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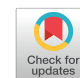
Sraffa, the 'marginal' method and change



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ABSTRACT

In the preface to *Production of Commodities by Means of Commodities* Sraffa emphasizes that his book does not make use of the method of marginal magnitudes. This paper, based mainly on the notes that Sraffa wrote over nearly forty years, shows that Sraffa's rejection of this method, which he calls 'marginism', is not due to some aprioristic methodological preconception, but is part of his views on the appropriate method to deal with actual economic phenomena. Indeed, 'marginism' deals with changes, which occur in time, as if changes were always amenable to the difference between two situations which exist side by side. But change, outside the world of mechanics and in that of social phenomena, does not follow predetermined paths which are known a priori. Therefore, the marginist method appears to Sraffa as constraining economic analysis within particularly rigid patterns inadequate for the study of economics. In the light of this criticism, the paper sheds new light on Sraffa's attention, which he never relented, for some passages of Marshall's *Principles*.

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1. As is well known, in the preface to *Production of Commodities by Means of Commodities* (1960), while warning the reader that in his work 'no changes in output and [...] no changes in the proportions in which different means of production are used by an industry are considered', Sraffa takes care to underline that this 'standpoint, which is that of the old classical economists from Adam Smith to Ricardo', is in sharp contrast with the '"marginal" method'. The latter, Sraffa writes, 'requires attention to be focused on change': for indeed without change '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-vi*).

Rejection of the 'marginal' *method* (and not only of the theory which is based on that method) is recurrent in Sraffa's papers, where it is often referred to as 'marginism'. In fact, as is shown in Marcuzzo-Rosselli (2011), it dates back at least to the second half of the 1920s — when, in the summer of 1927, Sraffa realised just how irreconcilable the Marshallian approach is with that of the classical economists[1] — to reappear with a certain frequency over the following years, both before and after the publication of *Production of Commodities.* However, despite the numerous works on the meaning and relevance of Sraffa's contribution that have appeared in recent years also thanks to the possibility of accessing the rich archival material of his papers[2], this aspect of Sraffa's thought has not been the subject of a specific analysis. An important exception in this respect is the contribution by Sen (2003) according to which Sraffa's rejection of the marginal method would be due to an aprioristic methodological position which, moreover, is perceived by Sen to be excessively restrictive.

What we want to argue in this paper is that Sraffa's rejection of 'marginism', far from being the outcome of an epistemological preconception, is grounded in his views on the appropriate method to deal with actual economic phenomena. To this end, in section 2 we start by recalling some of the notes ranging from the late 1920s to the mid 1960s where Sraffa expressed doubts concerning marginal magnitudes on account of the fact that these magnitudes are not *directly* observable. It is probably doubts such as these that have led interpreters like Sen to ascribe to Sraffa an excessively restrictive methodological approach. In section 3 we reject this interpretation, taking particular advantage of a long unpublished note by Sraffa dating from the late 1950s which, although showing a considerable degree of elaboration, has not been thoroughly examined yet. What this note helps to show is that it is the 'margin-

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[1] This is what Garegnani (2005) has called Sraffa's 'turning point' in his theoretical position. On certain possible early signs of this breakthrough, albeit only with regard to the question of the marginal method, see also note 7.

[2] Several works have addressed the issue of Sraffa's general scientific approach. See for example, Blankenburg et al. (2012); Davis (2012); Ginzburg (2013); Kurz and Salvadori (2005) and Martins (2013).

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ist' method which appears to Sraffa to constrain economic analysis within exceptionally rigid patterns. Indeed, this method assumes that, in certain cases that are especially relevant for economic theory, changes, which by themselves imply that the economic system under study should find itself in different positions in different periods (or points) of time, can be analysed as if those different positions existed side by side and at the same time. Against this assumption, which as we shall see Sraffa calls 'faith in universal determinism', in section 4 we give two examples where Sraffa, criticizing Marshall, argues that those specific changes that are at the basis of the marginal theory—changes in output and changes in the way different means of production are used by an industry—cannot in concrete terms be reduced to the difference between alternative situations. In Section 5 we address a possible objection to our reconstruction based on the role that the wage-profit curve plays in *Production of Commodities*. Section 6 concludes.

2. Perusing Sraffa's papers devoted to the 'marginal' method, what immediately captures attention is, as already mentioned, the point repeatedly made that marginal magnitudes are not *directly* observable, but may possibly be observed only indirectly by means of experiments. As early as 1929, in fact, Sraffa remarked that:

> demand and supply curves, marginal productivities [. . .] do not exist at any one moment, nor during any period of the recurrent steady process of production and consumption. They are alternatives, only *one* of which can exist in any one position of equilibrium, all the others being thereby excluded [. . .]. Therefore they cannot be found by merely observing the process or state of things, and measuring the quantities seen. They can only be found by means of experiments (D3/12/13: 3)[3].

In much the same terms, Sraffa was to return to the issue in the final stage of work on *Production of Commodities*. Thus, for example, he would point out in 1955:

> The most striking feature of the marginal theory of distribution is that it asserts that the method of production and the quantities of the factors of production determine the distribution. And yet, if we suppose that a man from another planet came down to see the system postulated by the marginal theory, he would never, by observation, no matter how searching, succeed in discovering the determinants of distribution. He would himself have to bring them into the open by changing the proportions of the factors, and then observe them. He could discover them by experiment, but never by pure observation (D3/12/42: 86).

A year later he wrote:

> "Marginal products" cannot be discovered by mere observation: because they do not exist at any one moment. [. . .] "marginal products" do not exist because [the methods of production from which they arise] are incompatible. The "experiment" consists in trying one method, and *then* the other, and comparing the result: but not simultaneously (D3/12/42: 4).[4]

Again, in 1965, comparing the two cases of decreasing productivity analysed by Wicksteed—the case of decreasing productivity arising from the employment of additional doses of an input of given quality (or 'intensive' decreasing productivity), and the one arising from the employment of doses of the same input which differ in quality (or 'extensive' decreasing productivity)—Sraffa would write:

> Another aspect, not mentioned by Wicksteed, is that in the first case there is only a decrease of product in time with the increase of the doses: at any instant of time no difference can be seen. Whereas in the second case the difference in productivity is noticeable at any instant (D3/12/42: 5).

It appears then that, in stressing—both in his papers and in the preface to *Production of Commodities*—the question of the observability of marginal magnitudes, Sraffa did not mean to refer to some insurmountable difficulty in the process of observation itself, nor to the fact that marginal magnitudes would be of a psychological or 'mental' nature, and so in a certain sense intrinsically subjective. Actually, this would apply to marginal utility, but not to marginal productivity. The crux of the matter is that marginal magnitudes emerge from a comparison between mutually exclusive situations. We cannot observe the same productive process using at one and the same time both *n* and *n+1* units of a factor, just as we cannot observe different quantities of the same commodity supplied (or demanded) at the same time.

If, then, Sraffa's appraisal of the nature of marginal magnitudes appears to be clear enough, there is the risk of taking his *rejection* of a theory based on these magnitudes to derive from an aprioristic and, largely for this reason, excessively restrictive methodological position: from what for want of a better definition we might call a methodological preconception, an argument, that is, that, interesting as it might be in itself, had nothing to do with Sraffa's concern for the *specific* problems of method that the study of economic reality raises. Such, indeed, is the conclusion one might arrive at reading in isolation some of the considerations Sraffa himself advanced at the end of the 1920s, when, one should not forget, he was only just beginning to draw the implications of his 'turning point'. For example, in 1929 he remarked: 'Clearly, we must reduce *all* the data to things that actually happen, excluding inexistent possibilities. Only such things are measurable and can enter the theory as "knowns" or "constants"' (D3/12/13: 1(2)).

Effectively, this is how Sraffa's position seems to have been interpreted by Sen, one of the few scholars to have openly confronted this aspect of Sraffa's thought in the last few years. Note that Sen keeps Sraffa's rejection of marginal magnitudes carefully distinct from Sraffa's well-known aversion to a theory based on 'mental states'. According to Sen, Sraffa's rejection of a theory based on marginal magnitudes would rather derive from a '*philosophical* suspicion of the invoking of "counterfactual" magnitudes in factual description' (Sen, 2003: 1251; italics added): a 'suspicion' which, for his part, Sen does not share, finding it excessively restrictive ('life would [be] unbearable with such abstinence [from the use of counterfactuals]', ibid). And it is under the heading of 'areas of enquiry in Sraffa's work [which] are, *primarily*, of a *philosophical* [. . .] nature' that this aspect of Sraffa's thought is listed in the introductory paper to the 2012 *Cambridge Journal* special issue on Sraffa (Blankenburg et al., 2012: 1277; italics added), although the authors do not share Sen's reservations on Sraffa's position.

This is not a matter of merely historical interest. In fact, the idea that *a*) Sraffa arrived at criticising 'marginism' by virtue of a 'philosophical' or generically methodological concern and not on account of his positive knowledge of the nature of economic phenomena, and *b*) that, largely for this reason, what that criticism ultimately boils down to is an excessively restrictive methodological position, would ultimately bear out the verdict, occasionally emerging in the literature, that Sraffa pursued rigour in theory *at the sacrifice* of its relevance, *i.e*. at the sacrifice of the efficacy theory can have as a means to understand reality.[5]

[3] The unpublished writings of Sraffa are conserved in the Sraffa Papers at the Wren Library, Trinity College, Cambridge and are indicated according to the archive classification. Most of the papers quoted in this article are available online. For the sake of clarity, the abbreviations Sraffa often uses in his notes are filled out.

[4] For detailed comment on the passages quoted, see Marcuzzo and Rosselli (2011).

[5] See, for example, Blaug (2009: 219): 'I argue that [Sraffian economics] condemns itself to irrelevancy by its obsessive concern with rigor'.

Although we believe that it would be possible to find in Sraffa's published works evidence sufficient to exclude this interpretation, it may prove interesting to dwell briefly on a long unpublished note dating to the late 1950s, which casts further light on the issue. The note bears the title *Margins and margins* and is to be found in various versions in Sraffa's papers. An initial version of the note, still in manuscript, dates back to January 1955, when Sraffa got back to work on *Production of Commodities* having completed the edition of Ricardo's works. The final, typed version is dated to early 1958 and, in keeping with Sraffa's style, is more essential and less explicit than the previous versions.[6]

3. The question we shall address in this section is the following. For the time being we shall limit ourselves at the level of *method*, and, looking at Sraffa's note just mentioned, we shall try to give a closer look at his position on the nature of marginal magnitudes. As we shall seek to demonstrate, there was nothing inherently restrictive about this position. If anything, the case is quite the contrary: it is the method based on the use of these magnitudes which, under Sraffa's scrutiny, is found to constrain analysis within particularly rigid patterns. That Sraffa found these patterns *excessively* rigid for the study of economic phenomena, and hence that in his opinion the use of these magnitudes was ultimately to be rejected *for this reason*, are points we will endeavour to illustrate in the next section.

As we have seen, according to Sraffa a primary characteristic of marginal magnitudes is that they cannot be observed *directly*. Now, in Sraffa's papers recognition of this particular nature of marginal magnitudes is often associated with the distinction between the notion of 'difference' and that of 'change'; and nowhere else in economic theory does this distinction appear to Sraffa more necessary—and generally less appreciated—than in the comparison between the extensive and the intensive versions of the 'Ricardian' theory of rent. 'Every beginner in economics', thus begins *Margins and margins*, 'must be struck (at any rate, I was struck) by the incongruity of the two types of Diminishing Returns from land, and the corresponding two types of rent'. 'The names usually given to the two types', Sraffa goes on,

> "extensive" and "intensive", conceal rather than describe the essence of the distinction. This is that the first is based on the *difference* between situations which are mutually compatible and can coexist at the same time, since they involve the payment of different rents on different qualities of land; while the second is based on *changes* in the situation on a single quality of land which represent a transition from one to another state, the two states being incompatible and mutually exclusive, since they determine two different rents on the same quality of land (D3/12/46: 50).[7]

The distinction between the circumstances underlying the theory of extensive rent (the existence of land of different location and fertility) and that of intensive rent (the transition from one method of production to another on the same piece of land) is reflected in the different observability of the returns from land on the part of an external observer. 'The true test of the nature of the difference', Sraffa points out immediately after,

> is that a man who was in a position to observe the methods of production of a stationary society (but not to make experiments), would be able by observation to discover all about the returns from lands of different fertility, but could never find out *by observation alone* the "marginal product" on one and the same land: this is not a visible object, for the reason that it has no existence (D3/12/46: 50–51).

Before we proceed, we must pause to underline that Sraffa's reference to intensive rent is to the *marginalist* explanation of the phenomenon. This explanation entails that, as the quantity of output increases—as, say, the quantity of corn to be raised on a given quantity of land of a certain quality increases—a *single* method of production, employing more of the other factors of production, is applied to the entire quantity of land. Such had been also the way in which Ricardo had mainly looked at this side of rent theory, and this had fostered the confusion between the phenomenon of intensive rent and a particular explanation of the phenomenon. That intensive rent may instead arise from the *coexistence* of *two* different methods of production—and that it may therefore be studied in a surplus based theory in terms of simultaneously 'visible objects'—is a result Sraffa will reach only in a late stage of the writing of *Production of Commodities* and that will appear in § 88 of the book (on this point see Kurz and Salvadori, 2005).

Let us go back to the distinction between the two kinds of decreasing returns and its counterpart in the different observability of the two phenomena. The notion of marginal utility and, even more, that of marginal productivity are frequently presented as matters of fact, immediately observable magnitudes. As we have seen, the first point that Sraffa set out to make clear was that there are no foundations for taking this to be so. It is beginning to emerge, however, that—from the point of view of Sraffa's lifelong reflection on the issue, if not from the point of view of each particular phase in that reflection—this was but a *preliminary* observation. The reaction of what in other manuscripts is a 'man from another planet', and that in *Margins and margins* is an 'outside observer who cannot make experiments'—the fact that he will not be able to observe a marginal product directly—, is clearly not in itself sufficient for Sraffa to exclude marginal magnitudes from the theory. This conjectural reaction is in fact merely '*the true test*' thanks to which distinction can be made between 'differences' and 'changes'; or, more precisely, the test by which the distinction between magnitudes that can and magnitudes that cannot be directly observed may be traced back to this latter distinction.

What struck us most in first perusing Sraffa's papers dealing with the 'marginist' method, and which seemed to hold the basic reason for his rejection of that method (the fact that it is not based on directly observable magnitudes), actually turns out, through the distinction between 'differences' and 'changes', together with the recognition that marginal magnitudes necessarily depend on the latter, to be not so much a criterion to decide whether these magnitudes might legitimately be used as the basis of economic theory, as, rather, a warning about the very particular role of the experiments to which these magnitudes appear to owe their existence—and hence as a calling for a closer study of the conditions under which they would be admissible as the basis of an explanation of value and distribution.

[6] A copy of the typescript is also conserved among the papers of Raffaele Mattioli, to whom Sraffa had passed it, which shows that it was already in an advanced stage of drafting. Sraffa might indeed have initially been thinking of including the note in *Production of Commodities*, either in the Preface or in the chapter on rent, as an appraisal and direct criticism of the marginal method. In fact, in a plan for the book drawn up in January 1955 (D3/12/49: 1 verso), under the heading Rent, Sraffa wrote: 'Extend here discussion of marginism: Ricardo's two forms—no inventor: Jevons etc. Various qualities of land—OK'. As we will see, these are in fact the issues addressed in *Margins and Margins*.

[7] Concerning the two versions of the classical theory of rent, Sraffa writes shortly after: 'Ricardo was well aware of the different logical basis of the two types of Diminishing Returns and refers to the effects of the former as a certainty, and to those of the latter with doubt' and remembers how he had drawn attention both to the difference between the two versions of the theory and to Ricardo's different attitude towards them as early as 1925 (Sraffa, 1925: 291, fn) in the hope 'that others might take up the point and throw some light on the matter; but in this', he adds, 'I was disappointed'. This is not the place to decide whether Sraffa's assessment of Ricardo's attitude was correct. The fact remains that the expression of caution used by Ricardo in connection with the intensive version of rent theory could hardly have hit Sraffa if he had not already begun to doubt the solidity of the marginal method in 1925.

It is on this particular point that *Margins and margins* goes considerably deeper than any other note taken by Sraffa on the question of marginal magnitudes. 'The question is', Sraffa asks himself in one of the early versions of the typescript,

> Are the potential, hypothetical returns which would be obtained by additional doses part of the existing situation (D3/12/49: 5)?

To understand fully the relevance of this question, let us recall that in 1929 Sraffa had written that solely to be included in the 'data' of the theory were 'things that actually happen' (see Section 2 above). Exactly as in Sen's reconstruction, this condition would appear to exclude marginal magnitudes *by definition*. But now Sraffa asks himself whether marginal magnitudes may not be conceived as 'part of the existing situation' notwithstanding their particular nature—as, one may say to paraphrase Sraffa himself, '*existing* possibilities'. The question Sraffa poses is then a crucial one. For if the answer were to be affirmative, then after all marginal magnitudes (at least marginal products) could be taken as a basis for economic theory.

But just under what conditions would this be possible? To answer this question, Sraffa makes reference to a passage in Wicksteed's *Alphabet of Economic Science* on the existence of a labour supply *curve* (although his argument is not limited to this particular case, but extends more generally to the nature and use of demand and supply curves in economic theory). In this passage Wicksteed, as Sraffa cautions us, was 'writing [. . .] before the marginal approach had become a second nature for economists', so that he 'felt the need for reassuring his readers about the actual existence of a "marginal supply curve"'. Wicksteed's passage runs as follows:

> But even if he [the labourer] cannot tell what amount of work he will be willing to do under the varying circumstances, obviously *there is* a given amount which, as a matter of fact, he would be willing to do under any given circumstances. Thus the curve *really exists* whether he is able to trace it or not (Wicksteed, 1888: 55).

Variation in the labour supply 'under varying circumstances' is clearly a process of change. The point is, can the possible effects of this change be included within the 'existing situation'? 'Wicksteed', Sraffa observes, 'with great and indeed reckless consistency, thinks that they do' (D3/12/49: 5). To this Sraffa observes:

> This is nothing less than a declaration of faith in universal determinism, for nothing else can support the belief in the *actual existenc*e of a *prescribed* path which must inevitably be followed, whether by the consumer or by the producer, such as is described by the demand-and-supply curves (D3/12/46: 52; second emphasis added).

Or, as he wrote in a previous draft of the same passage:

> Wicksteed considers that the path to be followed when one of the quantities is changed is *prescribed a priori* like the rails prescribe the path of a tramcar (D3/12/46: 43b);

or yet again, in another draft:

> This sounds like a declaration of faith in universal determinism ("not a bus, not a bus, but a tram"): however Wicksteed considers that when one of the quantities is changed, the dependent variable will follow a path which is prescribed *a priori* although no rails or other circumstances capable of directing its motion are visible. But of course saying that it will follow "one" path at a time does not prove that it will follow one particular prescribed path rather than another (D3/12/46b).

In the light of the distinction between 'differences' and 'changes' we can start to appreciate the sense of Sraffa's forthright reference to a 'faith in universal determinism' as the only conceivable foundation for the 'marginist' method. As we have seen, variations in the labour supply 'under varying circumstances'—and the same obviously applies to variations in the cost of production of a commodity attending variations in the quantity produced or, again, to variations in cost due to variations in the way different means of production are used—are all processes of *change*. As such they should, *in principle at least*, be subject to a wide range of outcomes. However, this would preclude them from serving *as a basis* for an explanation of value and distribution. Thus the only way to support the 'marginist' method would appear to lie in postulating a certain 'determinism': in the form, for example, of a *marked degree of regularity* in the relation between cost and quantity produced.

Here it is worth noting that the determinism Sraffa refers to is not the one to some extent attributable to the physical sciences (and in particular to mechanics) and which concerns the *results* reached by theory. The role of the experiments that should lead to the definition of the marginal magnitudes is, in fact, completely different from the part experiments normally have to play in the physical sciences. With these experiments, it is not a matter for the marginalist theory of applying the conceptual tools of the theory in order to investigate certain properties of the economic systems under study. Rather, the very creation of these tools is made to depend upon one and only one possible result of the experiments. If the experiments were to yield different outcomes, we would not be dealing with a different theory, *i.e*. a theory yielding different results, for there would no longer be any theory from which results could be derived.

4. Sraffa's reference to a 'faith in universal determinism' brings us back to the idea which emerges in interpretations of Sraffa's position as the one suggested by Sen, according to which Sraffa's rejection of a theory based on marginal magnitudes would stem from a *generically* methodological criterion (in Sen's words, a 'philosophical suspicion'), and not from the *specific* knowledge Sraffa had of economic phenomena and of the *specific problems of method* which arise in their study. For, as we have seen, according to Sraffa marginal magnitudes—certainly *suspect* in themselves as magnitudes that cannot be directly observed—could after all be accepted at the basis of an explanation of value and distribution if only one could trust that the experiments that could actually generate them would always give the same predetermined results. But this means that the rejection of a theory based on similar magnitudes must ultimately rest on the persuasion that the univocal nature of the results of those experiments is not plausible for those particular cases of change which are specifically at the basis of the marginal theory. This means, in other terms, that a judgement on the marginal method, as the one whose first step is the clear distinction between 'differences' and 'changes', cannot be reached *separately* from a judgement on the validity of the marginal theory.

Naturally, to discuss the critique of the marginalist theory that is contained in Sraffa's work or stems from it cannot fall within the narrow limits of this paper. Rather, what we want to do is to draw the attention to two problems that can be found with a certain frequency in Sraffa and that appear to be particularly well suited to illustrate the relationship between his critique of the marginalist theory and his rejection of the marginal method. Both problems take their cue from two passages in Marshall's *Principles* which had attracted Sraffa's attention since the earliest stages of his work in economics and which he would return to subsequent to the publication of *Production of Commodities*. The first has to do with the difficulties that Marshall himself had signalled regarding the reversibility of the supply curve when an industry is working under

conditions of increasing returns, while the second has to do with the difficulties involved in defining and measuring the marginal product of a factor and, in particular, with the answer Marshall gave to what is usually referred to as 'the Hobson objection' (Blaug, 1978: 459).

It may seem strange that throughout all his labours as an economist Sraffa never ceased to level his critical fire against Marshall. While in the 1920s it had seemed only natural to take a great interest in Marshall—a key figure in British, but not only British, economic thought at the time—, it might seem odd to have viewed him with the same attention forty years later, when other strands within the marginalist approach were gaining ground and other textbooks were finding their way into the basics upon which economists were reared. Now, the question of Marshall's position in the history of economic thought is obviously too far-reaching for us to tackle here; nevertheless, there is one aspect worth dwelling upon as it is directly relevant to our argument. As we have seen, underlying the 'marginist' method lies the possibility of considering the relation between cost and quantity produced as a stable relation of, above all, predetermined sign. And yet, as Sraffa had observed as early as 1925, the idea of such a relation 'is certainly *not suggested by experience*, and could not have occurred spontaneously' (Sraffa, 1925: 279). Faced with this difficulty, economists like Wicksteed had shown themselves to be ready to accept (with 'reckless consistency') all the restrictive conditions under which the relation can be postulated—and, as we know, Wicksteed would ever effectively remain for Sraffa the 'purist of marginal analysis' (Sraffa, 1960: *vii*). However, we may reasonably doubt whether the marginalist theory could ever have achieved a dominant position if the difficulties involved in the attempt to postulate those stable relations had not been taken into serious consideration and, at least apparently, solved; and, what is more, if the solution had not been passed off as something decidedly rooted in common experience. Now, this endeavour is certainly one of the distinctive features of Marshall's work and it also represents, we believe, one of the reasons why Sraffa paid such constant attention to his work.[8]

As we know, Marshall had argued that in the case of an industry with increasing returns to scale, when output undergoes contraction subsequent to an expansion, it is legitimate to expect that the supply price does not return to the previous level, but, though increasing, remains at a lower one. It is, in fact, hardly conceivable that the improvements arising from internal and external economies (e.g 'developments of mechanical appliances, of division of labour and of means of transport, and improved organization of all kinds') achieved when production increased should entirely disappear when production falls back to a lower level (Marshall, 1920: 807). Taking the return to the previous output levels to follow backwards exactly the same path that had been followed during the expansion would, as Marshall himself recognised, mean accrediting a theory 'out of touch with real conditions of life' (Marshall, 1920). However, Marshall believed he could contain these difficulties by reducing them to certain 'limitations in the use of statical assumptions', to be discussed in the appendix dedicated to them, and stressing the need for caution in the use of the supply curve concept.[9]

In his notes for the lectures held in the autumn of 1928 Sraffa showed on the other hand far more decisiveness in drawing the conclusions from Marshall's admission of difficulty:

> Therefore the supply curve "which holds for the forward movement of the production of a commodity" will not hold for the return movement. Marshall says that in such cases the supply curve will in general require to be lowered.
> This is a rather mild way of putting it: that the supply curve requires to be lowered, means that we are introducing a new variable, and thus the problem becomes indeterminate; which is equivalent to saying that in such cases the demand and supply curves do not determine the value of the commodity.
> The additional variable, of course, is time (D2/4/3: 145).

Exactly the same observation, in practically the same wording, reappears in a note written in January 1963, where Sraffa stresses that although Marshall was aware of the impossibility of retracing the supply curve backwards, he did not draw the inevitable conclusion that what was being traced out in this case were 'historical, not equilibrium, diagrams' (D3/12/42: 10).

In the light of the distinction between 'changes' and 'differences', the relationship between Sraffa's interest in this aspect of Marshall's work and his rejection of the marginal method should be clear. What Sraffa appeared to be interested in stressing was that, in connection with the relation between cost and quantity produced, there are—and are generally acknowledged—elements of *irreversibility* that, by the way in which they occur, make that relation partially indeterminate, and hence unsuitable as a basis for a general explanation of value and distribution. Since which 'improvements arising from internal and external economies' would be preserved after a contraction in the scale of production is largely a fact that should be decided on a case by case basis, the degree of the irreversibility cannot be determined *a priori*.

Less simple is the relation between Sraffa's rejection of the marginal method and the second example we propose to discuss. We may recall in this connection that John A. Hobson argued in various contexts against the marginalist theory of distribution that the variation in output, which would attend the variation in the employment of a particular factor of production, cannot be identified with the 'specific productivity' of that factor. If, for example, one were to remove one unit of a factor, leaving the amount employed of all the other factors unchanged, one could not in Hobson's view go on to ascribe the loss in output that would thereby result to the loss of the 'productive contribution' of that factor alone. For to the latter, Hobson argued, one should add the loss of output due to the 'diminished productivity' of the factors whose employment had been left unchanged (see, for example, Hobson, 1900: 145). To Hobson's objection Marshall answered in a long note inserted in the fifth edition of his *Principles* (1907). Marshall noted that

[8] Actually, the twofold aspect of Sraffa's reflections which we sought to point out in the previous sections—his criticism of a method based on marginal magnitudes and the exposure of the heroic hypotheses necessary to make such magnitudes a basis for a theory of value and distribution—is to be seen as from his earliest writings that have survived. Significant in this respect are the notes on Marshall's *Principles* dated April 1923 (D1/2), probably drafted by Sraffa with a view to the course he was about to hold at the University of Perugia (for fuller analysis, see Rosselli, 2005). In these notes we see Sraffa already seeking out the ambiguities in Marshall's use of the concept of marginal variation itself. In particular, Sraffa pointed out the difficulty of reconciling the analysis of a variation that takes time to come about with the *coeteris paribus* hypothesis: 'the Law of Diminishing Returns assumes that throughout the period under consideration a product of *identical* quality is always maintained: and yet in the cases cited by Marshall the quality changes' (D1/2: 12); 'Implicit in the law of decreasing utility is the condition that people's tastes remain the same: in other words, time is disregarded. The determination of marginal utility does not consist in the choice between different quantities in different times, but between different quantities at the same moment in time' (D1/2: 2). This may in fact be the first airing of the idea of an essential difference between 'differences' and 'changes'.

[9] In an article prompted by Sraffa and discussed at length with him, Krishna Bharadwaj (Bharadwaj, 1972: 36) reconstructs Marshall's tormenting second thoughts about where to insert discussion of increasing returns in the *Principles*, eventually placing it in appendix H under the heading 'Limitations of the use of statical assumptions in regard to increasing returns'. And indeed Marshall made further reference to 'limitations', care in the use and caution in his unpublished comments on Pigou quoted by Bharadwaj in the same article.

> When the adjustment [in the distribution of resources] is such as to give the best results, a slight change in the proportions in which they are applied diminishes the efficiency of that adjustment by a quantity which is very small relatively to that change—in technical language it is of "the second order of smalls"—; and it may therefore be neglected relatively to that change' (Marshall, 1920, V, viii, fn 4).

More concisely, in the same note Marshall went on to point out to Hobson that 'in economics, *as in physics*, changes are generally *continuous*' (ibid; italics added).

Probably not convinced by Marshall's reply, Sraffa made a first reference to Hobson's criticism already in his 1925 article (Sraffa, 1925: 311, n. 3). But what at first sight might surprise is that at the dispute between Hobson and Marshall Sraffa will come back even after the publication of *Production of Commodities*: when, that is to say, with the critique of the notion of a 'quantity of capital' given independently of value and distribution, he disposed of a much more direct line of attack on the marginalist theory of value and distribution. As Sraffa wrote in the early 1960s in a rapid sketch outlining issues to address,

> If the attempt is made to apply the marginal mechanism to one of the means in my system, it will immediately be seen to be impossible because other means must accordingly change to a comparable (not negligible) extent at the same time, increasing or diminishing according as to whether they are complementary or rivals (?). *This is the same difficulty raised by Hobson in terms of reorganisation* (D3/12/42; italics added).

As can be seen, the problem here is not, at least directly, the more or less determined nature of the relation between cost and the proportion of the productive factors employed. The problem in other terms does not lie, as was the case with our first example, in the existence of a 'prescribed path' that the experiment needed to generate the marginal product of a factor should follow. What is being questioned here is the very possibility of conceiving such an experiment. The 'organic' nature of production, which Hobson ultimately resorted to in his writings to corroborate his objection (see, for example, Hobson, 1900: 142), is in fact no more nor less than the marked *complementarity* normally at work between the various *means of production* within one and the same production process; and this in turn depends on the relatively specialized nature which, in general, characterizes many capital goods for the fact that they are produced (and hence previously conceived) means of production. But the specialized nature of capital goods clearly disappears if they can be conceived as different materializations of a single 'quantity of capital'. It comes out, therefore, that the treatment of capital as a single magnitude allowed the marginalist theory to present the choice between alternative production methods as something considerably simpler than it actually is.[10]

5. An objection could be raised against our reconstruction. It could be argued that also the movement along a wage-profit curve (which, as is well known, plays such an important role in *Production of Commodities*) is, after all, a process of change: so much so that, indeed, we cannot observe an economic system at two different levels of income distribution at one and the same time. And this would apparently leave us with the following dilemma: either our reconstruction of Sraffa's rejection of a theory based on marginal magnitudes is wrong, or it is that rejection which, to some extent at least, is inconsistent since it should also hold for the wage-profit relation. Neither the first nor the second alternative need however occur. Consider in the first place that in classical theory the role of the wage-profit curve *is not* that of determining the position of the economic system. For this is unambiguously determined once the social product, the technical conditions of production and the wage rate are known. Hence it cannot be said that this curve is *at the basis* of the classical theory in the same sense as demand and supply curves are said to be at the basis of the marginalist theory. All that is displayed by that curve is a particular *property* of the economic system—consisting in the way the profit rate changes attending a given variation in the wage rate, if these changes do not affect the social product and the technical conditions of production. And important as this property certainly is, it is clear that the classical theory does not *draw* its validity from it. Nor is it in the second place implied that, when we pass from the mental experiment whose results are summarized in a single wage-profit curve to the study of the actual process of change in income distribution, the condition of the absence of changes in the social product and in the technical conditions of production (which made the experiment possible) need be satisfied. Indeed, all that is implied in that mental experiment is the recognition that the relation between profits and wages is, for given levels of output and hence for the associated methods of production, amenable to a general study, *i.e.* reducible to a stable relation of given sign; whereas the same does not apply to the relation between income distribution on the one side, and the social product and the technical conditions of production on the other, where the mutual influence among the variables may produce relations of different sign in different historical contexts.

6. We may now draw some conclusions. Marginalist theory, Sraffa wrote in the introduction to *Production of Commodities*, 'requires that attention be concentrated on change'. As we have seen, however, it is a very particular change that is involved. It is not, in fact, a matter of a merely potential change (and this is the point Sraffa drew attention to underlining the fact that marginal magnitudes are not directly observable); but, moreover, a change that *must* necessarily come about in a certain way if the very notions underlying theory are to hold good. Returning to Sraffa's distinction between 'differences' and 'changes', we might then say, paradoxically, that for marginalist theory the change is to be seen to lie in the difference between two situations existing side by side.

However, this means that marginalist theory, precisely due to its need to refer to this extremely particular type of change, is decidedly ill-equipped to study real change—change as it is effectively manifested in reality. As we saw in the previous section, the possibility of increasing returns in the presence of 'changes in output', like the possibility of complementarity when the change is a matter of the 'proportions in which different means of production are used by an industry', are both characteristics of economic reality that are not captured by the notions of marginal cost and marginal product.

Thus *Margins and margins* seems to illustrate very well what in any case emerges from Sraffa's published works: namely that Sraffa's rejection of a theory based on marginal magnitudes has nothing to do with a predetermined and, basically, excessively restrictive methodological position. What might appear so—the warning that marginal magnitudes are not directly observable—is in fact simply the first step Sraffa needs to take to clear the ground of the illusion that the notions of marginal productivity and utility are absolutely beyond discussion. Once this step is taken, we can see quite clearly not only that Sraffa's critique of 'marginism' has nothing to do with a restrictive methodological position, but that, on the contrary, it was only the other side of his rediscovery of the 'standpoint [...] of the old classical economists', which, precisely because it has no need to reduce change to a comparison between different situations existing side by side, is decidedly more flexible and potentially more fruitful than the 'marginist' approach.

[10] On the role that the treatment of capital as a single magnitude had a) in shifting the accent in the explanation of rent from the extensive to the intensive case; b) in ascribing to the latter the property of continuity; and c) in extending this relationship beyond agriculture to any productive factor, see Scazzieri (1981, chap. II, § 3).

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