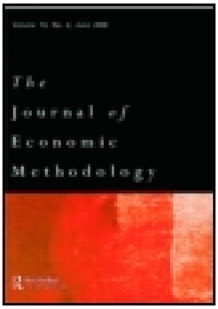

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Piero Sraffa: economic reality, the economist and economic theory: an interpretation

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Piero Sraffa: economic reality, the economist and economic theory: an interpretation

Neri Salvadori and Rodolfo Signorino

Abstract We carry out a textual analysis of Sraffa's main published contributions to pure economics in order to elaborate a rational reconstruction of an aspect of Sraffa's implicit methodology which has not yet been duly investigated. We refer to the threefold relationship between 'economic reality', 'the economist/observer' and 'economic theory'. We elucidate the constraints which, for Sraffa, should bind the economists' arbitrariness and we trace the elements of continuity and evolution from the 1925–6 critique of Marshallian economics to *Production of Commodities*.

Keywords: Piero Sraffa, methodology, theory of value, laws of returns, marginalism, classical economics, joint production

1 INTRODUCTION

As is well known, Piero Sraffa never published extensive discussions of epistemological or methodological issues. Yet, in recent years, partly as a response to growing interest in economic methodology, several scholars have tried to outline rational reconstructions of some aspects of Sraffa's logic of scientific research in economics. To mention just a few: Lunghini (1975), Roncaglia (1978) and Marion (2005) have deeply analysed the relationship between Sraffa and Wittgenstein; Davis (1988, 1993, 1998 and 2002) has highlighted the Gramscian roots of Sraffa's critique of methodological individualism both in Marshallian economics and in Wittgenstein's logical atomism (see also Signorino 2001a for an analysis of Sraffa's unpublished manuscripts at this regard); Mongiovi (1996) has investigated the relationship between the 1925 and 1926 papers and the 1960 book against the background of the classical method of logical separation of the analysis of output from that of price; Salvadori (2000) has reconstructed Sraffa's strategy of research on the role of demand; Salanti and Signorino (2001) have traced some elements of continuity and some of discontinuity in Sraffa's overall contribution to economics from a methodological point of view; Kurz and Salvadori (2004 and 2005) have analysed the role of objectivism in Sraffa's thought.

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In this paper we concentrate on a specific and hitherto neglected aspect of Sraffa's implicit methodology: the threefold relationship between 'economic reality', 'the economist' and 'economic theory'. By 'economic reality' we mean the collection of human agents and material objects which constitute the human process of production and reproduction of commodities. By 'the economist' we mean the human agent who observes, classifies and analyses economic reality. By 'economic theory' we mean the main intellectual product emerging from the economist's effort to analyse the economic reality under investigation.

Our main results may be summarized as follows. In his published works of the 1920s and early 1930s Sraffa appears to consider economic reality *as if* it existed independently of the activity of observation and classification carried out by economists. Furthermore, he makes several empirical claims about economic reality *as if* they were self-evident or, at least, easily verifiable. Whereas Sraffa acknowledges that an element of human arbitrariness is unavoidable within economic theorizing, he also stresses that different *quæsita* may require different 'points of view' in the sense that, given a specific theoretical problem, one specific 'point of view' may prove to be best suited to analyse and solve the problem at hand. This implies the necessity of the choice of the 'point of view' by an economist. This choice is relevant in so far as this choice determines the portion of economic reality which can be consistently described by the theory elaborated by the economist in question. From this perspective, Sraffa appears to be an advocate of a method of analysis which some philosophers of science call 'piecemeal theorising' (Salanti and Signorino 2001 and Signorino 2005). With respect to *Production of Commodities by Means of Commodities* (*PC* hereafter) our investigation shows that there is a methodological continuity in Sraffa's work, running from his early papers on the Marshallian theory of value through to his 1960 book. Such a methodological continuity may be obscured by the fact that in *PC* Sraffa's 'style of argumentation' is radically different from that adopted in his previous contributions. As is well known, in *PC* Sraffa's remarks on the structural properties of economic reality are sparse, indirect and extremely general. Notwithstanding the fact that with the lapse of time Sraffa becomes more guarded when he speaks of economic reality, we claim that Sraffa does not change his mind on the relationship between economic reality and the economist/observer and on the importance of choosing the point of view best suited to solve the given problem selected by the economist. What matters to Sraffa is to detect what different economists/observers can consistently say about a given object or to build the analytic tools required to discover a given property of the object.

This is perhaps the place to stress that we are not making nor intend to make binding claims on Sraffa's ontology. While Sraffa's ontology concerns his vision about 'reality' as an object which does or does not exist independently of its 'observer', Sraffa's methodology concerns the rules the economist must abide by in the process of elaboration of economic theory. Though interrelated, these two levels of analysis should be kept distinct. To consider the economic reality as something that exists independently from the activity of observation and classification carried out by the economist is certainly not an ontological position that is unique to Sraffa; nor is the belief that the perspective of the investigator is, in some sense, relevant to the shaping of the economic theory. In particular, many Marshallian economists would have shared basically the same assumption about an independent reality (Signorino 2000a, 2000b and 2001b). We claim that a characteristic of Sraffa's methodology, not shared by the majority of his contemporaries, is how Sraffa makes use of these elements in his critical writings and in the elaboration of his own theory. As we show in the paper, in some crucial passages of his argument Sraffa introduces and compares different observers with specific analytical attitudes and investigates how these attitudes may be useful to or detrimental for grasping some specific aspects of the object under investigation. This procedure explains why Sraffa is particularly attentive in separating the elements which are part of the object under analysis and those which depend on the special theoretical lenses used by the observer: in our view Sraffa's implicit assumption is that theoretical lenses are indeed required for the investigation to be carried out and therefore an effort is to be made in order to choose which are the best ones in the given situation. The differences we notice in this regard between the young Sraffa and the mature one lie mainly in that in the later writings the distinction between the object of analysis and the perspective of the observer is more explicit. Our exclusive concern with Sraffa's methodology explains why we do not attempt to reconstruct what exactly Sraffa means when he speaks of a 'point of view'. Such a question is an intricate one and may involve a circularity problem: to the extent that a 'point of view' has any coherent structure at all, it is already informed by a theory of some sort – an embryonic theory perhaps, but a theory nonetheless. In short, economic theory is shaped by the economist's point of view, but the point of view must on some fundamental level be grounded in a theoretical framework. In this paper we consider the different points of view chosen by different economists as exogenous and we focus on (i) Sraffa's assessment of the economic theory which may be consistently elaborated from a given point of view; and (ii) Sraffa's comparison of the results achieved from different standpoints.

Finally, we want to stress that the analysis we propose in this paper may help furthering our understanding of Sraffa's economics since (i) it helps give unity to the many lines of criticism Sraffa directed against marginalist economics during his long intellectual carrier; and (ii) it helps to show the intimate relationship existing between the *pars destruens* and the *pars construens* of Sraffa's overall theoretical contribution.

In this paper we have deliberately chosen to focus on Sraffa's published material and, among the published works, only on the theoretical contributions, setting aside his historiographical and applied contributions. Nevertheless in some cases we quote from Sraffa's unpublished papers just to confirm that the unpublished material we had the opportunity to consult supports, or is at least consistent with, the line of interpretation we provide here. A first obvious reason for our choices is that of manageability. A further reason for the former choice is that we intend to analyse the wording that Sraffa chose with deliberation and care. Analysis of this kind on material that an author has written just for himself could be misleading. We think that an investigation such as that presented here must be rooted in the material that the author has chosen to publish, even if we acknowledge that Sraffa's silence on economic methodology implies that a rational reconstruction of Sraffa's logic of scientific research in economics involves an unavoidable element of conjecture. As to the latter choice, a further reason is the following. We are aware of the fact that a threefold relationship of the kind we analyse here may be discovered also in Sraffa's historiographical and applied works. For example, it would be interesting to investigate the threefold relationship between Ricardo's texts, the interpreter of Ricardo and the interpretation of Ricardo's economics. We thought it best first to establish our point on Sraffa's theoretical contributions.

We are perfectly aware that, since the opening of Sraffa's manuscripts at the Wren Library of Trinity College (Cambridge, UK), his published contributions to economic theory can be assessed in the light of the huge amount of preparatory material he collected from the early 1920s. Moreover, the unpublished material may include some explicit statements concerning the issues dealt with here. An investigation of Sraffa's manuscripts on the issues dealt with here will be the subject of future work.

The structure of the paper is as follows. In sections 2 and 3 we concentrate on the works of the 1920s and early 1930s. In section 2 we propose a rational reconstruction of the concept of economic reality and of the ability of the economists to appraise it. In section 3 we tackle the 'problem of the arbitrariness of the economist', its genesis and its possible boundaries. Section 4 analyses in detail *PC*. We highlight the way Sraffa defines the various objects to be analysed and the different points of view from which they can be observed and how he modifies his theoretical schemes in accordance with the different structural properties of the objects under investigation. Section 5 concludes.

2 THE RELATIONSHIP BETWEEN ECONOMIC REALITY AND THE ECONOMIST IN THE 1920S AND EARLY 1930S

Careful reading of the texts of the 1925–6 papers and of the 1932 exchange with Hayek shows that Sraffa makes continuous reference to economic reality. In 'Sulle relazioni fra costo e quantità prodotta' (1925 [1998]) Sraffa speaks of 'objective circumstances inherent in the various industries' (p. 324) and of 'objective conditions of the economic system studied' (p. 357). Moreover, Sraffa frequently uses expressions like 'experience' (p. 325), 'commonly observed fact' (p. 343), 'general fact' (p. 331), 'reality' and 'concrete reality' (pp. 330, 340, 344, 347, 350, 361, 362 and 363). Similarly, in 'The laws of returns under competitive conditions' Sraffa (1926) makes use of expressions like 'in fact' (p. 538), 'in reality' (pp. 540 and 541 fn 1), 'the reality of things' (p. 543), 'the actual conditions of industry [in the different industries]' (pp. 540 and 542), 'the actual process of determining the price and the quantity produced' (p. 544), 'real conditions' (p. 541), 'the actual state of things' (p. 542) and 'everyday experience' (p. 543). Finally, in his 1932 'Rejoinder' to Hayek Sraffa writes that 'Nobody could believe that anything that logically follows from such [Hayek's] fantastic assumptions is true *in reality*' (p. 250; emphasis added).

Moreover, the texts of the 1925–6 and 1932 papers provide extensive evidence of Sraffa making empirical claims about economic reality even in the absence of hard empirical data. Some of these claims have for Sraffa a status of certainty, while others only have a probabilistic nature. A few examples must suffice. In relation to the objective characteristics of a given plot of land, Sraffa writes that 'the proposition that the productivity of a given piece of land is to a large extent independent of whether or not another piece of land is cultivated is *both true and obvious*' (1925 [1998]: 335; emphasis added). On the contrary, in relation to external economies, Sraffa writes that in his view 'it seems *probable* that there must be very few cases indeed of external economies which can be introduced as a consequence of a variation – not a very large one – in the size of an industry' (1998 [1925]: 363; emphasis added). The 1926 paper contains several expressions like 'seldom' (pp. 540 and 542) 'great frequency' (p. 542) 'it is not easy … to find' (p. 543), 'it is not likely to be found' (p. 548), 'it is extremely unlikely' (p. 549), 'it will generally be found' (p. 550).[1] In the same vein, in his 1932 review of Hayek's *Prices and Production* Sraffa defines as 'platitudes' (p. 44) his views of money as 'a store of value, and the standard in terms of which debts, and other legal obligations, habits, opinions, conventions, in short all kinds of relations between men, are more or less rigidly fixed'. Similarly, in his rejoinder to Hayek Sraffa defines his argument on the permanence of capital accumulated by means of forced saving as 'an appeal to common sense' (p. 249).

The evidence provided above shows that in his published works of the 1920s and early 1930s Sraffa describes economic reality (i) *as if* it had given structural properties which do not depend on the activity of observation and classification carried out by the economist (economic theory is crafted by the economist while economic reality is not); and (ii) *as if* the structural properties of economic reality could be appraised by economists who, on a few occasions, are able to make quantitative judgements on them. We use the 'as if' clause to underline the fact that we are not making binding claims on Sraffa's ontology, as mentioned in section 1. Points (i) and (ii) may be due to the fact that the gist of Sraffa's criticism of Marshall and Hayek is that their theories apply only to a set of cases that rarely if ever exist in reality. In order for the criticism to be persuasive, the characterization of reality that is inconsistent with Marshall's and Hayek's theories must be straightforward and widely shared. In short, the criticism is compelling only to the extent that Sraffa's description of reality cannot be refuted.

Yet, we claim the relevance of the choice of the 'point of view' adopted by the economist for Sraffa: different 'points of view' allow economists to elaborate different economic theories characterized by different theoretical domains.[2] The gist of Sraffa's 1925–6 criticism of Marshallian economics is just that the point of view chosen by Marshallian economists allows them to elaborate an economic theory whose theoretical domain is limited to industries which employ factors specific to the industry itself and industries whose scale economies are external to firms and internal to the industry. Similarly, the essence of Sraffa's 1932 criticism of Hayek is that his theory, even if purged from its logical blunders, can deal only with a 'neutral money economy', that is an economy where money is just a 'medium of exchange' and not also a 'store of value', and thus an economy which behaves exactly as a barter economy.

Sraffa acknowledges that the economist has to carry out a few discretionary choices in the process of elaboration of economic theory. Sraffa's acknowledgement of the problem of the arbitrariness of the economist raises (at least) two orders of questions:

(i) What exactly is the source of the 'arbitrariness' of the economist?
(ii) How does one cope with the problem of the arbitrariness of the economist, that is, what are, if any, its admissible boundaries?

The following section is devoted to answering the above questions.

3 THE 'ARBITRARINESS' OF THE ECONOMIST AND ITS BOUNDARIES IN THE 1920S AND EARLY 1930S

The expression 'point of view' or 'standpoint' recurs 25 times in the 1925 paper (pp. 323, 324, 326, 327 fn 11, 330, 330 fn 14, 334, 337 fn 32, 338, 342, 344 fn 49, 346, 349, 350, 351 fn 64, 355, 356, 362 and 363), 13 times in the 1926 paper (pp. 536, 538, 539, 540, 542, 543, 544, 547, 548 and 548 fn 2) and twice in the 1932 paper (pp. 45 and 47). The expression 'arbitrariness' and its derivatives appear on 12 occasions in the 1925 paper (pp. 324, 327, 336, 337, 338, 349, 354, 357 and 358), not at all in the 1926 paper and twice in the 1932 paper (pp. 50 and 51).

The problem of the arbitrariness of the economist lies at the very heart of Sraffa's 1925–6 critique of the Marshallian theory of value and its inability to classify real world industries into the three 'boxes' of constant, increasing and diminishing returns. In the opening section of the Italian paper, Sraffa asks (rhetorically) whether

> the failing cannot be found in the very nature of the criterion according to which the classification should be conducted. In particular, it remains to be seen whether the *fundamentum divisionis* is formed by objective circumstances inherent in the various industries, or, instead, is dependent on the point of view of the person acting as observer; or, to put it another way, whether the increasing and decreasing costs are nothing other than different aspects of one and the same thing that can occur at the same time, for the same industry, so that an industry can be classified arbitrarily in one or the other category according to the definition of 'industry' that is considered preferable for each particular problem, and according to whether long or short periods are considered.
>
> (Sraffa 1998 [1925]: 324)

Similarly, in the final section of the same paper, Sraffa writes:

> [the hypotheses of decreasing and increasing productivity], rather than referring to different phenomena, represent different aspects under which the same phenomenon can be considered. That is to say that the applicability of one or of the other group depends, in many cases, not so much on the objective conditions of the economic system studied, as on the nature of the problems that we propose to study in respect to it. The element of arbitrariness that is thus introduced into the criterion that should guide us in a classification of industries according to the manner of the variation of cost, is evident in the choice of the characteristic that is to be taken as the basis of a definition of 'industry'.
>
> (Sraffa 1998 [1925]: 357)

The aim of the 1925 paper is to show the tension, existing within the Marshallian theoretical framework, between an object, economic reality and its structural properties, and the point of view chosen by a subject, the economist/observer. Such a tension obliges Marshallian economists to introduce some further assumptions, such as external–internal scale economies, within their theoretical framework. As a consequence, the theoretical domain of Marshallian theory is drastically reduced:

> The fact that the 'external economies' peculiar to an industry, which make possible the desired conciliation between scientific abstraction and reality, are themselves a purely hypothetical and unreal construction, is something that is often ignored.
>
> (Sraffa 1998 [1925]: 347)

The same argument is used by Sraffa in the 1926 paper to criticize the ability of the Marshallian theory of value, based on the assumption of perfect competition and the method of partial equilibrium, to analyse an economic reality characterized by scale economies:

> Here again we find that in reality the economies of production on a large scale are not suitable for the requirements of the supply curve: their field of action is either wider or more restricted than would be necessary. […] The only economies which could be taken into consideration would be such as occupy an intermediate position between these two extremes; but it is just in the middle that nothing, or almost nothing, is to be found. Those economies which are external from the point of view of the individual firm, but internal as regards the industry in its aggregate, constitute precisely the class which is most seldom to be met with.
>
> (Sraffa 1926: 540)

Finally, the same method of criticism is employed by Sraffa in his 1932 review of Hayek's *Prices and Production* (1931). Sraffa highlights the many contradictions, existing within the Hayekian theoretical framework, between the *asserted* object under investigation and the peculiar point of view chosen by Hayek. We have stressed the word 'asserted' because Sraffa claims that Hayek progressively shifted his analytical focus in the course of his book from the accumulation of capital in a monetary economy, the asserted object, to the statement that only a constant money policy does not distort the voluntary decisions of agents. It is true that Sraffa's review emphasizes Hayek's logical blunders, though Sraffa was of the opinion that the basic flaws of Hayek's theory originate with its 'subjective' method. (A possible explanation of Sraffa's chosen style of exposition is that Sraffa was aware of the risk of annoying his readers with an explicit methodological discussion: see Signorino 2001a in this regard.) Nonetheless, as already noted by Lawlor and Horn (1992: 23–4) Sraffa was well aware that *Prices and Production* contains both methodological prescription and positive analysis and, accordingly, he put under fire both Hayek's chosen framework and Hayek's use of his own framework.

According to our reconstruction of Sraffa's implicit methodology, the problem of the arbitrariness of the economist within economic theorizing derives from the freedom of the economist/observer to select her point of view. Sraffa's methodology involves at its normative level a kind of consistency requirement between the choice of the problem to solve and the choice of the point of view from which to tackle the selected problem. (As we show in the following section, this aspect of Sraffa's methodology becomes particularly evident in *PC*.) This requirement is manifest in a passage of the 1926 paper and in the final sentence of the 1930 rejoinder to Robertson. In the 1926 paper Sraffa writes:

> What is important is to ascertain how the various forces at work can be grouped in the most homogeneous manner, so that the influence of each of them on the equilibrium resulting from their opposition may be more readily estimated.
>
> (Sraffa 1926: 544)

The 'various forces at work' and the 'equilibrium resulting from their opposition' constitute the economic reality investigated by the economist. The arbitrariness of the economist lies in the choice of the scheme of classification, that is to say, the way the economic forces may be grouped. Since different schemes may be selected, the criterion to follow for Sraffa, at least in the 1920s, is that of simplicity, 'the most homogeneous manner', which obliges the economist to choose the scheme best suited to highlight the influence of each force on the equilibrium position. In the same vein, in his 1930 rejoinder to Robertson Sraffa stresses that the point of view chosen by Marshallian economists is not the best suited to solve the theoretical *quæsita* raised by themselves. The theoretical domain of Marshallian theory, once reconstructed in a logically consistent way, turns out to be too narrow:

> Reduced within such restricted limits, the supply schedule with variable costs cannot claim to be a general conception applicable to normal industries; it can prove a useful instrument only in regard to such exceptional industries as can reasonably satisfy its conditions.
>
> (Sraffa 1926: 540)

According to Sraffa, the Marshallian theory may gain logical consistency only by making recourse to unrealistic assumptions. Thus it proves to be unfit to hit the theoretical targets announced by the same Marshallian economists:

> I am trying to find what are the assumptions implicit in Marshall's theory; if Mr Robertson regards them as extremely unreal, I sympathise with him. We seem to be agreed that the theory cannot be interpreted in a way which makes it logically self-consistent and, at the same time, reconciles it with the facts it sets out to explain.
>
> (Sraffa 1930: 93)

Here it is possible to find an echo of Poincaré's methodology according to which the choice between different scientific explanations of the same natural phenomenon should be conducted according to the criterion of simplicity. Indirect confirmation of this parallel between Sraffa's and Poincaré's methodologies comes from the analysis of Sraffa's papers at the Wren Library. Kurz points out that

> apparently, Sraffa studied intensively Jules Henri Poincaré's *La Science et l'Hypothèse* (1902) and François Simiand's *La Méthode Positive en Science Économique* (1912), which is reflected in many annotations and

> underlinings in the two books. […] Sraffa apparently agreed with Poincaré's proposition that the axioms of geometry are neither synthetic judgements a priori nor experimental facts. They are rather conventions. Our choice from among all conventions at our disposal is first and foremost guided by experimental facts. In addition there is the necessity of avoiding contradictions. In this way the postulates of a theory may be rigorously true despite the fact that they were abstracted from experimental laws which are only approximative. Poincaré concludes that it makes no sense to ask, for example, whether Euclidian geometry is right or wrong. One should rather ask whether it is the most convenient.
>
> (Kurz 2004)

4 THE RELATIONSHIP BETWEEN ECONOMIC REALITY AND THE ECONOMIST IN *PC*

In the Preface to *PC* Sraffa introduces one object of analysis, 'the properties of an economic system' which 'do not depend on changes in the scale of production or in the proportions of factors', and two observers of that object. The former observer is introduced as (i) 'anyone accustomed to think in terms of the equilibrium of demand and supply', the latter as (ii) the scholar adopting the 'standpoint … of the old classical economists from Adam Smith to Ricardo'.

According to Sraffa, observers (i) and (ii) adopt two different attitudes towards the object under investigation. Such differences have a direct bearing on the observer's ability to comprehend it. Observer (i) 'may be induced' by the symmetrical theory of value to interpret a model in which demand conditions play no explicit analytical role in price determination as a model based on an implicit assumption of constant returns to scale. Observer (ii) appears to be better equipped than observer (i) to perform the task of studying the properties of the object under investigation:

> In a system in which, day after day, production continued unchanged in those respects, the marginal product of a factor (or alternatively the marginal cost of a product) would not merely be hard to find – it just would not be there to be found.
>
> (Sraffa 1960: v)

In our view, the reason why Sraffa is so eager to establish a tight connection between a well-defined object and a specific point of view, the classical one, is that he aims to highlight the constraints to which the observer is (consciously or unconsciously) tied in the moment she selects a given point of view. For Sraffa marginalist observers are *obliged* by their theory of value to study the properties of an economic system which depend on the (infinitesimal) changes in the proportion of factors of production or in the scale of production:

> The marginal approach *requires* attention to be focused on change, for without change either in the scale of an industry or in the 'proportions of the factors of production' there can be neither marginal product nor marginal cost.
>
> (Sraffa, 1960: v; emphasis added)

Moreover, Sraffa's emphasis that in an economic system in which production continues unchanged day after day the marginal product of a factor or the marginal cost of a commodity is not 'there to be found' may be interpreted as a warning for his readers: marginal products and marginal costs are theoretical objects and not observable objects. In fact, even in a stationary state the observer could calculate the marginal product of a factor or the marginal cost of a commodity provided that infinitesimal changes *were* assumed (counterfactually); but obviously no observer could experience them. Things are different with respect to what Wicksteed called 'spurious margins': 'The most familiar case is that of the product of the "marginal land" in agriculture, when lands of different qualities are cultivated side by side' (Sraffa, 1960: v). In this case two different objects are experienced by the observer and the difference between the two objects defines the increments implicit in the concept of margin. This concept of margin was actually introduced by classical economists. Sraffa reminds us that 'P.H. Wicksteed, the purist of marginal theory … condemns such a use of the term "marginal" as a source of "dire confusion"' (*ibid.*).

4.1 Production and prices

Sraffa describes technology by listing industries and each industry is considered as fully described by the list of inputs and the list of outputs. Where do these data come from? Sraffa is silent about this. However, even a quick exploration of the unpublished manuscripts clarify that these data are supposed to have been directly observed:

> The significance of the equations is simply this: that if a man fell from the moon on the earth, and noted the amount of things consumed in each factory and the amount produced by each factory during a year, he could deduce at which values the commodities must be sold, if the rate of interest must be uniform and the process of production repeated. In short, the equations show that the conditions of exchange are entirely determined by the conditions of production.
>
> (D3/12/7: 87; quoted by Kurz and Salvadori 2004: 1546)

> This paper deals with an extremely elementary problem; so elementary indeed that its solution is generally taken for granted. The problem is that of ascertaining the conditions of equilibrium of a system of prices and the rate of profits, independently of the study of the forces which may bring about such a state of equilibrium. Since a solution of the second problem carries with it a solution of the first, that is the course usually adopted in modern theory. The first problem however is susceptible of a more general treatment, independent of the particular forces assumed for the second; and in view of the unsatisfactory character of the latter, there is advantage in maintaining its independence.
>
> (D3/12/15: 2; quoted by Kurz and Salvadori 2005: 433)

Yet the act of observation would have provided the observer with a body of data larger than that actually contemplated by Sraffa. Thus we claim that the data have been screened and weighed by the observer, Sraffa, who has made use of his discretionary power of selection.

The basic feature of the object analysed in Chapter I of *PC* is that 'nothing has been added by production to the possessions of society as a whole: […] each commodity, which initially was distributed between the industries according to their needs, is found at the end of the year to be entirely concentrated in the hands of its producer' (p. 3). Straightforward scrutiny shows that (p. 3):

> There is a unique set of exchange-values which if adopted by the market restores the original distribution of the products and makes it possible for the process to be repeated; such values spring directly from the methods of production. In the particular example we have taken, the exchange-value required is 10 qr. of wheat for 1 t. of iron.

It is noteworthy that Sraffa here makes use of a hypothetical sentence, that is to say, he does not affirm the existence in the economy under study of a law which ensures that those exchange values would actually rule intersectoral transactions. A possible explanation is that the reader 'accustomed to think in terms of the equilibrium of demand and supply' when confronted with such a law might be induced to think that the observer is silently introducing some assumptions concerning individual behaviour in the market place. Instead Sraffa emphasizes that, independently of any assumption on individual behaviour, those prices will actually rule intersectoral transactions if that society is to survive. With a different set of prices that society cannot reproduce itself. In order to determine the prices there is no need to investigate either the behaviour of the agents or their preferences.

Given the properties of the object under study, the observer has no need to introduce any assumption concerning individual behaviour into her theoretical scheme. Despite the fact that individual behaviour is part of the observed object, the introduction of any assumption about it implies a number of choices by the observer and therefore may introduce what Sraffa would call an arbitrary element: given the properties of the object under investigation, the only assumption needed is that individual agents do not make choices whose consequences may threaten the requirements for systemic reproduction. Such an assumption may be taken for granted. In fact Sraffa, as observer, focuses attention on economic systems which actually survive (p. 5f):

> Systems which are incapable of doing so [being brought to a self-replacing state] under any proportions and show a deficit in the production of some commodities over their consumption even if none has a surplus do not represent viable economic systems and are not considered.

In Chapter II of *PC* Sraffa introduces an economy which 'produces more than the minimum necessary for replacement and there is a surplus to be distributed' (p. 6). The observer-Sraffa remarks: 'the system becomes self-contradictory'. This 'contradiction', however, is not inherent in the object under observation. Thus Sraffa's remark amounts to a warning concerning the observer and her theoretical schemes: the observer would fall into a contradiction if she analysed the object 'production with a surplus' by means of the same analytical tools used for the object 'production for subsistence'. A different theoretical scheme is needed.[3] In our view Sraffa's warning is justified by the fact that at least two substantive differences exist between the object of Chapter I and the object of Chapter II: the existence of a surplus, in fact, determines the necessity for the observer (i) to choose a rule for the distribution of the surplus; and (ii) to distinguish between basic commodities and non-basic commodities.

In Chapter I, with no surplus to be distributed, the observer who seeks to solve the problem of price determination has no analytical decision to take: her arbitrariness is bounded by the fact that prices are uniquely determined by technology. By contrast, in Chapter II there is a surplus to be distributed and prices are determined in accordance with the rule on the distribution of the surplus. Hence, the observer is to make use of her freedom by choosing a hypothesis on the rule according to which the surplus is distributed. Obviously, the observer's choice is discretionary but should not be arbitrary in the sense that the chosen assumption on distribution of the surplus must be in accordance with the (political, legal, etc.) institutions and social norms which, in a given historical period, characterize the economy under investigation.

Actually Sraffa provides two alternative schemes to analyse the object 'production with a surplus'. In the former (sections 4–7) wages are regarded '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 for the cattle' (p. 9). In the latter (sections 8–11) the subsistence wages assumption is dropped. As a matter of fact, many other alternatives are possible. The basic point is how the surplus is distributed. Only once such a question is answered is it possible to determine the prices and one distributive variable.

Sraffa's first choice is to add 'the rate of profits (which must be uniform for all industries) as an unknown' to be determined jointly with prices (p. 6). Sraffa does not explain why such a rate 'must' be uniform. But the whole heritage of the classical tradition, not contradicted, in this respect, by the neoclassical economists, may justify this silence.

After Sraffa has introduced in sections 4–7 this possible choice of the rule of distribution of the surplus, he abandons it and introduces another one, which is then followed in the whole book (except in Chapter XI on land, where it is modified to insert further recipients of surplus: the owners of natural resources which are used in production and are in short supply). The abandonment is justified since wages 'besides the ever-present element of subsistence, [...] may include a share of the surplus product' (p. 9). If workers can get part of the surplus, two distributive variables have to be determined and the 'result of adding the wage as one of the variables is that the number of these now exceeds the number of equations by one and the system can move with one degree of freedom; and if one of the variables is fixed the others will be fixed too' (p. 11).

The introduction of workers as recipients of surplus is certainly a change in the object to be studied: it may be taken for granted that an economy where workers do not participate in the distribution of surplus and an economy where workers do participate are characterized by different (political, legal, etc.) institutions and social norms and thus they must be reckoned as different objects. Sraffa analyses the consequences stemming from such a change (p. 10):

> The drawback of this course is that it involves relegating the necessaries of consumption to the limbo of non-basic products. This is due to their no longer appearing among the means of production on the left-hand side of the equations: so that an improvement in the methods of production of necessaries of life will no longer directly affect the rate of profits and the prices of other products. Necessaries however are essentially basic and if they are prevented from exerting their influence on prices and profits under that label, they must do so in devious ways (*e.g.* by setting a limit below which the wage cannot fall; a limit which would itself fall with any improvement in the methods of production of necessaries, carrying with it a rise in the rate of profits and a change in the prices of other products).[4]

Another, even more relevant consequence of the change is supplied in section 44 (p. 33):

> The choice of the wage as the independent variable in the preliminary stages was due to its being there regarded as consisting of specified necessaries determined by physiological or social conditions which are independent of prices or the rate of profits. But as soon as the possibility of variations in the division of the product is admitted, this consideration loses much of its force. And when the wage is to be regarded as 'given' in terms of a more or less abstract standard, and does not acquire a definite meaning until the prices of commodities are determined, the position is reversed. The rate of profits, as a ratio, has a significance which is independent of any prices, and can well be 'given' before the prices are fixed. It is accordingly susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest.

This paragraph has been commented upon elsewhere by one of us in a way that is clearly pertinent to this paper:

> The fact that workers' demand cannot be defined on the basis of physiological or social conditions does not imply, according to Sraffa, the necessity of an analysis of the determinants of it. In the traditional Classical analysis the role of workers' consumption is that of determining the real wage rate (*i.e.*, one of the distributive variables) from outside the relations among prices that must hold if commodities are to be *re*produced. This role can be played, Sraffa argues, by the rate of profits, which, 'as a ratio', is a pure number 'and can well be "given" before the prices are fixed'. It is remarkable that an important aspect of the analysis emerges as a consequence of a difficulty of the *observer*, rather than as an *observed aspect* of reality.
>
> (Salvadori 2000: 186)

As already mentioned, beside the necessity to choose the distribution rule, Sraffa highlights another consequence of the distinction between the object 'production for subsistence' and the object 'production with a surplus': the distinction between basic commodities and non-basic commodities. Such a distinction cannot be made in the case of production for subsistence because in that case either non-basics cannot be produced or, if they are, production with a surplus can be obtained by not producing them. The asymmetry between these two kinds of commodities derives from the structural properties of the object.[5] Evidence supporting our interpretation is provided by the content of a letter, dated 4 June 1962, to Peter Newman where Sraffa replies to some conclusions reached by Newman in his 1962 article on *PC* (see Sraffa 1962). In particular, Sraffa counteracts Newman's criticism according to which the distinction between basic and non-basic commodities depends on the level of aggregation of the system arguing that 'aggregation is the *act of the* *observer*, whilst the distinction is based on a difference in *objective properties*'.

(Sraffa 1962: 13; emphasis added)[6]

4.2 A 'preliminary survey' and the complete analysis

It is in Chapters III–VI of *PC* that we may recognize that in the 1960 book Sraffa adopts the following analytical strategy: first he describes accurately the salient features of the object he wants to investigate and then he provides the results which can be obtained on the basis of the assumptions he has introduced and the concepts he has forged. In short, Sraffa takes great pains over showing the tight relationship between his theoretical achievements and the specific standpoint he has chosen.

The main aim of Chapter III is to provide a 'preliminary survey' (p. 15) of price movements consequent upon changes in distribution on the assumption that the methods of production remain unchanged. The results presented in this chapter are those which can be obtained by the observer without any special theoretical tool. The complete analysis of these movements is presented in Chapter VI. Sraffa chooses to split the analysis of price movements into two chapters: Chapter III and Chapter VI. This procedure shows clearly that Sraffa takes care to separate what can consistently be said about the object under investigation *without* making use of the analytical tool represented by the Standard commodity from the results that *require* the use of such a tool, elaborated in Chapters IV and V. Despite the relevance of it, this story is not told here since it has been extensively investigated by one of us on another occasion. The interested reader may consult Kurz and Salvadori (1993).

4.3 Joint production

In dealing with joint production Sraffa is confronted with difficulties not encountered in the analysis of single production. The two ways out of these difficulties consist of either (i) setting an assumption on the properties of the observed object; or (ii) providing a more careful interpretation of the object under consideration. Our analysis reveals also that Sraffa prefers to be close to common sense whenever this is possible.

Joint products were referred to by major marginalist authors, in particular Jevons (1965 [1871]: 200), see also John Stuart Mill (1965 [1848]: 583), as phenomena which cannot be analysed without a theory of demand. Their argument is the following: with joint production the number of production processes operated will generally fall short of the number of products whose prices have to be ascertained. Hence there is a problem of underdeterminacy. Before Sraffa the solution was actually found by

Frederik Zeuthen (Zeuthen, 1933: 15; see also Kurz and Salvadori, 1995: 241–2). What concerns us here is mainly the path followed by Sraffa to propose the solution, rather than the solution itself.

Sraffa begins this discussion with an explicit reference to the problem of underdeterminacy in the familiar case in which two products are produced by a single process and states: 'The conditions would no longer be sufficient to determine the prices. There would be more prices to be ascertained than there are processes, and therefore equations to determine them' (p. 43). 'In these circumstances', Sraffa continues, 'there will be room' either 'for a second, parallel process which will produce the two commodities by a different method and [...] in different proportions' or for the production of 'a third commodity by two distinct processes' which use the two jointly produced commodities 'as means of production in different proportions'. Such further processes 'will not only be *possible* – [they] will be *necessary* if the number of processes is to be brought to equality with the number of commodities so that the prices *may be determined*' (p. 43; emphasis added). Then Sraffa assumes 'that the number of processes should be equal to the number of commodities' (p. 44).[7] Once again an assumption on the properties of the object is introduced because otherwise the observer cannot do her job.

Further, Sraffa is aware of the fact that prices do not need to be definite and positive and, once again, he uses assumptions on the observed objects to solve the problem. Productive processes must be 'subject ... to the general requirement of the resulting equations being mutually independent and having at least one system of real solutions: which rules out, for example, proportionality of *both* products and means of production in the two processes.' Sraffa continues:

> However (and this is the only economic restriction), while the equations may be formally satisfied by negative solutions for the unknowns, only those methods of production are practicable which, in the *conditions actually prevailing* (i.e. at the given wage or at the given rate of profits) do not involve other than positive prices.
>
> (p. 44; emphasis added)

Note that whereas in analysing single production prices are *proved* to be positive, in analysing joint production prices are *assumed* to be positive. The observed data are such as to allow positive prices at 'the conditions actually prevailing'.

Thus section 50 of *PC* is devoted to the introduction of two assumptions and to arguments concerning their plausibility. Both assumptions concern the 'conditions actually prevailing', i.e. the observations from which the data are obtained by the observer. A similar way out is used again in dealing with the positivity of prices *outside* the 'conditions actually prevailing'.

Since prices cannot be proved to be positive in general it is not true that 'if the prices of all commodities are positive at any one level of the wage between 1 and 0, no price can become negative as a result of the variation of the wage within those limits' (p. 59). The solution provided by Sraffa is the following.

> This conclusion is not in itself very startling. All that it implies is that, although *in actual fact* all prices were positive, a change in the wage might create a situation *the logic of which* required some of the prices to turn negative: and this being unacceptable, those among the methods of production that gave rise to such a result *would be discarded* to make room for others which *in the new situation* were consistent with positive prices.
>
> (p. 59; emphases added)

Sraffa's suggested way out of the impasse arising from the negativity of the price of a joint product outside the 'conditions actually prevailing' is tantamount to the assumption that there is always one or several processes of production which, if adopted, make the phenomenon of negative price disappear.[8] The prices relative to a given technique and a given rate of profits do not need to be non-negative, but the prices of a cost-minimizing technique at a given rate of profit are non-negative, provided that an appropriate reasonable assumption is introduced. Once again the way out of a difficulty is obtained by means of an assumption on the observed data.

Let us now analyse a case in which an assumption on observed data cannot do the job. Sraffa remarks that the multipliers defining the Standard commodity do not need to be positive (p. 47). The way out of the difficulty cannot be an assumption regarding the observation. The Standard commodity, in fact, is a construction of the observer and not an aspect of the observation. But precisely this property gives the solution in section 56. Some components of the Standard commodity need to be negative, but

> there is fortunately no insuperable difficulty in conceiving as real the negative quantities that are liable to occur among its components. These can be interpreted, by analogy with the accounting concept, as liabilities or debts, while the positive components will be regarded as assets.
>
> (p. 48)

This is the reason why '[w]e must therefore in the case of joint-products be content with the system of abstract equations, transformed by appropriate multipliers, without trying to think of it as having a bodily existence' (p. 48).

Comparing sections 50 and 56 gives us a way to interpret an aspect of the methodology used by Sraffa. In section 50 'conditions actually prevailing' are dealt with and these can be assumed to be such that a plausible property (non-negative process) is obtained. In section 56 an abstract object is dealt with and if this can have a property which would not be plausible if applied to a concrete object, a deeper interpretation is put forward to argue that such a property is not required. In fact Sraffa maintains:

> a Standard commodity which includes both positive and negative quantities can be adopted as money of account without too great a stretch of the imagination provided that the unit is conceived as representing, like a share in a company, a fraction of each asset and of each liability, the latter in the shape of an obligation to deliver without payment certain quantities of particular commodities.
>
> (p. 48)

Let us now analyse an argument which allows us to highlight the role of common sense in Sraffa's arguing. We accomplish this task by comparing the choice of the 'maximum rate of profit' in section 64 with the analogous choice in Chapter V for single product systems. In Chapter V Sraffa had maintained that there may be as many as k candidates for the role of the Standard commodity. However, there cannot be more than one with non-negative entries. This procedure is not applicable to joint production:

> In deciding which, among the j possible sets of values, is the one relevant to the economic system, we can no longer rely on there being, as the obvious choice, a value of R to which corresponds an all-positive Standard commodity; for in a system of joint production all may include negative quantities among their components.
>
> (p. 53)

Sraffa then reconsiders the matter from the standpoint of the single-products system and finds

> that while an all-positive Standard *appeals to commonsense*, its superiority is due at least as much to its being at the same time (as was shown in § 42) the one that corresponds to the lowest possible value of R. And we shall see that the possession of this last property is by itself sufficient to make the Standard net product that is endowed with it (no matter whether all-positive or otherwise) the one eligible for adoption as unit of wages and prices.
>
> (*ibid.*; emphasis added)

Therefore the mentioned argument from Chapter V was not the main reason for the choice, even if the choice would not have been changed if the main reason were used. A formally more appropriate procedure would have been to make the choice on the basis of the argument developed for joint production and then to prove that in the case of single production all coefficients relative to basics are positive, the others being nought. But in the analysis of single production Sraffa prefers to justify the choice of the multipliers defining the Standard commodity on the basis of their positivity because it has the advantage to 'appeal to commonsense'. We may conclude this point by asserting that Sraffa investigates more deeply an issue only when this is needed and in his exposition prefers to be close to common sense whenever this is possible.

5 FINAL REMARKS

In this paper we have analysed Sraffa's main contributions to pure economics in order to elaborate a rational reconstruction of an aspect of Sraffa's implicit methodology which has not been duly investigated so far. We refer to the threefold relationship between 'economic reality', 'the economist/observer', and 'economic theory', that is, the collection of human economic agents and material objects which constitute the subject field of economic theorizing, the human being who observes, classifies and analyses economic reality, and the main intellectual product emerging from the economist's effort to analyse the economic reality under investigation, respectively.

We have shown that in the 1925–6 and 1932 papers Sraffa plainly makes several empirical claims about economic reality *as if* they were self-evident or at least easily verifiable; while in the 1960 book Sraffa appears more concerned with the theoretical difficulties inherent both in the identification of the objects of his inquiry and the way(s) to analyse them. In particular, we have emphasized how Sraffa takes care to define (i) the salient features of the object he wants to investigate; (ii) the point of view chosen by himself and by others; (iii) the consequent assumptions and tools which can be used; and finally (iv) what can consistently be said about the object, given the point of view he has chosen and the assumptions he has introduced. We have also highlighted the role of the appealing to common sense in Sraffa's way of presenting his results. Moreover, we have investigated the role which, for Sraffa, the economists' arbitrariness plays in shaping economic theory and we have highlighted the constraints which, for Sraffa, should bind it.

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NOTES

1 The same attitude surfaces in private correspondence. In a letter to Keynes, dated 6 June 1926, Sraffa writes: 'of course, in reality the connection between cost and quantity produced is obvious' (quoted in Roncaglia 1978: 12).

2 Sraffa's archive at Cambridge reveals that Sraffa from the 1920s onwards cultivated a deep interest in the contemporary developments in the fields of natural sciences (especially physics and mechanics) and philosophy of science. He extensively read Bridgman, Poincaré, Russell, Whitehead, etc. In particular, quantum physics may have been a source of inspiration for Sraffa. As remarked by Kurz, 'quantum physics introduced the possibility that the observer's mind affects the reality he sees. Quantum theory tells us that nothing can be measured or observed without disturbing it, so that the role of the observer is crucial in understanding any physical process' (Kurz 2004).

3 The exploration of the Sraffa Papers in the Wren Library shows that this was also the intellectual path followed by Sraffa himself in 1927. The equations explored in Chapter I are called 'first equations' and Sraffa discovers that those equations cannot be used when there is a surplus since otherwise the equations are 'contradictory' (D3/12/2: 32–5) and 'the problem is overdetermined' (D3/12/11: 17, see Kurz and Salvadori 2001: 262).

4 As stressed by Sraffa, to rescue necessaries from the limbo of non-basic products it would be necessary to 'separate the two component parts of the wage [subsistence and share of the surplus] and regard only the "surplus" part as variable; whereas the goods necessary for the subsistence of the workers would continue to appear, with the fuel, *etc.*, among the means of production (pp. 9–10)'. Sraffa just hints in this direction but he prefers to stick to the more traditional notion of wages as being wholly variable (see Roncaglia 1978: Ch. II).

5 Sraffa is highly concerned with the empirical relevance of these concepts as is witnessed by the attention he pays to pick up concrete objects from the economic reality. Sraffa, in fact, first introduces commodities which 'are not used … in the production of others' (p. 7). Such commodities cannot play any role in the determination of 'the price-relations of the other products and [of] the rate of profits' (pp. 7–8). Then the same argument is extended to commodities which 'are merely used in their own reproduction, either directly (e.g. racehorses) or indirectly (e.g. ostriches and ostrich-eggs) or merely for the production of other [non-basics] (e.g. raw silk)' (p. 8).

6 Moreover, in the course of the same letter, in relation to the possibility of some non-basic commodities fetching negative prices Sraffa writes: 'how rare (if any) such cases must be *in the real world*. […] I certainly failed to discover any faintly realistic example of this which I could use, and had to invent those "beans"' (*ibid.*; emphases added). The wording of this letter clearly shows how, in private correspondence, the mature Sraffa refers to economic reality in a way which is close to that used in his early papers.

7 See Salvadori (2000) for a detailed analysis of the way followed by Sraffa to justify this assumption.

8 This assumption, peculiar as it may seem at first sight, is however no less *ad hoc* than the assumption of free disposal. In fact, the latter is equivalent to the assumption that for each process producing a given product there exists another process which is exactly identical to the first one except that the product under consideration is *not* produced.

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