of the Royal Economic Society.<sup>2</sup> We shall, in particular, confirm Steedman’s view that Sraffa was concerned with elaborating a theory of the rate of profits and prices of production that starts from ‘objective data’. It will also be shown that Sraffa was originally highly critical of the labour theory of value and called it a ‘corruption’ of what he considered to be the right approach in terms of ‘physical real costs’. He stressed that labour values cannot be known prior to and independently of the physical conditions of production and that they obtain as a solution of the system of production equations he had developed in the special case in which there are no profits and the entire net product goes to wage earners. In order to accentuate their special character, in the early 1940s he also spoke of the ‘Value Theory of Labour’. In this context it should be noted that Sraffa (1960, p. 9) typically used the term value (and price) in the sense of the classical terms ‘necessary price’, ‘natural price’ or ‘price of production’ and not (except in the case of a zero rate of profits) in the sense of labour value; we follow him in this regard. We also provide some further evidence from Sraffa’s papers that may explain his at first very critical attitude towards the labour theory of value. Clear expressions of a change in his view one encounters at the beginning of the 1940s when Sraffa found out that Marx had been struggling with similar problems and how he tried to cope with them in terms of his labour value-based reasoning.

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<sup>2</sup> For the reasons of the delay of the edition in the 1930s and early 1940s, see Gehrke and Kurz (2002).

The composition of the paper is the following. Section 2 summarizes Sraffa's physical real cost approach to the problem of value and distribution in what he called his 'first' and 'second equations', dealing with a no-surplus and a with-surplus economy and given real or commodity wages. Systems with given *real* wages were also the focus of attention in Steedman (1977). In Section 3 it will be shown why Sraffa thought that he could do without any reference to labour values and indeed the concept of 'labour', conceived of as a 'quantity', and develop his analysis entirely in material terms of commodities used up and produced. Section 4 provides a summary account of Sraffa's early criticisms of the labour theory of value and why in his view the classical authors and Marx had recourse to it. Section 5 deals briefly with a few further issues that have a bearing on the problem at hand as they are reflected in Sraffa's papers. Section 6 draws the attention to notes in which Sraffa deals with the concept of *tertium comparationes* in Marx. The argument turns around the question of whether exchange values also correspond to something physical. Section 7 discusses why in conditions in which workers participate in the sharing out of the surplus product Sraffa felt that he had to treat labour as one of the magnitudes (together with quantities of commodities and different types of lands) in terms of which the rate of profits and prices are determined, given the *share* of wages in national income. Section 8 turns to Sraffa's attempt to lay bare crucial properties of such a system independently of the disturbing interference of prices that change with a change in income distribution. This led him to elaborate the concepts of Standard commodity and Standard Ratio which is equal to the maximum rate of profits (corresponding to a zero share of wages) compatible with the given system of production in use. It is in this context that his appreciation for Marx's achievements rose considerably, because it was Marx who had insisted that in a circular flow system of production the maximum rate of profits was finite, not infinite. In Marx's conceptualisation it was given by the ratio of dead and living labour, or the 'organic composition of capital' of the system as a whole. While this cannot be sustained in general, it can be said to have anticipated an important property of the maximum rate of profits. Section 9 concludes.

In this paper we make use of some of the material contained in other papers written by one of us alone, by the two of us or by one of us together with other people (see, in particular, Kurz and Salvadori, 2005; Gehrke and Kurz, 2006).

We should like to thank Ian for his friendship, support and forbearance. He is an outstanding intellectual, one of the best we ever encountered. He is not only a friend of both of us, but he

was also a teacher of one of us, and a very patient at that, generously sharing his time. His work is a source of continuous inspiration to us. Our lives would have been less pleasant had our ways not crossed his.

## 2. Physical real costs

As early as the end of 1927 Sraffa in one of his notes referred to ‘mia teoria {my theory}’ and the ‘libro {book}’ he intended to write (D3/12/11: 55).<sup>3</sup> At the time he could not foresee the numerous difficulties he was to encounter with respect to the Ricardo edition which were responsible for the long gestation period of his 1960 book (and partly also for that of the Ricardo edition). A scrutiny of Sraffa’s papers shows that the years from 1927 to 1931 were the period in which he laid the foundations of his book (see Garegnani, 2005). It was then that he saw more clearly the distinctive character of ‘the standpoint ... of the old classical economists from Adam Smith to Ricardo’ (Sraffa, 1960, p. v) in the theory of value and distribution and that it was not just an early and somewhat crude version of Marshall’s theory. In an attempt to stilise his own doctrine as a continuation of that of the classical economists, Marshall had contended that what he considered to apply to nature also applied to economics: *natura non facit saltum*.<sup>4</sup> According to Sraffa this view could not be sustained. The classical approach to the theory of value and distribution was fundamentally different from the marginalist approach. But wherein precisely consisted the difference?

What initially appears to have impressed Sraffa most with regard to the classical authors was their explanation of all incomes other than wages in strictly objective terms on the basis of the social surplus product which obtains after all means of production used up and all means of subsistence in the support of workers have been deducted from given output levels.

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<sup>3</sup> The undated document is contained in a folder which gives November 1927 as the month in which the material has been written. At the time Sraffa defined his project as consisting of two parts: first, a history of the theory of value and distribution from Petty to Marshall, and, second, his own theory. He insisted that the ‘historical part’ was the truly important one and that his theory was essentially designed to ‘farmi capire {to make myself understood}’ (D3/12/11: 55; see also D3/12/4: 12).

<sup>4</sup> This was the motto of Marshall’s *Principles*.

According to Sraffa, this method had found a particularly clear expression in a passage in William Petty's *Political Arithmetick* in which Petty advocated the "physician's" outlook' which implied expressing himself exclusively 'in Terms of Number, Weight or Measure; to use only Arguments of Sense, and to consider only such Causes, as have visible Foundations in Nature' (Petty, 1986, *Works*, vol. I, p. 244).<sup>5</sup>

This was a starting point that met with Sraffa's approval, but was the method feasible? Could important aspects of a capitalist economy be analysed in these terms, and how far did the method carry one? Could the competitive rate of profits, the rents of land and relative prices be determined on the basis of objective data? Was not the replacement of the doctrine of the classical economists by that of the marginalists a clear expression of the fact that the former could not be given a coherent form?

At the time these questions were not easy to answer for Sraffa. First, his novel understanding of the classical authors had yet to be fully liberated from received modes of interpretation. He also had to understand better why the classical economists had not succeeded in elaborating a logically coherent theory of value and distribution. What was the reason for this failure? Was it the principal barrenness of the approach or its labour-based form? How precisely did the theory of Marshall and that of other marginalist authors relate to that of the classical economists?

One difference stood out, though: Whereas in explaining value and distribution the classical authors focused attention on cost of production, Marshall had conceived of the 'real cost' of a commodity as 'the exertions of all the different kinds of labour that are directly and indirectly involved in making it; together with the abstinences or rather the waitings required for saving the capital used in making it' (Marshall, [1890] 1977, p. 282). Hence there was the difference between the commodities actually consumed or 'destroyed' in the production of some other commodities on the one hand and the disutility and pain and abstinence experienced by agents on the other. Against Marshall's concept of *real cost* Sraffa put that of *physical real cost* (see the evidence collected in D3/12/42: 33-56). This concept, together with the related concept of

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<sup>5</sup> Similarly in Petty's *Political Anatomy of Ireland* (*Works*, vol. I, pp. 129-30); see also D3/12/4: 3. In Sraffa's diaries the name of Petty appears for the first time on 27 November 1927 in a list of names containing also those of Adam Smith, the Physiocrats, Quesnay and Sismondi; see Sraffa's papers: E1.

physical surplus, Sraffa convinced himself, held the key to the classical economists' approach to the theory of value and distribution. He stressed, 'the sort of "costs" which determines values is the collection of material things used up in production.' (D3/12/7: 106)<sup>6</sup> As to labourers, Sraffa sided with Petty who had insisted that what matters are the means of subsistence in their support or, for short, 'food', not labour.

From November 1927 Sraffa began to elaborate his equations of production, first for a system without a surplus ('first equations'), then for one with a surplus ('second equations'). For example, in a document composed in the winter of 1927-1928 Sraffa stated:

No surplus –

$$\left. \begin{array}{l} A = a_1 + b_1 + c_1 \\ B = a_2 + b_2 + c_2 \\ C = a_3 + b_3 + c_3 \end{array} \right\} \text{ where } \begin{array}{l} A = \Sigma a \\ B = \Sigma b \\ C = \Sigma c \end{array}$$

These are homogeneous linear equations. They have infinite sets of solutions, but the solutions of each set are proportional. These proportions are univoche {unique}.

These proportions we call ratios of Absolute values. They are purely numerical relations between the *things*  $A, B \dots$  They are not necessarily the ratios, in which exchange will actually take place in any community in which *the quantities of things respectively used in production (i.e. consumed) and produced* satisfy those equations: such actual ratios of exchange are also conditioned by such things as legal institutions, etc. which vary in different organisations of society and which are "arbitrary", i.e. irrelevant, from our present point of view. (D3/12/5: 2; emphases added)

What will probably perplex readers is that Sraffa apparently interpreted the above equalities in two ways. First, he saw them as the tabulation of production processes with  $A, B$  and  $C$  as gross outputs of three commodities and  $a_i, b_i$  and  $c_i$  as the amounts of the three commodities used up in the course of the production of the respective gross outputs ( $i = 1, 2, 3$ ). They are thus not all that different from the tabulation encountered in the first chapter of his book, the

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<sup>6</sup> While these costs could easily be ascertained with regard to circulating capital goods, such as raw materials, things are different with regard to fixed capital. In this paper we set aside fixed capital; see therefore Kurz and Salvadori (2004, 2005).

only significant difference being that in the latter we find a ‘→’ (with inputs on the LHS and outputs on the RHS) in the place of a ‘=’. Secondly, he appears to have interpreted them as equations although there are no unknowns for which a unique solution (except for a proportionality factor) could be found. Yet, as his work in the following months make clear, this is what he actually had in mind. This is evidenced by systems of his first equations in which he explicitly used two letters for each quantity, one expressing the amount of units of the commodity and the other its value (or price) (see, for example, the system of equations in D3/12/6: 18, composed in the winter of 1927-28). As Sraffa rightly stressed, the important result of his inquiry was that relative prices are fully determined by solving a set of simultaneous equations in which only objective data describing the social production process mattered as proximate determinants.

Sraffa swiftly also saw that ‘reducing’ the value of a commodity to the amounts of some other commodity needed directly and indirectly in its production yielded the following result:

For the first equations (without surplus) it is obviously true that the amount of  $B$  that a unit of  $A$  fetches in exchange is equal to the amount of  $B$  that directly or indirectly has been used up, in successive stages, in the production of a unit of  $A$ . The method would be that, if in  $1A$  enter  $3B + 2C$ , we would put aside the  $3B$ ; find that in  $2C$  enter  $1B + 2D$  ..., put aside the  $1B$  and find how many  $B$  enter into  $2D$  etc. etc. The series is infinite but the sum is finite. (D3/12/7: 30-31)<sup>7</sup>

Since this method can be applied with regard to each and every commodity produced in the system, the exchange ratios of any two commodities can be conceived as reflecting the relative amounts of any one of the commodities in the system used up in the production of one unit of the two commodities under consideration.

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<sup>7</sup> In order to clarify this point and, in particular, that ‘the series is infinite but the sum is finite’, we can write the equation  $\mathbf{p} = \mathbf{A}\mathbf{p}$  in obvious notation as

$$\begin{bmatrix} \hat{\mathbf{p}} \\ p_b \end{bmatrix} = \begin{bmatrix} \hat{\mathbf{A}} & \mathbf{b} \\ \mathbf{a} & \beta \end{bmatrix} \begin{bmatrix} \hat{\mathbf{p}} \\ p_b \end{bmatrix}$$

and remark that  $\hat{\mathbf{p}} = (\mathbf{I} - \hat{\mathbf{A}})^{-1} \mathbf{b}p_b$ .



From the end of November 1927 Sraffa put down also equations with a surplus, in which  $A \geq \Sigma a$ ,  $B \geq \Sigma b$ ,  $C \geq \Sigma c$  and at least one inequality is a strong one. These are his ‘second equations’. They can be said to consist of a direct extension of the above first equations:

$$\begin{aligned} v_a A &= (v_a a_1 + v_b b_1 + c_1)r \\ v_b B &= (v_a a_2 + v_b b_2 + c_2)r \\ C &= (v_a a_3 + v_b b_3 + c_3)r \end{aligned} \tag{1}$$

Here  $v_j$  is the value of commodity  $j$  ( $j = a, b$ ), commodity  $c$  serving as standard of value ( $v_c = 1$ ), and  $r$  is the interest factor ( $1 + \text{interest rate}$ ). When Sraffa confronted his friend Frank Ramsey with system (1) in June 1928, Ramsey reformulated the system of homogeneous linear equations by first putting it into its canonical form and then by setting the determinant of coefficients equal to zero in order to obtain a non-trivial solution. This was enough for him to see that there are solutions for  $v_a$ ,  $v_b$  and  $r$  for any number of equations, that is, processes and therefore commodities. Hence relative prices and the (competitive, i.e. uniform) rate of interest (or profits) can be determined exclusively in terms of physical data. (For a discussion of the collaboration between Ramsey and Sraffa, see Kurz and Salvadori, 2001.)

### 3. Labour and labour values

Obviously, in the conditions postulated (no surplus or, alternatively, with surplus-cum-given real wages) there was no need to refer to ‘quantities of labour’ or ‘labour values’ in order to determine relative prices and the rate of profits. The physical data concerning production conditions and real wages were enough to accomplish the task. It was not even clear what could have been meant by the ‘amounts’ of labour carried out by different workers or by the ‘labour value’ of a commodity. As Sraffa stressed repeatedly at the time, what matters are not hours of work performed but the actual advancement of wage goods to workers. The case of a worker in agriculture whose upkeep and that of his family has to be guaranteed during the entire year and not only during the working seasons underscored the correctness of Petty’s concern with ‘food’ rather than labour.<sup>8</sup> What mattered were the amounts of the means of

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<sup>8</sup> As Petty and the Physiocrats knew well, in agriculture workers have to be fed and sheltered even in periods when natural conditions prevent them from performing at all

subsistence in support of workers and their families. With different kinds of work performed by different workers and different real wages advanced to them, what could be the meaning of *labour*, how could its quantity be ascertained, would this quantity be independent of prices, and, last but not least, could it perform any useful role in the theory of value and distribution that cannot also be performed by the physical data?

In order to illustrate the irrelevance and superfluity of the concept of labour conceived of as a quantity it suffices to consider the no-surplus case. Let us assume that each one of the three types of commodities in equations (1) is produced by a different kind of concrete labour and each kind of labour is paid a different real wage per year. Assume that the real wage in the first industry is given by vector  $\omega_a$  and the corresponding number of workers employed in order to produce gross output  $A$  is given by  $L_a$ ; the corresponding vectors and scalars with respect to the other two industries are  $\omega_b$  and  $L_b$  and  $\omega_c$  and  $L_c$ , respectively. We can now separate the productive consumption of the means of production on the one hand and that of the means subsistence in support of the workers employed in each of the three industries on the other. How much do the three kinds of labour ‘contribute’ to the values of the gross outputs of the three commodities? Obviously this can only be answered after equations (1) have been solved for  $v_a$  and  $v_b$ . Given the solution we could say that the ‘contribution’ of the  $k$ -th kind of labour expressed in terms of commodity  $c$  is

$$L_k(\omega_{ka}v_a + \omega_{kb}v_b + \omega_{kc}) \quad (k = a, b, c)$$

These quantities could then be aggregated in order to get labour’s total contribution in terms of commodity  $c$ . It hardly needs to be stressed that all these quantities would be derived quantities that depend on prices which, in turn, depend on the physical schema and thus on the given real wages.

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or at least from performing their normal tasks, such as in winter time. (See Sraffa’s respective observations in D3/12/12: 8, composed in summer 1929.) When in the second half of 1940 Sraffa was in an internment camp on the Isle of Man he read the reprint of volume I of *Capital* (Marx, 1938). Interestingly, he annotated a passage (ibid., p. 484) in which Marx refers to a case in which a boy works ‘too hard for half the year ... {and} is nearly idle for the other half.’ (We are grateful to Christian Gehrke for having drawn our attention to this passage.)

We might also change the standard of value and express all prices and other value magnitudes in terms of, for example, the third kind of labour. In this case the nominal wage rate per unit of it,  $w_c$ , would be set equal to unity, that is,

$$w_c = (\omega_{ca}v_a + \omega_{cb}v_b + \omega_{cc}v_c) = 1$$

Now the values of the commodities would generally be different compared with the previous solution, but their ratios would be the same. Expressed in terms of the third kind of labour, the nominal wage rates of the other kinds of labour would be  $w_a$  and  $w_b$ . The total amounts of labour performed in the three industries, expressed in terms of the third kind of labour, would then be  $w_aL_a$ ,  $w_bL_b$  and  $L_c$ . With the third kind of labour as standard of value, the prices of all commodities represent quantities of this kind of labour. Summing up across all commodities (means of production and means of subsistence) consumed productively in an industry we get the equivalent of an amount of labour of the third kind. Similarly the value of an industry's gross output represents a certain amount of this kind of labour. The former may be called the labour value (in terms of the third kind of labour) of the intake of the industry's productive activity, the latter the labour value of its gross product.

Again, the quantities calculated are merely derivatives of the given physical data. They do not provide any new information that was not already contained in the latter. Therefore they cannot possibly provide a foundation, let alone an independent foundation, of value analysis.

#### **4. Sraffa's criticisms of the labour theory of value**

Right from the beginning of his constructive work in 1927 Sraffa was critical of the labour-based reasoning of the classical economists and Marx. He maintained: 'A. Smith and Ricardo and Marx indeed began to corrupt the old idea of cost, – from food to labour.' He added: 'But their notion was still near enough to be in many cases equivalent.' (D3/12/4: 2)<sup>9</sup> Yet, he went on, small errors may grow into larger ones:

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<sup>9</sup> In the document cited Sraffa did not explain which 'cases' he had in mind. The only cases in which the labour theory of value holds true as a theory of relative prices in conditions of free competition (that is, with a uniform rate of profits), on which Sraffa

The fatal error of Smith, Ricardo, Marx has been to regard “labour” as a quantity, to be measured in hours or in kilowatts of human energy, and thus commensurated to value. ... All trouble seems to have been caused by *small* initial errors, which have cumulated in deductions (e.g. food of worker = quantity of labour, is *nearly* true). Petty had foreseen the possibility of being misunderstood, cfr. Marx, Hist., I, p. 1 (D3/12/11: 36; similarly D3/12/4: 4)<sup>10</sup>

In this early phase extending well into 1929, Sraffa was opposed to employing the concept of labour as a ‘quantity’ in his equations.<sup>11</sup> He insisted:

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 got mixed up and said that value is proportional to quantity of labour (in second sense) whereas they ought to have said that it is due to *human labour* (in first sense: *a non measurable quantity, or rather not a quantity at all*). (D3/12/11: 64; emphases added)

In this passage Sraffa distinguished between two concepts of labour in Ricardo and Marx. He disputed that a measure of labour can be elaborated that allows one to portray in a reliable way the material process of production and which can therefore be used in the theory of value, as Ricardo and Marx had been inclined to think. While quantities of means of subsistence in the support of workers have a clear and unambiguous meaning, this is not so with regard to labour. (See, however, Section 3 above.)

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after some deliberation began to focus attention, are (i) the case in which all industries exhibit the same input proportions and (ii) the case in which the rate of profits is zero.

<sup>10</sup> The reference is to the French edition of *Theorien über den Mehrwert*; see Marx (1924-25).

<sup>11</sup> For his attempts at understanding the meaning of labour quantities in Ricardo and other authors, see folder D3/12/3 which contains mostly notes written in London in the summer of 1927 in preparation of his lectures on advanced theory of value. These lectures he was supposed to give later in the year but then postponed for a year.

Sraffa's critical stance at the beginning of his constructive work towards the second sense in which the concept of labour was used is documented in several papers and notes composed in the late 1920s and in annotations in his books. For example, in his copy of the French edition of Marx's *Theorien* – the eight volumes of the *Histoire des doctrines économiques* – Sraffa noted carefully passages in which Marx distanced himself explicitly from an approach to the theory of value that proceeds exclusively in terms of commodities or 'use values'. Right at the beginning of the *Histoire*, in volume I, Marx took issue with Petty who had singled out food, not labour, as the measure of value. In the margin Sraffa placed a wrinkled line along the passage in which Marx contended that any such physical input 'n'est pas la mesure immanente des valeurs' (Marx, 1924-25, vol. I, p. 3, fn).<sup>12</sup> And in his own index of volume III Sraffa noted 'Quantités de produits (non de travail) comme mesure 278, 287-9, 306-7' (Marx, 1924-25, vol. III, fly-leaf at end of book). And then again, in volume VI, we find in Sraffa's own index the entry 'Marx against physical costs 122' (Marx, 1924-25, vol. VI, fly-leaf at end of book).

According to Sraffa, Petty and the Physiocrats had not only the right notion of cost; they also advocated a view of production which was congenial to modern industrial societies: They envisaged production as a *circular flow* rather than (as, for example, the Austrian economists) as a unidirectional sequence leading from the services of original factors of production via a series of intermediate products to final goods. The circular flow view was expressed most effectively by François Quesnay in the *Tableau Économique*. Sraffa paid tribute to the latter by equating his equations with it (see D3/12/16: 7). In a non dated draft of parts of the preface of his book probably written in the 1950s he maintained that this point of view 'implies replacing the notion that "commodities are produced by factors of production" with the other one that "*commodities are produced by commodities*"', which in turn amounted to 'replacing

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<sup>12</sup> See also Sraffa's respective excerpts from the *Histoire* in D3/12/11: 88, composed in November 1927, and his quotation from Gentile (1899) in D3/12/10: 40, jotted down in Lent term 1928: 'Il Feuerbach disse, come espressione ultima e tipica del suo materialismo: *l'uomo è nè più nè meno di ciò che mangia* (der Mensch sei nur das, was er esse) {Feuerbach says as the ultimate and typical expression of his materialism: Man is neither more nor less than what he eats}.' In this context it should be mentioned that the name of the Young Hegelian and materialist philosopher Ludwig Andreas Feuerbach (1804-72) is mentioned in Sraffa's diary on 11 January 1928 (together with that of the evolutionary philosopher Ernst Heinrich Haeckel (1834-1919)).

the idea that the process of production has a beginning and an end with that that it is a circular one – an idea first introduced by the *Tableau économique*’ (D3/12/7: 2; emphasis added).<sup>13</sup>

Why had the classical economists failed to elaborate a consistent theory of value and distribution on the basis of (a) production viewed as a circular flow and (b) the twin concepts of physical real costs and social surplus? In Sraffa’s view a main reason consisted in a mismatch between analytical concepts and tools. More specifically, as Sraffa had demonstrated with his first and second equations, the tool needed in order to bring to fruition both conceptual elements (a) and (b) were simultaneous equations and the knowledge of how to solve them and what their properties are. As Sraffa stressed in a document written in all probability in late 1927 or early 1928, the role of physical real costs in determining value is ‘seen only in general equilibrium.’ (D3/12/42: 46)<sup>14</sup> The indispensable tool – simultaneous equations – alas! was not at the disposal of the classical authors and Marx who therefore tried to solve the problems they encountered in a roundabout way, typically by first identifying an ‘ultimate measure of value’ by means of which *heterogeneous* commodities were meant to be rendered *homogeneous* (in the dimension relevant to the problem of value). Several authors,

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<sup>13</sup> The formulation that ‘commodities are produced by commodities’ can probably be traced back to Sraffa’s reading of Mill (1826, p. 165), who had boldly stated that ‘the agents of production are the commodities themselves’.

<sup>14</sup> It had not escaped Sraffa’s attention that Vilfredo Pareto (and, following him, also Francis Y. Edgeworth) had criticised earlier authors for treating as givens what had to be considered as unknowns in the theory of value: Pareto’s focus were especially the wage fund theory, the labour theory of value, cost of production theories and the Austrian theory. Sraffa had carefully studied several of Pareto’s contributions at an early time which is reflected in many annotations in those that are in his library and in several references to Pareto in his early papers. On 11 January 1928 we find in Sraffa’s Cambridge Pocket Diary next to the names mentioned in footnote 5 also the remark: ‘Par. systemes, II, 288, G. E. Set 1901’. Scrutiny shows that this is a reference to p. 288 of vol. II of Pareto’s *Les systèmes socialistes* (Pareto, 1902) and a paper published by Pareto in the September issue of 1901 of the *Giornale degli Economisti* (Pareto, 1901). (The latter paper is referred to in Pareto, 1902, p. 287.) On the page mentioned Pareto deals with the necessity to determine (relative) prices in terms of simultaneous equations and introduces his criticism of the older economists who did not have this tool at their disposal and tried to simplify matters by taking a sufficiently large number of the variables under consideration as known magnitudes.

including Smith, Ricardo and Marx, had then reached the conclusion that ‘labour’ was the sought standard and had therefore arrived in one way or another at some version of the labour theory of value. This was understandable in view of the unresolved tension between concepts and tools. However, it was far from clear where these labour values came from or how they could be ascertained in a circular framework.<sup>15</sup> There is no reason to presume that they could be known independently of solving a system of simultaneous equations. Hence the route via labour values was not really a way out of the impasse in which the classical authors found themselves: it rather landed them right in that impasse again. Commodities were produced by means of commodities and there was generally no way to circumnavigate the simultaneous equations approach.<sup>16</sup>

## 5. Further observations

In Sraffa’s interpretation the labour theory of value constituted the most important version of a single-ultimate-cause-of-value theory before its replacement with another such theory: marginal utility theory.<sup>17</sup> However, as Sraffa kept stressing, contrary to marginalist utility

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<sup>15</sup> With production conceived of as a finite sequence of labour inputs that result in the generation of a product, things are simple. Ricardo every so often had recourse to such a simplified scheme and therefore had no difficulty in ascertaining the total amount of labour ‘embodied’ in a commodity.

<sup>16</sup> It is interesting to note in parenthesis that several of the early marginalist authors, including William Stanley Jevons, Eugen von Böhm-Bawerk and John Bates Clark, while stressing the importance of marginal utility, arrived at the result that in long-run equilibrium relative prices are proportional to the relative amounts of labour needed in producing the various commodities. Hence it may safely be said that at the beginning of the twentieth century the majority of economists, that is, both friend and foe of classical economics, considered the labour theory of value as being correct in some sense.

<sup>17</sup> See D1/22: 1. See also Sraffa’s annotation in Dobb (1937, p. 12; Sraffa 536). Sraffa annotated Dobb’s qualification that the opening chapter of *Das Kapital* was ‘much misconstrued’ and rested its structure ‘on a quantity which lay outside the system of price-variables, and independent of them’: the objective factor of labour – similar to marginal utility theory with its emphasis on the subjective factor. See also Smart’s

theory the labour theory of value was a close kin of the physical real cost approach because it based its explanation on the same set of physical data: the system of production in use, expressed in terms of quantities of products consumed and produced, and the real wage rate(s), data that have an objective existence and can be measured physically (see, in particular, D3/12/13: 2-3, 5). However, as we have already learned, Sraffa was at first strictly opposed to the idea that ‘labour’ belongs to the set of these quantities.<sup>18</sup>

In this section we provide some evidence from Sraffa’s papers that have a bearing on the theme under consideration. We deal, first, with Sraffa’s early view on whether it is only *human* labour that ‘creates’ value. Then we turn briefly to his conviction that contrary to the physical real cost approach the labour-value based approach cannot take into account natural resources that are gradually exhausted over time. Next we turn to Sraffa’s response to the claim that the labour theory of value provides a correct explanation of the exchange values of commodities in early stages of economic development, that is, the so-called ‘historical’ interpretation of the theory.

(a) *Which kind of labour?*

Advocates of the labour theory of value typically singled out human labour to the exclusion of other kinds of labour when dealing with the problem of value. The different treatment was not restricted to such authors as Ricardo and Marx, but was encountered also, for example, in Marshall. The latter had specified that the ‘keynote’ of his *Principles* was ‘in the fact that free human beings are not brought up to their work on the same principles as a machine, a horse,

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discussion of whether labour, ‘life’ or utility should be regarded as the ‘common third’ (Smart, 1923; pp. 92-4; Sraffa 2306) culminating in the contention: ‘The common third is Utility’ (p. 93). We come back to the issue of *tertium comparationes* in Section 6 below.

<sup>18</sup> For example, in the document referred to in the above, which was presumably written in the second half of 1929, he specified the quantities under consideration as follows: ‘Such are quantities of various materials used or produced, of lands{,} quantities of labour (?), lengths of periods (?), etc. These are the *only* quantities which must enter as constants in economic theory, i.e. which can be assumed to be “known” or “given”.’ The bracketed question mark after ‘quantities of labour’ is significant and expresses well Sraffa’s vacillation as late as 1929 as to the possibility of taking labour as a given constant.



or a slave.’ (Marshall, [1890] 1920, p. 504). Basically the same view had been advocated by F. Y. Edgeworth (see D3/12/42: 36). Sraffa objected in a note composed in the period between May and July 1928:

There appears to be no objective difference between the labour of a wage earner and that of a slave; of a slave and of a horse; of a horse and of a machine; of a machine and of an element of nature (?this does not eat). *It is a purely mystical conception that attributes to human labour a special gift of determining value.* Does the capitalist entrepreneur, who is the real “subject” of valuation and exchange, make a great difference whether he employs men or animals? Does the slave-owner? (D3/12/9: 89; emphasis added)<sup>19</sup>

Sraffa’s argument echoes an observation by John Ramsey McCulloch which had been criticised by Marx in the *Histoire* (Marx, 1925, vol. VII, pp. 22 and 24; see also Marx, 1971, p. 179). Sraffa did not agree to the criticism. In his own index of the volume he stressed: ‘Sbagliata critica c.{ontra} McCulloch {Mistaken criticism of McCulloch}22, 24’.<sup>20</sup> He also noted: ‘Smith appelle un boef {sic} un ouvrier productif {Smith calls an ox a productive worker} 23’, which Sraffa considered the correct view with respect to the conditions under consideration.

In this context it is apposite to draw the readers’ attention to Sraffa’s excerpts from the ‘Report of the Meeting’ of the Committee of the British Association on ‘a common measure of value in Direct Taxation’, 1878 (see D3/12/2: 24-5). There it is argued that as regards the ‘cost of labour’ workers should be treated on a par with horses: ‘As the horse has to be

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<sup>19</sup> See also the discussion of Marshall’s above view in D3/12/7: 105-106, where Sraffa distinguished between the concept of goods that ‘enable’ workers to perform their tasks and that of goods that ‘induce’ them to do so. He ascribed the former concept to the classical economists and in his first and second equations strictly stuck to it. See in this context also his statement that ‘we have no reason to attach such a peculiar importance to human labour’ (D3/12/7: 27).

<sup>20</sup> In his annotations in his copy of Whitaker’s *History and Criticism of the Labor Theory of Value in English Political Economy* (1904, p. 63), which he read in December 1927, Sraffa expressed his disagreement with Whitaker who considered McCulloch’s view ‘one of the most crossly ridiculous originalities in the annals of political economy’.

clothed and stabled, so the productive labourer has to be clothed and housed', etc. Hence what mattered in all cases considered were physical real costs or 'food' – irrespective of whether the reference was to the labour of a wage earner, of a slave, of a horse or of a machine.

This was Sraffa's view up until approximately mid 1929. For the reasons why he changed it, see Section 7 below.

(b) *Doing away with 'human energy'*

Another objection stemming from around the same period can be related to Sraffa's reading of books devoted to the natural sciences and methodological issues. For example, he had (in all probability at an early time) carefully studied Henry Poincaré's *La Science et l'Hypothèse* (1902), and from his annotations relating especially to chapter VIII, 'Énergie et Thermodynamique', we may infer that in his view economists must not ignore the laws of physics, chemistry and biology. This request spoke in favour of the physical real cost approach and against the labour-based approach. Sraffa expounded:

The difference between the "physical real costs" and the Ricardo-Marxian theory of "labour costs" is that the first does, and the latter does not, include in them the natural resources that are used up in the course of production (such as coal, iron, exhaustion {sic} of land) – [Air, water, etc. are not used up: as there is an unlimited supply, no subtraction can be made from  $\infty$ ]. This {is} fundamental because it does away with "human energy" and such metaphysical things. (D3/12/42: 33)

By means of the physical real cost approach Sraffa thought to be able to cover not only renewable natural resources, such as lands of unchanging qualities, but also exhaustible resources, such as mineral ores and oil deposits. For a long time he intended to treat both kinds of resources in his 1960 book. This is evidenced by the fact that the first proofs of it still contained a passage dealing with 'wasting assets'. This passage was omitted only at the final stage.

(c) *The 'historical' labour theory of value*

Several authors, including Adam Smith, Robert Torrens and Friedrich Engels, had contended that the labour theory of value holds in ‘primitive’ societies.<sup>21</sup> Apparently Sraffa was not convinced. In the late 1920s he consulted books on economic history, anthropology and ethnology and annotated *inter alia* passages dealing with the historical interpretation of the theory. The literature he consulted implied that in such societies economy of time and labour plays a negligible role, while economy of materials tends to be all-important. For example, Sraffa studied and took excerpts from Frank R. Eldridge’s *Oriental Trade Methods* (1923) (see D3/12/10: 18) and Elizabeth E. Hoyt’s *Primitive Trade. Its Psychology and Economics* (1926) (see D3/12/9: 42). From the former he excerpted the following passage contained in a subsection titled ‘Waste of Time and Economy of Material’:

In China and Japan, in common with other over-populated countries, the value of human endeavour {sic} has been subordinated for centuries to the lack of goods, wealth and the pressure of population on food supply. The laws of supply and demand have, therefore, developed common characteristics which disregard time but conserve material with a highly developed economy. One of the poorest appeals to the natives of these countries is the time-saving appeal. ... The appeal of a material-saving device is for the same reason instantaneous and alluring to the economic instincts of these people. (Eldridge, 1923, pp. 5-6)

He also noted the author’s observations that ‘In India waiting is a rule’ (ibid., p. 21) and that ‘time is immaterial where price is concerned’ (ibid., pp. 21 and 22) and that ‘Not labor-saving but material-saving devices of modern industry have the greatest vogue in China. Smoke-consumers, by-product industrial machinery, etc. are very attractive and appeal to this characteristic in the Chinese temperament’ (ibid., p. 42). Hoyt’s book gives a list of references which, Hoyt stressed (and Sraffa excerpted), provide ‘striking examples of failure to accord value to time and labour even when exchange is well developed’ (see D3/12/9: 42 where the reference is to p. 93, fn.). Hoyt (p. 93) insisted: ‘There is no evidence that primitive men made valuations in terms of labour costs at all. The observation that “labour ... is the real measure of the exchangeable value of all commodities”<sup>22</sup> finds no support in the practices of primitive society.’

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<sup>21</sup> As regards Torrens, see Sraffa’s annotations in Whitaker (1904, p. 74; Sraffa 1095).

<sup>22</sup> Hoyt cites Smith (WN I.v.1).

Of particular interest is Sraffa's response to a view expressed by Karl Bücher in his *Industrial Evolution*, published in 1910. In chapter I, 'Primitive Economic Conditions', Bücher had maintained:

It is entirely erroneous, though customary, to imagine that primitive people are particularly expert in measuring time by the position of the sun. They do not measure time at all and accordingly do not make divisions of it. No primitive people observe fixed meal times, according to which civilized man regulates his time for work. Even such a relatively advanced tribe as the Bedouins has no conception of time. (Bücher, 1910, p. 19)

Sraffa objected that 'it is not a question of being primitive; even the Chinese and the Indians seem to have no conception of the value of time', as 'a shrewd observer of eastern {sic} trade remarks.'<sup>23</sup> A concern with time and labour time is rather said to be the result of a positive rate of interest:

It is interest on money that hammers into the head of man the notion that time is valuable, as valuable as material / it gives correctness to abstract time / – that in fact a saving of time is a saving of material ( $t^2$ ). The business man who takes as his insegna {motto} "time is money" is urged by the pressure of compound interest that accumulates with the lapse of time, long before being acquainted with Jevons's formula of amount {of} capital as a function of time. (D3/12/7: 101-102)<sup>24</sup>

Therefore, one would expect time and labour to become important only in conditions in which there is interest and thus a surplus and not in conditions in which there is none – contrary to the historical interpretation.

Bücher's book was probably brought to Sraffa's attention whilst reading (and annotating) Raymond William Firth's *Primitive Economics of the New Zealand Maori* (1929). Firth had

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<sup>23</sup> In parentheses he referred to 'Elbourne', but apparently he meant Eldrige.

<sup>24</sup> Sraffa's reference is to Jevons's concept of the period of investment of working capital in *The Theory of Political Economy*. Sraffa's working copy which is heavily annotated (especially in chapter VII, 'Theory of Capital') was the 4<sup>th</sup> edition, published in 1911 (Jevons, 1911).

criticised ‘theories of the development of our private ownership of to-day from primitive communism’ as ‘fantastic’ and contended that the underlying idea ‘was in particular the product of Marx and Engels, influenced by the Hegelian dialectic, with its conception of any state of society as being the negation of that which immediately preceded it.’ (Firth, 1929, p. 16)

## **6. *Tertium comparationes***

In the Lent term of 1928 Sraffa contemplated upon a famous fragment of Heraclitus whose English translation reads: ‘All things are exchanged for fire, and fire for all things, as goods for gold and gold for goods.’ It can safely be assumed that Sraffa came across the fragment when reading (the French edition of) volume I of *Das Kapital* (as regards an English edition, see Marx, 1954, p. 107 n.). He quoted the Italian translation – ‘Ogni cosa contraccambiarsi in fuoco, ed il fuoco in ogni cosa, come l’oro in merci e le merci in oro.’ – and then commented on the interpretation of the fragment as advocated by its translator, Eduard Zeller. According to the latter Heraclitus refers only to the qualitative change of the substance in exchange and insists that while the value is the same, the substance is not. Apparently Sraffa was not convinced. He quoted the following passage by Zeller and added in parentheses question or exclamation marks:

Ma non dovrebbesi esagerare l'importanza di un paragone. Il fuoco-sostanza diventa altro (?) cioè si trasforma, come vedremo in acqua, terra, meteora, ma Eraclito suppone (?) sempre che il fuoco rimane nascosto in ogni altra sostanza derivata, non in atto, come direbbero gli Aristotelici (!) ma in potenza. Quel paragone come tutti i paragoni non è l'espressione di una identità materiale (?), giacchè, se la sostanza fuoco diventa assolutamente altra, come l'oro si scambia contro carne, legno, vino o qualsiasi oggetto, non si può parlar più di sostanza universale. {But, the importance of a comparison must not be exaggerated. The fire-substance becomes something different (?), i.e. it transform itself, as we will see, in water, land, meteor, but Heraclitus supposes (?) always that fire remains hidden in every derived substance, but not in act, as the Aristotelians (!) would say, but in power/potentiality. This comparison like all comparisons is not the expression of a material identity (?), since, if the

substance-fire becomes an absolutely different one, like gold exchanges itself for meat, wood, wine or any other object, it is no more possible to talk of a universal substance}' (D3/12/10: 24).

Apparently, Sraffa did not agree with the interpretation given. He added: '(perché? La moneta, dice Verri e Lloyd, è la merce universale {why? Money, say Verri and Lloyd, is the universal commodity})', followed by: 'Tutto il dilemma dello Zeller che segue è contraddetto se a fuoco si sostituisce elettricità {Zeller's entire dilemma that follows is contradicted if one substitutes electricity for fire}.' (Ibid.)<sup>25</sup>

One can only wonder why Sraffa refers to electricity, and electricity only, in this context. One possible interpretation is that in modern times electricity is an input needed in the production of each and every commodity and that in particular circumstances there may be exchange ratios of commodities that are proportional to the relative overall amounts of electricity 'embodied' in the various commodities. Electricity would in this case be the 'common third' or 'substance'. This conforms to Sraffa's concern with 'the objective ground of value' (D3/12/7: 27) as is reflected by numerous documents in the late 1920s. In this context it is apposite to draw the reader's attention to the fact that Sraffa's concern with the problem of whether qualitatively different commodities can be said to represent equal or different quantities of the same substance received some support from contemporary physics. In a book originally published in German and then translated into English, titled *The Universe in the Light of Modern Physics*, Max Planck had stated: 'If we compare the old theory with the new, we find that the process of tracing back all qualitative distinctions to quantitative distinctions has been advanced very considerably.' And a bit further down on the same page he added: 'According to the modern view there are no more than two ultimate substances, namely positive and negative *electricity*.' (Planck, 1931, p. 16; emphasis added) Interestingly, in his personal copy of the book Sraffa had annotated these statements.<sup>26</sup>

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<sup>25</sup> For a more recent discussion of the fragment, its meaning and English translation, see Kahn (1979, pp. 145-53). Kahn suggested the following translation: 'All things are requital for fire, and fire for all things, as goods for gold and gold for goods.'

<sup>26</sup> There are two straight lines in the margin of the following passage: 'it is impossible to obtain an adequate version of the laws for which we are looking, unless the physical system is regarded *as a Whole*. According to modern mechanics, *each individual*

Sraffa dealt with the idea of a common third also in a nondated manuscript probably stemming from the late 1920s titled ‘Difference (simultaneous) v. Change (successive in time)’ (see D3/12/7: 118). In it he attempted to reach clarity about the relationship between two different kinds of theories of value. While a theory concerned with how the values of various commodities compare with one another at a given place and time refer to values that are simultaneous, a theory dealing with changes in values over time refer to a succession of time. As regards the first type of theory the question is, what determines the equality (or inequality) of values, ‘what is the common element, the substance which enters in equal {unequal} quantity in the two things hidden behind the widely different appearance?’ As regards the second kind of theory the question is: ‘what is the difference, hidden behind the identical appearance of these two pairs of boots, which makes them different in exchange {in two subsequent years}?’ Sraffa added: ‘This way of putting the distinction is confusing. If the “common substance” is drawn in for the first case, it is clear that as it explains the equality in the first case, it will explain the difference in the second. Besides the making of the first a matter of equality and of the second a matter of difference, is a purely verbal trick ...’

Apparently, Sraffa was intrigued by the idea that when commodities exchange for one another according to a certain rate they must be equal to one another also in some other dimension – the dimension of their ‘common substance’. Whether such a common substance existed and what precisely it was, was not so clear. As regards intertemporal comparisons of the exchange value of a commodity, Sraffa in the document referred to was inclined to think that if such a substance existed any change in the value of the commodity can be traced back to a proportional change in the amount of the substance ‘embodied’ in the commodity. However, this presupposes that in the two different situations the kind of substance under consideration, and thus the dimension at stake, has not itself changed. The question is also whether the argument is meant to apply both to systems without a surplus (first equations), systems with a surplus and given real wages (second equations) and systems with a surplus and a given share of wages (third equations).

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*particle* of the system, in a certain sense, at any one time, *exists simultaneously in every part* of the space occupied by the system. This simultaneous existence applies not merely to the field of force with which it is surrounded, but also to its mass and its charge.’ (The second and third emphases are Sraffa’s.)

These were not the only occasions on which Sraffa dealt with the problem of common substance. From 4 July to 9 October 1940 he together with other foreigners living in the United Kingdom was in an internment camp on the Isle of Man. Sraffa filled the time with reading the recently published reprint of volume I of *Capital* (Marx, 1938) and composed a few notes which he kept in his personal copy of the volume. He was once more intrigued by Marx's discussion, right at the beginning of chapter I of part I, 'Commodities', of the 'common "something"' or 'common substance' that is said to manifest itself in the exchange-values of commodities. When two commodities are equal in value, Marx had insisted, 'there exists in equal quantities *something* common to both.' And: The value 'is the mode of expression, the phenomenal form, of something contained in it, yet different from it' (ibid., pp. 3 and 5).

In one of his undated notes Sraffa asked: 'What is the force of this argument?' He gave the following answer: 'It ~~assumes~~ appeals to some generally accepted principle, which should be stated explicitly. Something like this: if two things are equal in one respect, they must also be equal in some other respect.' He pointed out that while 'the argument is supported by such critics as take "marg. utility" as the "other" thing', it is rejected by some other critics, including Gustav Cassel<sup>27</sup>: 'It is opposed by the Cassel-type of critics, who say, if two objects are of equal length, why should they have any other property in common, beside the same length?'

In a *Nota bene* Sraffa sought to clarify the problem at hand. He started out by saying that 'This way of putting it begs the question in favour of the Cassell {sic} point of view: it is absurd to put the two "respects" or properties on the same plane.' He added:

M{arx}. regards one as the expression, the appearance, and the other as the substance. "Two things are exchanged in a certain ratio, what do they have in common in that ratio?" is asking "what is the cause of that exchange ratio?" Cassel answers: "why should there be a cause?"

Sraffa went on:

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<sup>27</sup> The reference appears to be to Cassel's *Fundamental Thoughts in Economics*; see Cassel (1925, especially pp. 62-7) which is suggested by Sraffa's annotations in the book.



Now if a measurement is made, and two things are found to be equal, it is said that they have the same length, or weight, or force etc. This may be a mere restatement of the result of measurement in other words – which merely gives the illusion that there is a substance (length, force, etc) which is behind the measurement. But it may be not. If the length, force etc can be also measured (and therefore defined) in an independent way, then the statement is a real one, not an illusion.

He concluded:

Thus to say that two things exchange for one another “because they have the same exchange value” is tautological, *if exch. value cannot be measured in any other way than by seeing how they exchange. But if it can, the statement is a law.* (Emphasis added)

To this he added another *Nota bene* in which he asked himself to make a list of such ‘quantitative properties’ and then listed a number of them, including, for example, length, weight, force and temperature. Notice that all properties mentioned are physical properties.

Sraffa thus rejected Cassel’s view and insisted that the ratio at which two commodities exchange for one another may express a further property, another objective fact, common to both. This comes to the fore again in a note dated 8 January 1946 which contains a reference to the physicist Percy W. Bridgman.<sup>28</sup> Sraffa asked himself: What do values do? and then identified three aspects of the same property. The second aspect he described in the following way: ‘{They} give an *objective content* to ratios of exchange – *they correspond to something.* They satisfy a fundamental requirement, of which economists (Cassel) make fun, but other subjects see (Bridgman)’ (D3/12/16: 30A; emphases added). As Sraffa noted elsewhere, with a zero rate of profits values are proportional to quantities of labour embodied in the various commodities. This is the case in which a ‘Value Theory of Labour’ applies, with labour as the common ‘substance’ (see D3/12/44: 3 and D3/12/46: 24).

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<sup>28</sup> In Sraffa’s library we find the 1938 reprint of Bridgman’s *The Logic of Modern Physics* (Bridgman, 1938), originally published in 1927, with annotations by Sraffa, and Bridgman (1943). Bridgman advocated the view that it had no meaning to interpret physical concepts unless they are capable of observation.

## 7. Sraffa's 'third equations': the concept of wages as a share

While in the first and second equations Sraffa assumed wages to be given as an inventory of commodities, or a bundle of goods, he shortly afterwards began to investigate how a hypothetical change in wages, given the system of production, affected the rate of interest and relative prices. In this regard he followed once again Ricardo who had investigated the implications of a participation of workers in the surplus product and had thus arrived at his fundamental proposition on distribution: that the rate of interest (or profits) is inversely related to the *share* of wages, or 'proportional wages' (Sraffa).

With workers participating in the sharing out of the surplus, the concept of a given real (i.e. commodity) wage was obsolete. But this was not all. The adoption of the new wage concept necessitated also a reconsideration of Sraffa's earlier view that there was no 'objective difference' between the labour of a wage earner, of a horse etc. The amount of fodder given to a horse, for example, Sraffa argued, is decided exclusively by its owner on grounds of economy. Ricardo's characterisation of machines as 'mute agents' of production (*Works*, Vol. I, p. 42) had also not escaped Sraffa's attention (see D3/12/33: 34). Contrary to the amount of fodder given to a horse and the fuel given to a machine the wages paid to workers is the outcome of a bargaining process between capital owners and workers (see, for example, D3/12/42: 35). In a manuscript written in 1942, Sraffa expounded that in his first and second equations the 'food and sustenance of the workers {are} treated ... on the same footing as that of horses.' Significantly, he added: 'Men however (and in this they are distinguished from horses) kick.' (D3/12/16: 18) Hence in the new conditions contemplated human labour could no longer be treated on a par with other kinds of labour in terms of the physical real costs it involved.<sup>29</sup> Human labour had to be taken explicitly into account. Since wages were paid in relation to the work performed by workers, Sraffa eventually convinced himself that labour had to be treated as a measurable quantity. While soundings of doubts concerning his earlier view can be traced back to 1929 (see, in particular, his notebook D3/12/12) it appears to have

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<sup>29</sup> Interestingly, in the document referred to he went on: 'The horse (or his physiology) takes a strictly private view of his relation with his food, and does not allow any extraneous consideration to interfere: he is a perfect utilitarian and thus forms the ideal object of study of the marginal utility economist.'

been only from around the turn of 1929 that he gradually changed his view in this regard and began to consider human labour as both quantifiable and distinct from other kinds of labour. He now assumed that wages were paid in proportion to the labour performed and we encounter equations in which the quantity of labour employed in industry  $i$ ,  $L_i$ , is explicitly given (see D3/12/7: 166 and 159 (1)). As Sraffa (1960, p. 10) was to write: ‘We suppose labour to be uniform in quality, or what amounts to the same thing, we assume any differences in quality to have been previously reduced to equivalent differences in quantity so that each unit of labour receives the same wage.’

Also another classical concept lost much of its former appeal: that of *ante factum* payment of wages which implied reckoning wages as belonging to the capital advanced at the beginning of the (uniform) period of production. Ricardo and Marx had retained this assumption, but it sat uncomfortably with the rest of their analyses. While Sraffa at first followed the two, towards the end of 1943, after careful deliberation, he decided to take wages to be entirely paid out of the product. This move prompted him to reconsider the classical distinction between ‘necessaries’ and ‘luxuries’ and made him elaborate the more technical distinction between ‘basic’ and ‘nonbasic’ products. These were important steps on the way to developing his third equations as we encounter them in his 1960 book.

However, before we turn to a brief discussion of the device of the Standard system in the following section, it is apposite to point out what precisely it was that in the early 1940s made Sraffa’s esteem for Marx rise appreciably. When (re-)reading some of Marx’s works at the beginning of the 1940s, Sraffa found that Marx had spotted a serious blunder in Ricardo’s argument (see, especially, Marx, 1989, pp. 226-27, 419). Marx had approved of Ricardo’s new concept of proportional wages and had translated it into his own concept of ‘rate of surplus value’,  $S/V$ , with  $S$  as the labour value of the (net) social surplus (profits) and  $V$  as that of the social variable capital (i.e. wages). Ricardo had assumed that his fundamental proposition on distribution applied not only to a given system of production in use but also to technologically changing systems. Against this Marx had objected that Ricardo had erroneously identified the rate of profit with the rate of surplus value and had thus overlooked a second determinant of the former: the technical conditions of production as they are reflected in the organic composition of capital of the system as a whole. Ricardo’s oversight was due to the simplifying assumption he typically entertained in his observations on profits

and wages that capital consists only of, or can be resolved entirely into, wages.<sup>30</sup> (The implication of this assumption is that when wages vanish, the rate of profits goes to infinity.) However, with a circular flow this is not so: there is always a commodity residue left however far one carries the reduction of prices to dated quantities of labour and thus wages. Therefore the rate of profits can fall or rise even if proportional wages remain constant. This becomes clear when we turn to Marx's expression for the rate of profit

$$r = \frac{S}{C+V} = \frac{S/L}{C/L+V/L} = \frac{1-w}{1/R+w} = \frac{R(1-w)}{1+Rw} \quad (1)$$

with  $C$  as the labour value of constant capital,  $L$  as the amount of living labour expended during the year,  $w$  as the share of wages ( $V/L$ , or the rate of surplus value,  $(1-w)w^{-1}$ ) and  $R$  as the inverse of the organic composition of capital ( $C/L$ ). Obviously, the general rate of profits depends on two magnitudes instead of on only one:  $R$  and  $w$ . In Marx's conceptualization  $L/C = R$  gives the maximum rate of profits that corresponds to zero wages and thus an infinite rate of surplus value ( $w = 0$ ). If the maximum rate of profits happens to fall (rise) in the course of economic development, and proportional wages remain constant, the actual rate of profits is bound to fall (rise).

## 8. From the 'Hypothesis' to the Standard commodity

Focusing attention on the case of a given system of production in use, Sraffa credited Marx with having seen that in a circular flow framework the maximum rate of profits (corresponding to zero wages) is finite, not infinite (see Sraffa, 1960, p. 94). When in the late 1920s Sraffa began to study the dependence of the rate of profits on wages he had to face the fact that with a change in wages also relative prices change. Whilst in purely physical or commodity terms a rise in wages of necessity implies a fall in profits, and *vice versa*, given the system of production in use, it was not clear whether in nominal terms this fall was

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<sup>30</sup> Steedman (1982, pp. 126-7) is, of course, right in insisting that Ricardo did not generally ignore non-wage capital in his analysis.

counteracted by a change in prices. Hence it was not clear how a given change in wages translated into a change in the *rate* of profits, which relates the surplus product going to capital owners to social capital. Things would be fairly straightforward in the special case in which a change in distribution has no impact on the value of the social capital (or aggregate of the means of production employed) relative to that of the social product (or the totality of the goods produced). This case Sraffa actually contemplated in a document composed in the first half of 1931. He wrote:

It may be said that the value of total capital in terms of total goods produced cannot vary {as a consequence of a variation of wages and a contrary variation of profits}, since the goods are composed exactly in the same proportions as the capitals which have produced them. (D3/12/7: 157(3))

Sraffa was clear that the proposition was ‘false’, but surmised that it ‘may contain an element of truth’ (ibid.). When in a note composed in November 1943 he came back to the issue he clarified that his proposition was based on the ‘statistical compensation of large numbers’ (D3/12/35: 28). Henceforth he called the assumption that the value of social capital relative to that of social product does not change with a change in distribution ‘My Hypothesis’ or simply ‘Hypothesis’.

As Sraffa saw at the beginning of the 1940s, it was precisely this hypothesis that underlay also Marx’s labour-based concept of a given organic composition of capital for the system as a whole that can be ascertained independently of the distribution of the product. However, at that time he had already convinced himself that the ‘element of truth’ referred to resided neither in the statistical compensation of large numbers nor in the labour-based evaluation of social product and social capital. No actual economic system could ever be expected to strictly satisfy the Hypothesis. The only possibility left was to construct an artificial system that did so. This artificial system did however have to possess all the properties of that part of the actual system out of which it was constructed (that is, the set of ‘basic equations’) and at the same time offer a straightforward expression of one these properties: the inverse relation between the actual rate of profits and the share of wages.

This Sraffa accomplished in January 1944 in terms of the Standard system and Standard commodity in a set of notes interestingly titled ‘Hypothesis’ (see D3/12/36: 61-85). As we

have heard already, this accomplishment was premised on two decisions. First, Sraffa abandoned the tradition to treat wages as paid *ante factum* and therefore decided to assume *post factum* payment. Secondly, once this step was taken the way was open to the distinction between basic and nonbasic commodities which replaced the old one between necessities and luxuries. The upshot of these developments was the establishment of a linear relationship between the rate of profits,  $r$ , and proportional wages,  $w$ ,

$$r = R(1 - w) \quad (2)$$

where now  $R$  is the *Standard ratio* or *Maximum rate of profits* and  $w$  is the share of wages in national income. Expression (2) can be said to incorporate what is sound in expression (1) and at the same time overcome its deficiencies.

This is, we believe, the main reason for Sraffa's high appreciation of Marx's achievement. In fact, Sraffa went so far as to maintain that 'M. {Marx} knew all this' (D3/12/36: 67 (verso)). This interpretation is confirmed by numerous documents written in the mid 1940s and late 1950s and some after the publication of Sraffa's 1960 book. Of particular interest among the latter is Sraffa's response to a review of his book published by Stephen Bodington under the pseudonym 'John Eaton' in *Società* (Eaton, 1960). Sraffa was 'very pleased with this review. Not because it is so flattering (or, perhaps, *not* only because of that!) but because it presents it in such an interesting way'. Sraffa added:

I think, however, that Eaton has overlooked ~~the fact~~ that if we want to follow in Marx's footsteps and pass from values to prices of production and from rate of surplus value to rate of profits, the Standard System is a necessary adjunct: for that passage implies going through certain averages and if these are calculated without weights (or with the weights of the real system), a result which is only approximately numerically correct is obtained. If an *exact* result is wanted ~~the weights~~ (i.e. the proportions, ~~or q numbers~~) of the St. Syst. of eq's q's must be applied as weights. – This is not stated explicitly in the book, but is implied. (D3/12/111: 118)

Sraffa then composed a manuscript titled 'Risposta a Eaton {Reply to Eaton}' (D3/12/111: 127-130) in which he investigated how the general rate of profits can be an exact weighted average of the different industries' rates of profit, calculated for the different industries on the

basis of the labour values of the products and the role that the Standard Commodity may play in it.<sup>31</sup>

Sraffa at around the same time spelled out his reading of Marx's 'value hypothesis' which throws some light on his above exclamation that Marx knew all this. He insisted:

The propositions of M. are based on the assumption that the comp. of any large aggr. of commodities, e.g. wages, profits, const. cap., consists of a random selection, so that the ratio between their aggr. values (rate of s.v., rate of p.) is approx. the same whether measured at 'values' or at the p. of prod. corresp. to any rate of s.v.

This is obviously true, and one could leave it at that, if it were not for the tiresome objector, who relies on hypothetical deviations ... – It is clear that M's proportions are not intended to deal with such deviations. They are based on the assumption (justified in general) that the aggregates *are* of some average composition.

In order to be exactly true, the proportions would have to be the Standard commodity's proportions. Sraffa added: || 'i.e. Marx assumes that wages and profits consist *approximately* of quantities of st. com.' || (D3/12/111: 141)<sup>32</sup>

## 9. Concluding remarks

Ian Steedman has most attentively and perceptively studied Marx and Sraffa. With regard to Sraffa's analysis of (single-product) systems without and with a surplus and given *real* (i.e. commodity) wages, he pointed out that the general rate of profits and relative prices are fully determined by the '*objective* data' from which Sraffa started. Being themselves merely

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<sup>31</sup> The point was then established, with some slight differences, also in the secondary literature; see Meek (1961), Medio (1972) and Eatwell (1974-75).

<sup>32</sup> Sraffa's emphases. (In the original the first word is double underlined. There are two lines in the margin of the passage.) For a careful discussion of Sraffa's response to and correspondence with Bodington, see Gehrke (2007).

derivatives of the given physical conditions, labour value magnitudes have no role to play in this determination and are therefore at best superfluous in developing a materialist analysis of history. Steedman's interpretation is fully corroborated by Sraffa's hitherto unpublished papers. The evidence laid out especially from the first period of his reconstructive and interpretative work (1927-1931) documents in some detail Sraffa's critical attitude towards the labour theory of value and his advocacy of the concept of physical real costs.

However, when towards the end of the first period Sraffa began to discuss systems with a surplus and workers' participation in the sharing out of the surplus, he was willing to include quantities of labour among the objective data on the basis of which the rate of profits and prices were to be determined. He credited Marx with having spotted an error in Ricardo's fundamental proposition concerning income distribution. In some parts of his analysis Ricardo had for simplicity taken social capital to consist entirely of wages (or of being fully reducible to wages in a finite number of steps) and had therefore not seen that with production conceived of as a circular flow the rate of profits did depend not only on proportional wages (i.e. the share of wages) but also on the technical conditions of production. Sraffa also credited Marx with having discovered that in these conditions the maximum rate of profits was finite, not infinite (as Ricardo's assumption would have implied), and with having specified its magnitude as equal to the inverse of the organic composition of capital as a whole. The latter was seen to be independent of income distribution. The idea of the value of the social product being invariant with respect to the value of social capital as distribution changes, had been invoked by Sraffa as early as 1931 and was then referred to as 'Hypothesis' in the early 1940s. The invariance condition, Sraffa soon understood, was not satisfied by any actual system and therefore had to be brought about in terms of a special construction. The construction under consideration is, of course, the device of the Standard system which Sraffa had elaborated as early as January 1944.

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