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On the Meaning of Sraffa's Equations: Some Comments on Two Conferences

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You say 'I don't see how demand can be said to have no influence on... prices, unless constant returns...' I take it that the drama is enacted on Marshall's stage where the claimants for influence are utility and cost of production. Now utility has made little progress (since the 1870's) towards acquiring a tangible existence and survives in textbooks at the purely subjective level. On the other hand, cost of production has successfully survived Marshall's attempt to reduce it to an equally evanescent nature under the name of 'disutility', and is still kicking in the form of hours of labour, tons of raw materials, etc. This, rather than the relative slope of the two curves, is why it seems to me that the 'influence' of the two things on price is not comparable. (Sraffa to Asimakopulos, 11 July 1971)[1]

Production of Commodities by means of Commodities, one of the most fascinating books in the history of economics, was published, both in Cambridge and in Turin, in 1960. In 1985, to celebrate the twenty-fifth anniversary of this event, a great international meeting was held in Florence. This meeting, dedicated to Piero Sraffa and his work, was held over four days and included seven sessions and two round-table conferences. The proceedings of this meeting have now been published, five years later.[2]

These four days of study in Florence took place in a context of other gatherings and congresses held following Piero Sraffa' death in 1983. Two of these were held in Turin in 1983-84 and another, exclusively French, in Nice in 1985. Curiously enough, the proceedings from the Nice meeting, too, have only now been published[3]

But delays are not always harmful. In those meetings great care was

[1] Quoted in *Essays on Piero Sraffa. Critical Perspectives on the Revival of Classical Theory*, ed. by K. BHARADWAJ, B. SCHEFOLD, London, 1990, p. 342 (this book, red in colour, will often be mentioned as RED). Quoted also in *Sraffa: trente ans après*, ed. by R. ARENA, Paris, 1990, pps. XVIII-XIX (this book, blue in colour, will be mentioned as BLUE).

[2] *Essays* (RED).

[3] *Sraffa* (BLUE). One should also remember the 28th annual meeting of the *Società Italiana degli Economisti* (1987) which was devoted to the subject.

understandably taken in drawing conclusions, that is: in summing up years of sometimes animated discussion and criticism, and of impassioned attempts to formulate a new economic theory. Moreover circumstances were favourable, given that the polemic, which had formerly consumed so much time and energy, aso tho whether Sraffa's model was compatible with Marxist theory, was no longer there.

In recent years, however, there have been momentous developments both in the narrow field of analysis and, obviously enough, in the external world. As a consequence, it is now highly desirable to take stock of the situation and draw up a new and up-to-date balance sheet.

On the one hand it can be affirmed that the school of thought originating with Sraffa has now obtained its greatest academic achievement (since the time of the 1966 Symposium in the *Quarterly Journal*) with the publication of the *New Palgrave Dictionary of Economics*, a monumental work that will seemingly continue to influence the professional world for many years.

On the other hand, in these same years orthodox economic theory (although appearing in a variety of versions) seems to have won an unchallenged victory as a result of the discrediting of Marxist theory and the relegation of Sraffian criticism to the sidelines.

Given this situation, the present publication of the proceedings in Florence (and Nice) could represent a convenient and indeed timely opportunity for reflection. Moreover, many of the papers presented at the two meetings seem to have been "updated" to 1988-89. This, in fact, is curiously borne out by the very title of one of the two volumes: the publication of the proceedings of the French meeting dedicated to the 25th anniversary of *Production of Commodities* is, in fact, entitled *Sraffa: trente ans après*.

The nature of Sraffa's work is such that discussion inevitably tends to spread itself across all aspects of analysis. "The papers and discussions have covered a surprisingly broad range of issues", the editors of the Florence proceedings tell us. Many different themes are actually covered, and all are of significance.

But, in spite of the variety of themes, and indeed sometimes within each theme, it is possible to identify clearly three distinct levels of analysis. The first level concerns "what Sraffa really said", that is, the content and the implications of *his* theory. The second covers the critical range of his work as regards the various incarnations (including subsequent incarnations) of neoclassical economics. The third concerns the possibility and suitability of using Sraffa's model as a base for the construction of a new theory (or, to put it in Levine's rather blunt language, "what to do with the Sraffa model?").

It is obvious that these different levels have various points of affinity. For instance, those who are interested in the construction of operative models, normally tend to give only relative importance to Sraffa's insistence

in making no assumptions on returns. But it is still essential to keep the three levels carefully separated, at least in principle. The various themes that we meet on each of the three levels can be reduced to a few fundamental problems: the nature of Sraffa's equations (equilibrium relations, countable identities, or otherwise), or the analytical and historical relations with linear models (Leontief and von Neumann,) to take another example.

This note refers to the proceedings of the Florence meeting (whilst leaving in mind its French counterpart). Quotations will be simply indicated by the name of the speaker and the page number of the relevant volume. Only questions related to the first level of analysis (what Sraffa really said) will be taken into consideration, and of course our principal reference point will be what Sraffa actually wrote (*Production of Commodities* will be quoted with simple paragraph references).

In the Florence volume, a peculiar reluctance is noticeable on the part of the participants (the "Sraffian" participants, at least) to face the fundamental questions. This is understandably due to a legitimate diffidence with regard to arguments that are sometimes too general and badly-defined, and where discussion can all too easily lose its bearings. It is also understandable that, in adverse ideological conditions, the "school" prefers to project a constructive image of itself, rather than be seen endlessly disputing over fundamental principles. But even if this attitude is understandable, it is also true that it can have possibly undesired consequences.

As a first example one should consider the theme of the "invariable standard of value". This is clearly one of the themes that Sraffa considers to be of central importance. Indeed, he dedicated, directly or indirectly, more than half of his efforts to this (if we confine our attention to the part on single-product industries). It is also clear that there is no general consensus among scholars regarding the significance and the analytical utility of the standard commodity (in this context, see the informative discussion between Flaschlel and Schefold published the following year in the *Zeitschrift für die gesamte Staatswissenschaft*). And yet there is no specific essay on this theme.

The argument is brought up from time to time, but most often in reply to more or less specific criticism from the outside. Eatwell, Garegnani and Schefold discuss it at length in their comments on Samuelson's paper ("Revisionist Findings on Sraffa") where he stated, provocatively, "the total irrelevance of the standard commodity". But this leads the discussion more towards the concentration on Samuelson's misapprehensions and shortcomings than to an examination of the nature and use of the standard commodity itself.

The same thing happens, in much softer tones, with Steindl's paper ("Measurement and Aggregation") and Kurz's comment on it. The

divergence here does not so much reagard the caracteristics of the standard as its analytical use.

The standard commodity is repeatedly referred to in terms of *Hilfskonstruktion* (but can an analytical instrument be other than this?). One is sometimes left with the uncomfortable suspicion that this is considered a useful device for illustrative ends, but a clumsy and dispensable one as far as pure theory is concerned.

Garegnani (p. 290 & n. 11) is alone in mentioning the relationship between the choice of the standard and the change in the coordinate system. It is surprising that the studies by Richard Goodwin published over a decade, are not used here: Goodwin's normalized or general or principal coordinates are nothing but the standard commodity at work.

The same thing could be said about the vexed question of returns to scale. Here we have a paper explicitly dedicated to the subject (Levine: "The Sraffa Model, constant Returns to Scale and empirical Implications") but it is far from adequate. Anyone interested would find Garegnani's paper more satisfactory. This paper, "Sraffa, classical versus marginalist analysis", is yet another reply to an attack from outside — in this case Hahn's well-known *The neo-Ricardians*, published three years before (but already circulating among the experts for well over ten years prior to that).

These themes are well-known, important and well-covered in debate. But, in the last analysis, they lead us to an even more fundamental question, already hinted at above. What significance can be given to Sraffa's price equations?

It has been well known for some time that these price equations can lead to divergent interpretations. Levine reminds us (p. 168) that, in Joan Robinson's opinion, they express "equilibrium relationships (that) cannot be used to discuss the behaviour of the human beings who inhabit (it)". Hahn, cited by Garegnani (p. 129), asserts that these equations, without constant returns, become mere countable identities. Very few of the participants at the meeting in Florence seem to share these positions;[4] however, it is not clear if there is a reasonable consensus as to the meaning of these relationships.

"First — warned Joan Robinson — let us state the assumptions". Sraffa assumes (i) that the quantities produced and the corresponding methods of production are known ("all these represent known quantities", § 3). But he makes no assumption regarding the technology that determined these methods of production ("No question arises as to the variation or constancy of returns", preface). A missing assumption — as we have just noted — that has generated perplexity in many economists.

Sraffa also assumes (ii) that the variables considered unknowns — prices,

[4] LEVINE (p. 161) attributes to Burmeister a position similar to Hahn's.

wage, rate of profit — are uniform ("we are all the time concerned merely with the implications of the assumption of a uniform price for all units of a commodity and a uniform rate of profits on all the means of production", app. B).

We can easily conceive of a world where the same good receives differing valuations as input and as output (a possibility mentioned, and then rejected, by Sraffa when he refers to "beans" in app. B). And we can also conceive of a world with differing rates of profit, following an old suggestion of Sylos Labini (RED, p. 19, n. 4). In the same way, we can conceive of differentiated wages, a game Steedman plays in his paper in Nice (BLUE, pps. 67-74). These are all interesting worlds, and well worth looking into. But they do not correspond to Sraffa's assumptions.

The assumption of uniformity for prices and wage is normally considered quite innocuous; the existence of a market seems sufficient justification for such uniformity, and the operation of competition does not seem to interfere with the mechanism of the equations.

The case is different for the rate of profit. Two strategies have been adopted to justify its uniformity. On the one hand, Sraffa's analysis has been reduced to the theory of the equilibrium prices for a steady state, balanced growth economy. This position (mentioned by Schefold, p. 203), although relatively widespread, does not seem to have been represented at the Florence meeting.

On the other hand, use has been made of the Smithian metaphor of gravitation. Sraffa's prices would not normally coincide with actual (market) prices. This would happen only if we were in a state of equilibrium (in Harrod's sense, and that is, where the producers, in the light of final results, consider their initial productive decisions to have been right). Outside the equilibrium, the signal for producer discontent would come from difformity in the rates of profit; this would lead to a change in production decisions which by tendency should push profit rates towards uniformity; and Sraffa's prices represent the levels toward which this mechanism would make market prices converge (without necessarily making them reach them).

The theory of gravitation is fascinating in many ways, even if it does have well-known and as yet unresolved difficulties. It goes back to a fundamental intuition of the classical economists, and it gives us today the, perhaps, more interesting model for the formation of prices in a competitive capitalist economy. But it does not seem possible to consider it a part, even implicit, of the argument of *Production of Commodities*.

Sraffa, who is rather sparing with references, seems uncharacteristically explicit in his warnings here: rate of profit is "assumed to be uniform" (index, and app. B); the argument "contains no references to market prices" (§ 7); "no changes in output are considered" (preface) which implies — as we have observed — that no hypotheses on returns are envisaged. These

assumptions are incompatible with the working — whether implied, or elsewhere — of some adjustment mechanism.

So we remain with our problem: what significance must be given to Sraffa's equations and to the prices in them? This problem, traditionally, has been faced by referring to classical economic theory. And this is surely a useful procedure, backed by Sraffa's own indications. But contemporary economic theory has been unduly neglected. In the 1920s, when the central propositions of the book were taking shape, Sraffa's position was much less removed from that of some of his fellow-economists than is recognised today.

Some of the participants at the Florence meeting seem to realize the existence of an open question, and the importance of that question. Schefold comments at one point (p. 225): "The remaining problems are, I believe, mainly conceptual, and only conceptual advances may one day generate new formal problems".[5] And Schefold himself, our editor, when publishing a twin volume (entirely his own, the same argument, the same argument, the same publisher[6]) gives us the example of an attempt in conceptual advance with his most recent essay, "Some Thoughts on the Foundation of Value in Sraffa".

Similarly, the Nice publication opens with an introduction by Richard Arena on the various hypotheses concerning the nature of the Sraffian theory of price (BLUE, pps. VII-XXI; see his observations already in RED, pps. 82-83).

Now, it is significant that all those who pick up on this theme use as their (not merely conventional) starting-point the first chapter of Sraffa's book, "Production for Subsistence" (see also Pasinetti, pps. 230-2). In fact, this chapter is commonly interpreted as a first and limited introduction to the general theme of prices. But it can also be seen as the presentation of a pure case, the only one where prices appear immediately in their real, essential nature.

Given that the system is physically able to reproduce itself, i.e. that it is viable (other systems, Sraffa says — § 3, n. 1 — "are not considered") and given that productive decisions are decentralized at the industrial level,

[5] One can hardly avoid thinking of the copious literature on joint production. To use Kuhn's terminology, this seem to be a typical instance of "normal science" (dedicated to the solution of puzzles) although the "paradigm" is far from being accepted within the scientific community. Moreover, the majority of experts do not seem to follow Sraffa's advice to limit the complications of joint production to those cases where it is analytically necessary, that is, those of fixed capital. Nor are they specially attracted by the only puzzle which seems to have troubled Sraffa, the possible anomalies in the relation between wage and profit rate.

[6] *Mr. Sraffa on joint Production and other Essays*, London, 1989. The other editor, K. Baradwaj, followed suit, publishing a companion volume, *Themes on Value and Distribution: Classical Theory reappraised*, London 1989.

prices, being "necessary" par excellence, must guarantee the economic reproducibility of the system.

> Let us suppose — Leontief writes in 1928 — that barter takes place in such a way that all the producers make one single pile of all the goods intended for exchange, and then take the necessary means of production: in this case there would be no special problem (as far as exchange value is concerned). But in practice these goods counterpose each other in couples, and not in groups as in the productive process.

Five years later Remak, a mathematician, writes:

> A price is not formed on the basis of supply and demand but is a number that satisfies certain conditions. The price of a commodity must cover the price of the means used in its production, including the standard of living of the people involved, which is assumed to be known.
> This is the so-called objective theory of value (Leontief).[7]

If the economy is able to produce a surplus, then prices, in order to guarantee that the process can reproduce itself, must guarantee that all industries are able to rebuy the productive stocks, but they must also guarantee a given distribution of the net product to both classes.

The German and Russian theoristis of circular flow, working just after the First World War, had considered the requirements of reproduction in an undifferentiated manner. This means that these theorists lumped together technical inputs and purchases of various types by all participants in the process of production (workers and capitalists). From a formal point of view, this keeps us within the closed model examined by Sraffa in his first chapter.

Sraffa's theory is richer and more versatile because it distinguishes between reproductive requirements dictated by technology and requirements imposed by a given distributive set-up. The possibility of distinguishing between heterogeneous elements in the determination of prices (and to consider their reciprocal relations in isolation) is one of the central results of the theory.

The distributive set-up is defined on the basis of a profit rate, assumed to be uniform. It was, in fact, an assumption of this type that caused so much argument (in France, Italy, Germany and Russia) at the turn of the century: this is not because it was debatable, but rather because it was not clear if, in combination with the requirements of reproducibility, it would give a consistent and univocal definition of prices.

"The question does not arise as to the way in which one really arrives at that process of adjustment (of profit rates) — writes an obscure professor from Modena in 1900 — but on the way to express this process in an exact

[7] W. LEONTIEF, "Die Wirtschaft als Kreislauf", *Archiv für Sozialwissenshaft und Sozialpolitik*, LX, 3. R. REMAK, "Konnen superponierte Preissysteme praktisch berechnet werden?", *Jahrbücher für Nationalökonomie und Statistik*, LXXX.

mathematical formula which will allow us to determine the rate deriving from that adjustment".[8]

In those years there were many economists with mathematical gifts who where able to give a positive answer to this question (sometimes, though not always, assimilated to the transformation problem) but always assuming wages known in physical terms (and constant returns). The priority is seemingly due to Dr. Mühlpfort (1895), but this is of largely academic interest.

Ricardian economists, however, were asking, from the very beginning, how a change in wages could influence the conditions of reproducibility, and therefore prices. "According to Ricardo — a professor from Forlì tells us in 1883 — the value of things is determined not only by the quantity and quality of labour, but also by the rate of profit, and thus by the rising or lowering of wages".[9]

If the production of commodities takes place by means of commodities (given that the system is vital), the process can repeat itself year after year (on the basis of decentralized decisions) only if prices guarantee the satisfaction of the reproducibility requirements dictated by technology (recovery of productive expenses) and by a given distribution of income between the classes (defined by a uniform rate of profit).

An indirect confirmation of this interpretation is given by the treatment of wage: Sraffa assumes that it "is paid *post factum*" (§ 9). This assumption is usually seen as a trivial adjustment to modern realities (wages paid at the end of the year?) or, even worse, as a result of the undeclared wish to obtain, eventually, a linear relation between wage and profit rate.

But the proposal to split the wage into two parts, the first defined in physical terms and paid in advance, the second defined in value and paid afterwards, can only conform to analytical needs. It is clearly an attempt to distinguish, within the requirements of reproduction, between the reconstitution of wage "advances" (subsistences, assimilable with other productive stocks) and the maintenance of a given distributive set-up.

In this way what Sraffa is doing seems to be a sort of linguistic cleaning-up, thanks to which the central notions of the theory of value are *defined* in the most rigorous manner. Though important for the construction of an explanatory model, this operation clearly does not coincide with the construction of the model itself.

[8] C. Conigliani, "Sul conguaglio dei saggi di profitto", *Archivio giuridico F. Serafini*, V, 1 (1900).

[9] E. Nazzani, "Due parole sulle prime cinque sezioni del capitolo *On Value* di Ricardo", *Rendiconto del Reale Istituto Lombardo di Scienze e Lettere*, 1883. More precisely, Conigliani, mentioned above, seventeen years later wrote: "Now to make this calculation we need an analysis of product prices, which is often in practice impossible owing to the highly intricate relations between this or that branch of production, but which is *theoretically* easy and in any case *necessary* if one wishes to numerically compute the profit rate after the change in wages".

"The relation between distributive variables and relative prices — maintains Garegnani (p. 155) — has the same degree of rigour and generality as our assumptions concerning the definitions of distributive variables". A comment which reminds us in turn of a remark made by Sraffa at the meeting in Corfù (1958) on the theory of capital: "The definition in this case must be absolutely water-tight".

During the meeting, both in Florence and in Nice, a great deal is said about the complications deriving from joint production in Sraffa's work. In particular, one notes how an interdependence emerges between distribution, prices and quantities produced. To put it in the words of one of the French papers (BLUE, pps. 245-56), it is important to bear in mind the *rôle intime de la demande dans la production jointe*. In practice, seen in this light, joint production does not seem to present anything really novel.[10]

If one takes Sraffa seriously when he says he need not assume constant returns, it is clear that changes in productive levels — which can be generated by variations in the composition of final demand — influence prices even in the absence of joint production (Schefold, p. 305). And Eatwell can reasonably conclude (p. 281) that "in Sraffa's analysis, any change in the composition of output that leads to a change in the conditions of production, for whatever reason, will change relative prices".

Sraffa's answer to Asimakopulos, quoted at the beginning, may help to clarify the point. The requirements dictated by the reproduction of the system, i.e. the necessary recovery by each industry (in terms of hours of labour, tons of raw materials, etc.), united to a given distribution of income, can allow us to define prices consistently and univocally.

It is reasonable to admit that the productive requirements which appear in the definition of prices are influenced by the composition of final demand, albeit indirectly, through its action on gross productive levels (just as final demand is presumably influenced by variations in distribution). But this does not cancel the fact that for Sraffa there is no sense whatsoever in putting reproductive requirements ("cost of production") on a par with demand, as if they were two symmetrical forces in the determination of prices. On the one hand, we do have the requirements of production, which directly and forcibly influence prices (and autonomously determine them). And on the other hand we have demand (attributed to evanescent subjective preferences) which acts indirectly (and to a modest extent) on those same requirements.

[10] There is another aspect of joint production which, although frequently stressed, is not entirely new: distribution influences the number of products present on the market as commodities (and therefore deserving a positive price). An analogous situation was already found, however, in the single-product world with the self-reproducing non-basics ("beans").

One may ask whether this proposed reading is nothing but a return to the old image (Roncaglia, pps. 473-5) of Sraffa's equations as a "photograph of the system at a point in time" (or "snapshot": see Levine, p. 166). The answer is not entirely clear, because the theoretical implications of the metaphor are by no means clear either. A photograph, by its nature, records external reality, and the reality is made up of produced quantities, utilized inputs and current (market) prices. It is difficult to see how our snapshot can give a different treatment to quantities and prices (see also Petri, p. 172).

This leads to an observation of a general character. A reading of the various contributions shows that there is an abundant and occasionally rather careless use of metaphors. These, for didactic and explanatory purposes, are often very useful; but their use in theoretical discourse can be of little value, if, indeed, they are not just an excuse for hazy thinking. We have already spoken of snapshots and of *Hilfskonstruktionen*, but one could also recall the distributive variations seen as "isolated *in vacuo*" or also as "thought experiments" (it is a question, after all, of the relation between two variables in a system with one degree of freedom).

Even the appeal to the image of "gravitation", which does have the merit of referring the theme to its Smithian (and Newtonian) roots, should be used with care; and in any case it should not be used as a means of helping us forget that we still do not have a satisfactory theory of the working of the mechanism of competition.

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