

# SRAFFA'S AND WITTGENSTEIN'S CROSSED INFLUENCES: FORMS OF LIFE AND SNAPSHOTS

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***Sraffa's and Wittgenstein's crossed influences: forms of life  
and snapshots \****

*Final version*

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## **1. Preliminary remarks**

The purpose of this contribution is to investigate Sraffa's and Wittgenstein's mutual methodological and philosophical influences to try to point out how they reveal the possibility of an interpretation of Sraffa's contribution to economics which differs from the most usual ones. The second part of this paper will consider how it is possible to read *Production of Commodities by means of Commodities (PCMC)* as an attempt to build a classical version of the theory of General Economic Equilibrium. Its third part will focus on the interpretation of Sraffa's 1960 scheme in terms of "long-period positions". In a fourth part, we will investigate the notions of "form of life" and "language game" in Wittgenstein post-*Tractatus* contributions, beginning to connect them to some developments included in Sraffa's *Unpublished Manuscripts*. Finally, in the last part of this paper, we will show how these notions offer some similarities with an interpretation of Sraffa's contribution in terms of morphological and comparative analysis of the economic foundations of surplus-based societies.

## **2. Classical General Economic Equilibrium**

For most of the readers of *PCMC*, Sraffa's economic project was the construction of a contemporary *classical* theory of general economic equilibrium providing an alternative to the neo-Walrasian theory of relative prices (for a more systematic presentation, see our introduction of Arena and Ravix, 1990).

A first example of this standpoint can be retraced to Claudio Napoleoni's book published as soon as 1965 and entitled *L'Equilibrio Economico Generale* (Napoleoni, 1965). It played an important role in Italy, was several times re-published and widely used by teachers as well as students. The book initially dedicated some pedagogic chapters to the formal presentation of the Walrasian theory of general economic equilibrium. Thus, the first of them coped with « the general formulation of the Walrasian theory of production and exchange » and the fifth with « the equilibrium system with technological coefficients » (Napoleoni, 1965). Then came the investigation of Leontief and von Neumann multi-sector models. The end of the book coped with Sraffa's system of determination of relative prices and distribution variables. The book suggests the existence of a progressive but

natural evolution from Walras's to Sraffa's price theories based on a succession of stages corresponding to various multi-sector models (such as the closed Leontief model, the dynamic Leontief model or the Von Neumann model of growth). Therefore, the Sraffian construction appeared to be the final outcome of a sequence of analytical progress in the realm of price theory based on a new theory of general economic equilibrium where the notion of scarcity is replaced by the notion of reproduction.

A second example of the assimilation of *PCMC* to a mere contribution to the theory of relative prices is provided by Walsh's and Gram's *Classical and Neo-classical Theories of General Equilibrium* (Walsh et Gram, 1980). This book was written fifteen years after Napoleoni's one. In the beginning of the eighties, the community of economists did not still realize that the research program of the neo-Walrasian General Economic Equilibrium theory was declining especially after the discovery of unresolved problems of price instability and the devastating consequences of the Sonnenschein-Debreu-Mantel theorem (see Sonnenschein, 1972 and 1973; Debreu, 1974 and Mantel, 1974) and therefore could believe to the possible rise of an alternative "neo-Ricardian" version of it. In other words, Walsh and Gram wrote their book in a period in which the General Economic Equilibrium theory— either neo-Walrasian or neo-Ricardian – was the real core of economic theory. In the introduction of the book, both authors indeed noted that

"the chosen topics [...] cover the main span of basic economic theory as it exists to-day"  
(Walsh and Gram, 1980: xii)

The main idea of the book is simple. Contrary to the predominant opinion of the time, Walsh and Gram argued that *two* and not *one* versions of the General Economic Equilibrium theory did exist, one called "classical" and the other called "neoclassical":

"A sharp distinction can be drawn in the theory of general equilibrium between the classical theme of the accumulation and allocation of surplus output, and the neoclassical theme of the allocation of given resources among alternative uses. Without this distinction neither the history of economic analysis nor the structure of modern mathematical models of general equilibrium can be clearly understood"  
(Walsh and Gram, 1980: 3)

After an investigation of the historical roots of these respective theoretical traditions, the book provided two distinct canonical models. The "neo-classical model" presented in chapter 10 is a linear bi-sectoral model using fixed production coefficients, constant returns to scale and two primary factors (capital and labour). The "classical model" presented in chapters 11 and 12 offers some analogies with the neo-classical model but does not include primary factors and therefore needs to be completed by the introduction of labour coefficients. This second model is in fact a traditional Leontief-Sraffa model in which prices as well as quantities are determined as dual solutions. This

interpretation of Sraffa's contribution is close to the one which Abraham-Frois and Berrebi offered as soon as 1976 (the first French version of Abraham-Frois and Berrebi, 1979). According to this contribution, it is useful to build a "bridge between J. von Neumann's and Sraffa's analyses" (Abraham-Frois and Berrebi, 1976: 9). Here again, Sraffa's system of prices is associated to a dual system of quantities. This dual system is here based on an assumption of balanced growth with a unique inter-sectoral rate of growth equal to the uniform rate of profit. Constant returns to scale are again assumed in contrast with *PCMC* and markets are always cleared. Abraham-Frois and Berrebi as well as Walsh and Gram therefore also contributed to interpret *PCMC* as the price side of a dual model which contrasted with the neo-classical approach.

Paradoxically, these interpretations of Sraffa's contribution were reinforced by the opposite camp. As soon as 1975, Frank Hahn noted:

« I assert the following: there is not a single formal proposition in Sraffa's book which is not also true in a General Equilibrium model constructed on his assumptions »  
(Hahn, 1975: 362)

This view does not even imply that Sraffa's contribution was a tribute to an alternative theory of General Economic Equilibrium but to the mainstream General Economic Equilibrium theory itself. According to this view (Hahn, 1982), Sraffa's system had to be considered a specific inter-temporal equilibrium model in which the uniform rate of profit was now the rate of interest. This model may surprise the reader since usually inter-temporal equilibria are associated to various own rates of interest. Hahn however considers that Sraffa's quantities are not exogeneous and given but that they correspond to a very specific configuration of initial endowments and to a very specific technology which renders the emergence of a unique rate of interest possible. Sraffa's price system is therefore described as a « very special case of economy » (Hahn, 1982: 363) and

« the neoclassical economist who is always happy to consider interesting special cases sets to work to find a proper equilibrium for Mr Sraffa »  
(Hahn, 1982: 365)

Sraffa's system of production prices is therefore considered by Hahn as a *curiosum* of the General Economic Equilibrium theory.

### **3. Uniformity of the rates of profit and long-period positions**

Sraffa's assumption of the uniformity of the rates of profit is often associated to the notion of "long-period position" and usually provides one of the basic foundations of the theory of production prices.

This interpretation clearly differs from the GEE perspective, even if it “and standard microeconomic theory have some ground in common” (Kurz and Salvadori, 1997: XV). But this again still places Sraffa’s contribution in the realm of price theory. As Sinha noted,

“The Sraffians’ interpretations of Sraffa have concentrated almost exclusively on the economic theory aspect of his work, i.e., he is read within the context of the theoretical debates in economics only.”

(Sinha, 2002: 1)

For instance, as soon as the beginning of the Preface of their *Theory of Production*, Kurz and Salvadori wrote:

“This book deals with the theory of production from a long-period perspective. It is concerned with the inseparable problems of production and distribution, and, since the two are connected via the theory of value (or price), also with the latter. The method of analysis adopted in the book is that of “long-period positions” of the economic system, characterized by a uniform rate of profit on the supply prices of capital goods and uniform rates of remuneration of all factor services which are of homogeneous quality, such as certain kinds of labor or land services. In accordance with a long-standing tradition in economics, the tendency toward a uniformity of these rates is taken to result in conditions of “free competition”, that is, the absence of significant barriers to entry or exit”

(Kurz and Salvadori, 1997: XV)

This specific identification of Sraffa’s contribution to economics is obviously prior to the investigation of his *Unpublished Papers* which the authors later strongly contributed to; this is why their characterization of this contribution as a theory of the determination of relative prices associated to a uniform rate of profit may have changed since 1997 (see Kurz and Salvadori, 2005). However, if this second interpretation is still today widely accepted among Sraffa’s scholars, it is still debated and raises two different and essential problems.

The first concerns the consistency of the notion of long-period position which depends on the logical validity of the assertion that in the long run, the rate of profit tends to be uniform because of market competition. Now, this assertion is far to be always true. The formal conditions requested to ensure the convergence of the rate of profit towards uniformity are specific and restrictive; they are not therefore obvious (Arena, 1990b; and more recently Dupertuis and Sinha, 2009): the investigation of local asymptotic stability of production prices is often privileged, being simpler and giving better results than the study of its general stability for which rather little has been done to-day (Caminati, 1990: 17-22; Steedman, 1990: 69-70; Kurz and Salvadori, 1997: 19-20); when the size of the price system tends to be larger, convergence becomes less and less probable (Steedman, 1984; Arena, Froeschlé and Torre, 1990); non constant returns to scale substantially decrease the number of

convergences (Arena, Froeschlé and Torre, 1990); cross-dual models – often used in the literature – assume specific assumptions which are debatable (such as the assumption of constant returns to scale or the absence of microfoundations, for instance; see Caminati, 1990; Boggio, 1990 and Arena, Froeschlé and Torre, 1990: 288); expectations and behavioral reactions matter (according to their size, for instance; see Caminati, 1990; Arena, 1990, Arena, Froeschlé and Torre, 1988 and 1990); there is no reason that short run and long run economic changes are totally independent (as it is often argued, in Garegnani, 1983: 132 or Bellino, 1997 for instance; see, by contrast, Arena, Froeschlé and Torre, 1990: 288 and Steedman, 1990: 69-70); it is not obvious to choose the appropriate market adjustments (Arena, Froeschlé and Torre, 1990: 288-289); the relation between the gravitation mechanism and the context of economic growth and technical change *should* not be assumed but discussed and specified, in contrast with the cross-dual models assumptions (Steedman, 1984 and 1990; Sinha, 2010: 13); etc.

This is why we agree with Kurz and Salvadori (1995:20) when they say:

“A proper answer to [the issue of gravitation] would seem to contain, of necessity, an answer to many economic questions which are as yet unsolved. Hence, while in some analyses the problem of gravitation is seen in a way that is overly simplistic, there is the opposite danger of overburdening it with demands that are hard to meet. It should then be clear that there is no fear that the issue of gravitation will be settled in the foreseeable future”

(Kurz and Salvadori, 1995: 20)

We however consider that their conclusion of 1997 is debatable, when, in spite of these remarks, Kurz and Salvadori think that the best – or perhaps the only possible – theoretical choice is “to start from the ‘stylized fact’ of a uniform rate of profit, that is, adopt the long-period method” (Kurz and Salvadori, 1995: 20). We do not deny that the notion of long-period position can be regarded as a *possible development* of Sraffa’s approach. However, it is only *one of the possible developments* and not **the key of interpretation** of Sraffa’s work. And this development is *possible* and *not necessary*: others excluding the notion of long-period position (for example, Semmler, 1984; Boggio, 1990; Arena, Froeschlé and Torre, 1990) are possible and even closer to the real world.

Secondly, in the framework of *PCMC*, the assumption of a uniform rate of profit has *not* to be *necessarily* interpreted as the result of a *competitive* process of convergence of disequilibrium prices towards equilibrium production prices or of convergence around production prices or to a *free competitive* process of gravitation of market prices around natural prices. As we know, in *PCMC*, Sraffa does not refer to any of both these processes; he only wrote: “We add the rate of profits (which must be uniform for all industries) as an unknown which we call *r*” (Sraffa, 1960: 6) and

nothing more. In the *Sraffa Archives*, we also find the important following remark which characterizes Smithian natural prices “determined by equations”, namely Sraffian production prices:

“When Smith, etc., said ‘natural’ he did not in the least mean the ‘normal’ nor the ‘average’ nor the ‘long run’ value. He meant that physical, truly natural relation between commodities, that is determined by the equations, and that is not disturbed by the process of securing a greater share in the product. ‘Exchange value’ was the result of natural value disturbed permanently by the scramble for the surplus: it might itself be distinguished into ‘market value’ (daily fluctuations) and normal or average”

(Sraffa, UP: D 3/12 11:83)

Referring to Smith, Sraffa therefore distinguishes *four* different concepts of price or value. The *natural price* corresponds to the production price “determined by the equations”, that is the price which is associated to *the given* distributive rule chosen by the theorist who wishes to describe a *given society* (we should not forget that on the first page of *PCMC*, Sraffa twice refers to a “*society*” and *not* to an “*economy*”; then he will go on, only using the term “*system*”). “*Exchange value*” is a price determined by “the scramble of the surplus”, that is *outside the equations* (or the “*core*” according to Garegnani’s expression); it is therefore a price which is not only influenced by the natural price but also by external circumstances different from the “physical (...) relation between commodities” such as the tastes of demand, market forms, class conflicts, etc. It finally results from the combination of two other types of prices: the various “market values” (i.e. actual market prices determined by day-to-day or “daily fluctuations” on one side and the *normal* or *average* price (i.e. the computed “average” of these “market values” actual market prices). Therefore, natural or production prices are not observed but analytical prices related to a theoretical representation of the real world independent from actual or average market prices. On the contrary, “exchange values” *do depend* on natural prices, on one hand but also on “daily” and “average” prices on the other hand. This clearly means that Sraffian production prices *only* depend on “physical, truly natural relations between commodities that is determined by the equations” *and not* on either a gravitation process the convergence of which reveals the level of the uniform rate of profit, or from a kind of empirical observed average of actual market prices.

This is why, as Hicks stressed it in a contribution dedicated to the relations between Ricardo’s and Sraffa’s theories (Hicks, 1985), the uniformity of the rates of profit is actually a “conventional” assumption. The meaning of this “convention” is *not* prevalently *economic* (that is related to free competition) but *social*. The assumption of uniformity of the rates of profit is indeed related to the choice made by Sraffa concerning the type of social surplus distribution he privileged in order to describe a *given specific society*. This given specific society is nothing else than the version of modern

capitalist society in which the “division of the surplus” primarily concerns “capitalists and workers” (Sraffa, 1960: 9). If we follow Sraffa, the uniformity of profit is therefore necessary to stress this *essential* and *primary division*. As Steedman (1986) indeed showed, in a system of production prices, the alternative assumption of differentiation of the industrial rates of profit can sometimes lead to a situation where “industrial interest” can prevail on “class interest”, i.e. where the meaning of the division of surplus between capitalist and workers is blurred. The combination of different rates of profit and different rates of wage is therefore unacceptable in a Sraffian perspective since it would hide one of the main characteristics of the social features of the modern capitalist society which Sraffa wishes to describe. The choice of a uniform or general rate of profit is therefore an analytical necessity and it plays the role of a *social norm* for all the capitalist producers: if this rate was not obtained by some of them, they would not be able to continue to be true members of the capitalist group insofar as they will not be able to reiterate their annual cycles of production; in other words, they would disturb *social reproduction*. This is the real relation between *PCMC* and Ricardo’s economic theory: Sraffa did not keep from the classical tradition the competitive but the social justification of the uniformity of the rate of profit:

“Without a motive there could be no accumulation (...).The farmer and the manufacturer can no more live without profit than the labourer without wages. Their motive for accumulation will diminish with every diminution of profit, and will cease altogether when their profits are so low as not to afford them an adequate compensation for their trouble, and the risk which they must necessarily encounter in employing their capital productively”

(Ricardo, 1821/1973: 73)

In Ricardo as in Sraffa, the division of surplus between “capitalists and workers” implies the existence of two conflicting classes and the existence of these classes depend on their social motives, i.e., on the incomes they perceive as social classes. Obviously, these social motives are not subjective since

“The basic idea implicit in [the classical] theories may be described rather as that of an explanation of the real wage, in which institutional and customary elements play a central role, because they determine to a considerable extent the present bargaining position of the groups involved, while at the same time expressing the past bargaining position of those same groups”

(Garegnani, 1990: 118)

In *PCMC* therefore, the uniformity of the rates of profit *and* of the rates of wage may be interpreted as conditions which are logically necessary to build the representation of the fundamental conflict of a given society (the capitalist society) between social classes characterized by social motives and “institutional and customary elements”.

#### **4. Wittgenstein’s forms of life and language games**

If we abandon the interpretation of Sraffa's schemes in *PCMC* based on the notion of long run position, we should try to offer an alternative one. We will argue that the exchanges between Sraffa and Wittgenstein from 1929 to 1946 (Monk, 1991: 486-487) did not only influence the preparation of Wittgenstein's *Philosophical Investigations* but also exerted a long-term influence on Sraffa's *PCMC* allowing a maturation of his ideas and analysis about economy and society. This hypothesis cannot only be confirmed by written exchanges between both authors since they are too rare and insufficient to draw sound conclusions (see, for instance, the recent edition of *Wittgenstein in Cambridge* by Mac Guinness (McGuinness, 2008) and Kurz's review article (Kurz, 2009)). We therefore chose to build our interpretation on an analytical comparison between Sraffa's and Wittgenstein's writings: textual analogies do not always reveal who influenced whom but they show at least that exchanges between them influenced their respective contributions.

Our starting-point will consist to reconsider what Wittgenstein called "forms of life" and "language games" and can explain why he declared to Rush Rhees that the greatest gain from his conversations with Sraffa was an «anthropological way of confronting philosophical problems» (Monk, 1991, p. 260). According to the Wittgenstein's conception which replaced the one he defended in his *Tractatus*, language is indeed strictly related to the practice of social life: "Here the term 'language-game' is meant to bring into prominence the fact that the *speaking* of language is a part of an activity, or a form of life" (Wittgenstein, 1953/2009: 15). Now, a form of life is a social context in which a specific language game is used. This context is not arbitrary; it depends of the common activity (or of the set of common activities) considered, of agents' capabilities and of the techniques employed to pursue this activity or set of common activities. What are the main determinants of the implementation of these activities and these techniques? Undoubtedly, these determinants are the rules which prevail in a specific form of life. Grammar, usually taken to consist of the rules of correct syntactic and semantic *use*, becomes, in Wittgenstein's hands, the wider -- and more elusive -- network of rules which determine what linguistic move is allowed as making sense, and what isn't. « Rules » of grammar are not mere technical instructions for correct usage; rather, they express the norms for meaningful language and therefore consistent activity. Thus, social activities of the real world cannot be understood by a unique general language assumed to apply to any type of cultural and social processes. Quite the opposite, for Wittgenstein, the meaning of a sentence is entirely dependent on the normal set of behavior in which it has to be considered. Therefore, Wittgenstein also abandons the idea that there is *only one* type of causality which we could discover "by observation and experimentation". He interprets it as a grammar rule among others. He also criticizes the notion of "efficient causes" which he presented as a teleological device

based on individual motivations such as beliefs, intentions or desires, arguing that if agent motivations do exist, they do not necessarily produce and therefore explain their actions: motivations (even social) are not causes.

The observance of a rule originates, therefore, from an activity within the framework of a form of life. The concept of the rule for use in the latter Wittgenstein acquires a new methodological, operative statute, linked to human decisions and conduct and no longer committed to transmitting ideal representations as, for instance, optimizing behaviour based on a purely normative and formal conception of economic rationality. For Wittgenstein, then, following a rule is a normal practice:

“Following a rule is analogous to obeying an order. One is trained to do so, and one reacts to an order in a particular way.”

(Wittgenstein, 1953/2009: 88)

And:

“To follow a rule, to make a report, to give an order, to play a game of chess are *customs* (usages, institutions)”

(Wittgenstein, 1953/2009: 87)

The observance of a rule originates, therefore, from an activity within the framework of a form of life.

The distinction between forms of life is also important for our purpose. On one side, forms of life could present some analogies and Wittgenstein stressing these analogies was not willing to build a general typology of the forms of life or to point out the universal foundations of such a typology. He indeed thought that this task was impossible. For him, it was only possible to emphasise a “family resemblance” (see for instance, Wittgenstein, 1953/2009: 36) between *some* language games and to draw some conclusions from it, comparing the forms of life which they were related to. On the other side, he thought that it was at least possible to focus on the various rules corresponding to these forms of life. Now, these rules were related by Wittgenstein to “facts of nature” including some general regularities belonging to the world in which we are embedded, biological and anthropological habits allowing learning capabilities as well as reckoning methods; moreover, they were also related to “socio-historical facts related to peculiar groups or peculiar periods of time” but also to specific “interests and practical needs shaped by history” (Glock, 2003: 85; see also Wittgenstein, 1983: § 10; 114-117).

From this prospect, Wittgenstein’s purpose was to build a “philosophical grammar” explaining how rules and uses were related. This grammar was supposed to make distinct rules related to meaningful and meaningless uses and not to find abstract logical foundations to these rules. In

parallel, in a “note on language” dated “after 1927” (that is after he met Wittgenstein for the first time in his life), Sraffa interpreted, in his way, this conception of rules as follows:

“If the rules of language can be constructed only by observation, there can never be any nonsense said. This identifies the cause and the meaning of a word. The language of birds, as well as the language of metaphysicians can be interpreted consistently in this way. It is only a matter of finding the occasion on which they say a thing, just as one finds the occasion on which they sneeze. And if nonsense is “a mere noise” it certainly must happen, as sneeze, when there is cause: how can this be distinguished from its meaning?

We should give up the generalities and take particular cases, from which we started. Take conditional propositions: when are they nonsense, and when are they not?

“If I were the king” is nonsense, for either I, or the job, would have to be entirely different. I know exactly what the reasons are that make this unthinkable: and I see that the modifications required to make it thinkable would be so great, that I would not recognize myself so transformed, or nobody would say that the job, as adapted to my present self, is that of a king.

“If I were a lecturer” has sense. For I was last year, and I don’t think I have changed much since, nor has the job. The difference is small. Or rather I cannot see it: I don’t know exactly in what I have changed since last year. There is nothing repugnant to me in the idea.”

(Sraffa, UP: D 3/12/7 174)

For Sraffa as for Wittgenstein therefore, the rules of language should be meaningful, i.e., strongly depend on the social context in which they are used for a specific purpose in order to perform a given activity.

It is also interesting to note that in the volume of the *Philosophical Investigations* (paragraph 56, page 27) belonging to Sraffa’s personal Library, Sraffa especially stressed the following passage and within it its last sentence:

“...Or a rule is employed neither in the teaching nor in the game itself; nor it is set down in a list of rules. One learns the game by watching how others play. *But we say that it is played according to such-and-such rules because an observer can read these rules off from the practice of the game – like a natural law governing the play...* (sentence in italics stressed by Sraffa)”

(Wittgenstein, *Philosophical Investigations*’ edition present within Sraffa’s personal Library, Wren Library, Trinity College, Cambridge, U.K.)

Sraffa’s attention was therefore strongly attracted by the way Wittgenstein defined a rule, “like a natural law governing the play” and this parallel between rule following and obeying to a natural law provides one of the explanations of the interpretation of prices of production as “natural prices”. This remark is also reinforced by Wittgenstein’s characterization of the work of the philosopher trying to relate the different components of a form of life or a set of activities:

“The work of the philosopher consists in assembling reminders for a particular purpose.

A philosophical question is similar to one about the constitution of a particular society. – And it's as if a group of people came together without clearly written rules, but with a need for them; indeed also with an instinct that caused them to observe certain rules at their meetings; but this is made difficult by the fact that nothing has been clearly articulated about this, and no arrangement has been made which brings the rules out clearly. Thus they in fact view one of their own as president, but he doesn't sit at the head of the table and has no distinguishing marks, and that makes negotiations difficult. That is why we come along and create a clear order: we seat the president at a clearly identifiable spot, seat his secretary next to him at a little table of his own, and set the other full members in two rows on both sides of the table, etc., etc."

(Wittgenstein, 2013: 306)

Introducing the concepts of form of life, activity and language game, Wittgenstein however went further and stressed the interest of defining the notion of *Übersichtliche Darstellung* (translated in English by *surveyable representation* and in French by *tableau synoptique*). Wittgenstein's criticism and rejection of usual forms of causality led him to define with this concept a new type of representation able to point out the mutual relations of data corresponding to the synthesis or the synopsis of the grammatical rules of a form of life, without formulating any assumption on their time evolution. Rejecting the usual type of causal explanation and referring even critically to Darwin's as well as Freud's approaches, Wittgenstein renounced to *explain* reality as he tried to do it in the *Tractatus* but substituted to it its alternative *comprehensive description*. Surveyable representations therefore sum up the « physiognomy » (to use Wittgenstein's own words) of forms of life. If this representation can be expressed in ordinary language, it does not exclude however the use of mathematics interpreted as a specific language game and not as *the* ideal language:

"The concept of a surveyable representation is of fundamental significance for us. It designates the form of account we give, the way we see things. (a kind of '*Weltanschauung*', as is apparently typical of our time. Spengler.)

This surveyable representation produces just that understanding which consists in 'seeing connections'. Hence the importance of finding intermediate cases"

(Wittgenstein, 2013: § 89, 417 and 1953/2009: § 122)

The concept of surveyable representation does not imply "the construction of a system of all the systems or a kind of catalogue of all the anthropological possibilities, among which in some way men would have chosen their forms of life", as Bouveresse pointed out referring to Wittgenstein's specific use of this concept in the context of his *Remarks on "The Golden Bough"* related to Frazer's anthropology (Bouveresse, 2000: 182). This remark confirms the choice to substitute a surveyable description to a causal explanation.

The origin of this notion of surveyable representation is to be found in Goethe as well as in Spengler who both developed "a kind of generalized physiognomy approach of phenomena" (Bouveresse, 2000: 227). This kind of approach implies the use of a comparative approach and the investigation of

analogies between different forms of life (ibid: 228-229). Thus, in his comments on Frazer, Wittgenstein noted that causality based on historical or evolutionary types of explanation is only a way to collect data related to a specific field and to insert them into a temporal succession. Now, a surveyable representation is *also* a way of collecting data but also of connecting them through mutual relations without the use of time (Wittgenstein, 1987). These data allow to characterize what, for instance, Wittgenstein called a “game” in his *Philosophical Investigations* (Wittgenstein, 1953/2009: §§ 66 and 67). However, as Child recently noted,

“In Wittgenstein’s view, (...), there is no such thing as the essence of a game: no property or set of properties that is common to all and only the things that count as games. It follows that the meaning of the word ‘game’ cannot be analysed or explained by giving a set of conditions that are necessary and sufficient for something’s being a game; for there are no such conditions. The word ‘game’, we might say, expresses a ‘family-resemblance concept’. How, then, *do* we explain the meaning of the word? Simply by giving examples of games of different kinds and saying, ‘This and similar things are called ‘games’ (see *Philosophical Investigations* § 69)”.

(Child, 2011: 85)

Wittgenstein used the notion of surveyable representation in various fields: philosophy, anthropology or psychology, for instance. It allowed him first to replace the notion of causal explanation which he characterized in the *Tractatus*, by the use of a specific language game corresponding to a specific activity or set of activities. This possibility means that, for Wittgenstein, there is never a general and unique explanation of reality based on the usual concept of causality but a number of language games, each of them being consistent with a specific form of life. The notion of surveyable representation also allows to stress the necessity of a *morphological* analysis of a given phenomenon or set of phenomena, in relation to both the concept of “physiognomy” and the role attributed to mutual relations in this context. This is why Wittgenstein related the notion of surveyable representation to the concept of “family resemblance” (see, for instance, Pastorini, 2011: 146-147) quoted in Child’s above quotation: this form of representation *should* take into account differences and similarities between concepts or language games the comparison of which reveals a resemblance of this type.

We will come back to all the remarks of this section later taking now Sraffa’s economic analysis into account.

## **5. Forms of life and snapshots**

In order to grasp the mutual influence Sraffa and Wittgenstein had on each other in analytical as well as methodological fields, it is now necessary to introduce a third possible interpretation of Sraffa's main contribution to economics in *Production of Commodities by means of Commodities*. The starting-point of this interpretation – already developed in Blankenburg, Arena and Wilkinson, 2012 – is the assertion developed by Sraffa according to which “the study of the ‘surplus product’ is the true object of economics” (Sraffa, UP, D3/12/7: 161, 1928). In other words, the system of production prices which is investigated in *PCMC* and where capitalist producers *and* workers share a *variable* part of the surplus is only *an* illustration, *an* example of “society” (this is the word which Sraffa used at the beginning of *PCMC*) and not the “true object of economics”; this also means that price theory as such is not for Sraffa the main purpose of economics. This is confirmed by the fact that *two* other “societies” are also characterized in *PCMC*. The first is the no-surplus society described at the beginning of the book in which producers and workers are the same agents and form only one unique social class; this society shows a family resemblance with the simple merchant society described by Adam Smith in the *Wealth of Nations*. The second society described in *PCMC* has a positive “surplus product” which is however entirely appropriated by capitalist producers. Wage-earners are distinct from these producers but their wages are fixed by social norms and therefore they cannot share any part of the surplus; they receive a subsistence wage. The rules of income distribution are therefore distinct in the three different societies characterized in *PCMC*.

*Other societies associated to other rules* can and should be considered if we want to build a more general morphological and comparative economic approach of societies.

This is why in *Il Capitale nelle Teorie della Distribuzione* (Garegnani, 1960/1972), without having still be able to read *PCMC* (the book was written *before* 1960), Garegnani opened his book, noting that “in the classical theories of distribution, the central problem is the determination of the circumstances which rule the size of the social surplus” (Garegnani, op.cit.: 3) and *not* price theory as such. In 1985, Garegnani pointed out the notion of “‘core’ in the surplus theories” (Garegnani, 1981: 9) and made distinct its components, i.e., the “net product”, the “necessary consumption” and the “part of the social product which differs from wages” (Garegnani, 1981: 10). He represented the general relations between these magnitudes through a diagram called the “scheme of the ‘core’ of the surplus theories” (Garegnani, 1981: 14, figure 1), contrasting for example, with the same picture or “representation”, two different cases of societies: the first where wage-earners do not participate to the surplus distribution (*ibid*) and the second where “wages are part of the surplus” (Garegnani, 1981: 51, figure 4). Garegnani’s “core” was not therefore exclusively devoted to study modern capitalism but also other surplus-based societies.

The same perspective was adopted by Cartelier when he defined the family of the “classical systems” as those which “on the basis of the existence of a physical surplus product, try to determine the particular price system corresponding to a given rule of distribution of the price of the net product, under the constraint of the reproduction of a specified economy” (Cartelier, 1976: 19). He then showed that Boisguilbert, Quesnay, Turgot, Smith or Ricardo described different societies which could be characterized by distinct “classical systems” and therefore distinct rules of income distribution. Each of these rules defined a specific classical system, all systems having in common a family resemblance, i.e., the necessity of coping with what Ricardo called the “difficulty of production” in his *Principles* (see for instance, Ricardo, 1821/1973: chapter 2) .

This reference to various social systems helps to understand why these classical systems were presented as “snapshots” or “instantaneous photographs” by Sraffa. They indeed correspond to timeless or unitary representations of an “annual year of reproduction” and to use the case of the societies described in *PCMC* to an “annual cycle of production and annual market” (Sraffa, 1960: 3 and 10). Now, this reference to one year explains why from an accountant’s viewpoint, prices belonging to the same ‘year’ are uniform; it also includes another essential feature of these societies: *the social division of labour* which implies that market takes place after the production of the various distinct industries :

“This notion of time is important: it really substitutes “instantaneous photographs” as opposed to ordinary time. It is only a part of ordinary time, it has only some of its connotations: it includes events, also different events, but not change of events. It enables us to compare two simultaneous but not instantaneous, events – just as if they were “things”.

(Sraffa, D3/12 13: 1(3))

This point of view is therefore reinforcing the idea that Sraffa’s project was not the construction of a price theory as such, especially in a given society but was to transform the ‘prelude to the critique of economic theory’ into a more general theory of the “study of the ‘surplus product’” in different surplus-based societies presenting a family resemblance but requiring different language games, to use Wittgenstein’s terms.

Sraffa’s concept of snapshot is related to his criticism of the usual type of causality as Wittgenstein’s notion of surveyable representation:

“Cause required only when there is a deviation from what is normal, or uniform, or constant. That is to say, it is required only to explain change or difference. The habitual, normal or ‘natural’ course of events does not require explanations; rather, it serves to explain ‘why’ individuals behave in the way they behave – ‘everybody does it’.”

(Sraffa, D1/9 4)

In Wittgenstein's terms, this quotation stresses the fact that "normal" behaviour related to a given form of life "does not require explanations" and therefore causal relations, but only a clear and rigorous description of the *reasons* which allow to understand "why individuals behave in the way they behave" or why "everybody does it". In his "Note on Language" quoted above, Sraffa noted :

"We should give up the generalities and take particular cases, from which we started. Take conditional propositions: when are they nonsense, and when are they not?"

(Sraffa D3/12/7 174)

He therefore referred to the same methodology Wittgenstein pointed out: starting from real "forms of life" and not from axioms or very general behavioural assumptions. We can thus understand why Sraffa considered that the assumption "If I were a king" is nonsense, while the assumption "If I was a lecturer" has sense. In the first case,

" I know exactly what the reasons are that make this unthinkable: and I see that the modifications required to make it thinkable would be so great, that I would not recognize myself so transformed, or nobody would say that the job, as adapted to my present self, is that of a king."

(ibid)

while, in the second case,

"I was last year, and I don't think I have changed much since, nor has the job. The difference is small. Or rather I cannot see it: I don't know exactly in what I have changed since last year. There is nothing repugnant to me in the idea."

(ibid)

For Sraffa, it was therefore "normal" to expect a job of lecturer and therefore, no causal form of causality had to be required in this case, while it was absurd to expect to become a king. Thus, the explanation of the occurrence of this last possibility would require a very specific but improbable causal relation.

The notion of snapshot offers other characteristics which are similar to those associated to the concept of surveyable representation. First, for Sraffa as well as Wittgenstein, both these concepts result from a general criticism of the various notions of causality and especially of the notion of mechanical causality (concerning Wittgenstein, see Chauviré, 2004 and concerning Sraffa, see Blankenburg, 2006; Sinha, 2007; Arena and Blankenburg 2013 and Blankenburg, Arena and Wilkinson, 2012). Secondly, both concepts show that, if agent motivations – especially subjective – do exist, they do not necessarily produce and therefore explain their actions: on one side, for both our authors, motivations are not causes; on the other side, as we know, Sraffa always criticized subjective behavioral "microfoundations" (see for instance, Marcuzzo and Rosselli, 2011). Thirdly, surveyable representations as well as snapshots describe a group of "forms of life" or "societies"

pointing out their family resemblance. For instance, “classical systems” or “classical snapshots” offer a basic economic representation of the “cores” of various distinct but resembling societies corresponding to different rules of surplus distribution in accordance with the economic organization of society and its constitutive social classes or groups: they point out the respective *morphologies* of these societies mixing mutual *industrial* (according to the notion of division of labour and the inter-industrial organization of a production system) and *social* (according to the division of society in social classes) relations.

This analytical proximity between Sraffa and Wittgenstein is also confirmed by a letter from Wittgenstein to Sraffa and two Notes from and by Sraffa dated January and February 1934 recently edited (in McGuinness, ed., 2008: 223-228). These notes show how both authors tried to characterize the “physiognomy” of a people, like “the Austrians” or “the Germans” and its possible changes as the physiognomy of a human face. They first confirm the criticisms raised by Wittgenstein against the notion of “disposition” and the misleading role attributed to it in the explanation of human actions (Chauviré, 2004). Referring to changes in people’s taste and dressing fashion, Wittgenstein noted:

“...The fallacy which I want to point out is this – to think every action which people do is *preceded* by a particular state of mind which the action is the outcome. So they will not be contented to say that the tailors draw one model this year and a slightly different one next year and that this has all sorts of reasons, but they will say that there was a state of mind, the taste, the liking which changed; and regard the act of designing the model as a secondary thing (the state of mind being the primary one). As though the changed taste did not amongst other things consists in designing what they did design. The fallacy could be described by saying that one presupposes a mental reservoir in which the real causes of our actions are kept.”

(Wittgenstein in Mac Guinness, ed., 1934/ 2008: 225)

Clearly, Wittgenstein is discussing how it could be possible to represent the “physiognomy” of a people’s tastes and its changes, namely to build a surveyable representation of these tastes. Answering to Wittgenstein, Sraffa comes back to his own critique of subjective dispositions and notes:

“The fallacy is to suppose that phys. [*physiognomy – RA*] is the reservoir of primary changes. (...) I think that the reservoir must contain definite concrete things, preferably measurable or ascertainable with some certainty, independently of my likes and dislikes. (...) I want a reservoir of things the changes of which will be visible first, or more accurately, or certainly or more easily and (above all) such that I may be able to ascertain as more dispassionately (indep. as far as possible from my wishes, prejudices, sympathies, habits, etc.); things of the sort of the quantity of coal produced in Germany (if it is relevant), not of the spirit of the German people”

(Sraffa in McGuinness, ed., 1934/ 2008: 227)

This brief exchange between Sraffa and Wittgenstein is especially interesting for our purpose. First, it confirms the common interest of both authors for a morphological analysis expressed by their discussion on the concept of “physiognomy”. Secondly, it also shows how both authors purposes differed besides this common interest coming from their shared hostility against causal explanations. On the one hand, Wittgenstein is criticizing the notion of mental disposition which he will replace by the notion of capacity or capability in the *Philosophical Investigations*, including the second in his surveyable representations. On the other hand, Sraffa is criticizing subjective foundations of behavior and argues in favour of objective magnitudes which can be observed and measured and that he will refer to in his *PCMC*.

Other interesting differences could be stressed concerning the views both authors had on mathematics and their possible use (see Kurz and Salvadori, 2001, 2003 and 2007 for Sraffa; and Bouveresse, 1973 and 2003 for Wittgenstein) and this preoccupation played a central role in Sraffa’s process of elaboration of *PCMC*. Taking them into account would however only reinforce the thesis of a crossed influence of Sraffa and Wittgenstein and allow to broaden our third interpretation of Sraffa’s contribution to economics.

## **6. Concluding remarks**

This contribution is only a first step. First, it will be necessary to investigate more thoroughly the similarities but also the differences between Sraffa’s and Wittgenstein’s methodological contributions. For instance, the problem of causality has to be studied systematically in their contributions to assess their degree of convergence concerning the critique they both addressed to the usual forms of this notion. Secondly, some specific important problems are present in both authors contributions, as for instance the problem of the individual degree of freedom in the context of a given activity or form of life: for instance, in the *Big Typescript* and in a paragraph called “(Sraffa)” (Wittgenstein, 2013: 190-191), Wittgenstein investigated how much individuals are committed to an inter-individual contract and his questions are very close to Sraffa’s ones when he tried to make distinct social and technical “necessary” constraints (see Blankenburg, Arena and Wilkinson, 2012). Finally, Sraffa’s and Wittgenstein’s crossed influences are also present in the works of some modern economists and philosophers, as Jacques Bouveresse or John Searle, for instance. A more thorough interpretation of these influences and of the understanding of Sraffa’s contribution we proposed is therefore a necessary and hopefully a fruitful task.

## BIBLIOGRAPHY

Abraham-Frois G. and Berrebi E., 1976: *Théorie de la valeur des prix et de l'accumulation*, Economica, Paris.

Abraham-Frois G. and Berrebi E., 1979: *Theory of value, prices and accumulation, a mathematical integration of Marx*, Von Neumann and Sraffa, Cambridge University Press, Cambridge.

Arena R., 1990: « Introduction » of Arena R. and Ravix J.L., *Sraffa 30 ans après*, Presses Universitaires de France, Paris.

Arena R., 1990 b : « La dynamique économique classique : une revue de littérature », *Revue d'Economie Politique*, vol. 100, n° 4.

Arena R. and Blankenburg S., 2013: "Sraffa, Keynes and Post-Keynesians: Suggestions for a synthesis in the making", in G. Harcourt (ed.): *The Oxford Handbook of Post-Keynesian Economics, Volume 1*, Oxford University Press, Oxford. [forthcoming].

Arena R., Froeschlé C. and Torre D., 1988: "Formation des prix et équilibre classique : un examen préliminaire », *Revue d'Economie Politique*, vol. 39, n° 6.

Arena R., Froeschlé C. and Torre D., 1990: "Gravitation theory: two illustrative models", *Political Economy : Studies in the Surplus approach*, vol. 6, n° 1-2.

Bellino E., 1997: "Full-cost pricing in the classical competitive process: A model of convergence to long-run equilibrium", *Journal of Economics*, vol. 65, issue 1.

Blankenburg S., 2006: "A methodological interlude: Sraffa's early critique of Marshall and of marginalism", chapter 2 of *PHD*, Cambridge University, Cambridge.

Blankenburg S., Arena R. and Wilkinson F., 2012: "Piero Sraffa and the 'true object of economics': the role of unpublished manuscripts", *Cambridge Journal of Economics*, vol. 36, n° 6, November.

Boggio L., 1990: "The dynamic stability of production prices: a synthetic discussion of models and results" *Political Economy : Studies in the Surplus approach*, vol. 6, n° 1-2.

Bouveresse, 1973 : *Wittgenstein : la rime et la raison, science, éthique et esthétique*, Editions de Minuit, Paris.

Bouveresse J., 2000: *Essais I. Wittgenstein, la modernité, le progrès et le déclin*, Agone, Paris.

Bouveresse J., 2003 : *Essais III : Wittgenstein ou les sortilèges du langage*, Agone, Paris.

Caminati M., 1990: « Gravitation: an introduction », *Political Economy: Studies in the Surplus approach*, vol. 6, n° 1-2.

Cartelier J., 1976: *Surproduit et reproduction. La formation de l'économie politique classique*, Presses Universitaires de Grenoble, Grenoble.

Chauviré C., 2004: *Le moment anthropologique de Wittgenstein*, Kimé, Paris.

- Child W., 2011: *Wittgenstein*, Routledge Philosophers, Routledge, Abingdon, Oxon.
- Debreu G., 1974: « Excess demand functions », *Journal of Mathematical Economics*, vol. 1.
- Dupertuis M. and Sinha A., 2009: “A Sraffian critique of the classical notion of centre of gravity”, *Cambridge Journal of Economics*, vol. 33, n° 6.
- Garegnani P., 1960/1972: *Il capitale nelle teoria della distribuzione*, Giuffr , Milan, reprint of the original 1960 edition.
- Garegnani P., 1981 : « Valore e distribuzione in Marx e negli economisti classici » in Garegnani P., Eatwell J. and alii : *Valore e prezzi nella teoria di Marx*, Einaudi, Turin.
- Garegnani P., 1990: “Sraffa’s Production of Commodities: classical versus marginalist analysis” in Bharadwaj K. and Schefold B. (eds), *Essays on Piero Sraffa*, Unwin and Hyman, London.
- Glock H.-J., 2003: *Dictionnaire Wittgenstein*, Gallimard, NRF, Paris.
- Hahn F., 1975: “Revival of political economy: the wrong issues and the wrong arguments”, *Economic Record*, vol. 51.
- Hahn F. 1982: “The neo-Ricardians”, *Cambridge Journal of Economics*, vol. 6, n° 4.
- Hicks J., 1985: “Sraffa and Ricardo: a critical view” in Caravale C. (ed.): *The legacy of Ricardo*, Basil Blackwell, Oxford.
- Kurz H., 2009: “Review article ‘If some people looked like elephants and others like cats or fish...On the difficulties of understanding each other: the case of Wittgenstein and Sraffa”, *European Journal of History of Economic Thought*, vol. 16, n°2, june.
- Kurz H. and Salvadori N., 2001: “Sraffa and the mathematicians: Frank Ramsey and Alister Watson” in Cozzi T. and Marchionatti R. (eds.): *Piero Sraffa’s political economy: a centenary estimate*, Routledge, London.
- Kurz H. and Salvadori N., 2003: “Sraffa and the mathematicians: Frank Ramsey and Alister Watson” in Kurz H. and Salvadori N. (eds): *Classical economics and modern theory – studies in long period analysis*, Routledge, London.
- Kurz H. and Salvadori N., 2007: “On the collaboration between Sraffa and Besicovitch: the cases of fixed capital and non-basics in joint production” in Kurz and Salvadori, eds.: *Interpreting classical economics- Studies in long period analysis*, Routledge, London.
- Kurz H. and Salvadori N., 1997: *Theory of production: a long period analysis*, Cambridge University Press, Cambridge.
- Kurz H. and Salvadori N., 2005: “Representing the production and circulation of commodities in material terms: on Sraffa’s objectivism”, *Review of Political Economy*, vol. 17, n°3
- McGuinness B. (ed.), 2008: *Wittgenstein in Cambridge: Letters and Documents 1911-1951*, Blackwell, Oxford.

- Mantel R., 1974: « On the characterization of aggregate excess demand », *Journal of Economic Theory*, vol. 7.
- Marcuzzo C. and Rosselli A., 2011: "Sraffa and his arguments against 'marginism'", *Cambridge Journal of Economics*, vol. 35, n°1.
- Monk R., 1991: *Ludwig Wittgenstein, the duty of genius*, Penguin Books, New York.
- Napoleoni C., 1965: *L'equilibrio economico generale: studio introduttivo*, Boringhieri, Milan.
- Pastorini C., 2011: *Ludwig Wittgenstein, une introduction*, Pocket, Univers Poche, Paris.
- Ricardo D., 1821/1973: *The principles of political economy and taxation*, Everyman's library, London and Rutland, Vermont.
- Semmler W., 1984: *Competition, monopoly and differential profit rates*, Columbia University Press, New York.
- Sinha A. 2002: *Reading Sraffa: The Philosophical Underpinnings of Production of Commodities by Means of Commodities*, Gokhale Institute of Politics and Economics.
- Sinha, 2007: *A Reinterpretation of Sraffa's Production of Commodities*, Indira Gandhi Institute of Development Research (IGIDR), Mumbai.
- Sinha, A. 2010: *Theories of value from Adam Smith to Piero Sraffa*, Routledge, London.
- Sonnenschein H., 1972: « Market excess demand functions », *Econometrica*, vol. 40.
- Sonnenschein H., 1973: « Do Walras' identity and continuity characterize the class of community excess demand functions? », *Journal of Economic Theory*, vol. 6.
- Sraffa P., 1960: *Production of commodities by means of commodities*, Cambridge University Press, Cambridge.
- Sraffa P., UP: *Unpublished Papers* –Wren Library, Trinity College, Cambridge.
- Steedman I., 1984: "Natural prices, differential profit rates and the classical competitive process", *Manchester School*, vol. 52, n° 2.
- Steedman I., 1986: "Trade interest versus class interest", *Economia Politica*, vol. 2.
- Steedman I., 1990: "Questions and suggestions re-gravitation", *Political Economy: Studies in the Surplus approach*, vol. 6, n° 1-2.
- Walsh V. and Gram H., 1980: *Classical and neoclassical theories of general equilibrium: historical origins and mathematical structure*, Oxford University Press, Oxford.
- Wittgenstein L., 1953/2009: *Philosophical Investigations*, German Text, with an English translation by Anscombe G.E.M., Hacker P.M.S. and Schulte J., revised 4<sup>th</sup> edition by Hacker J. and Schulte J., Wiley-Blackwell.

Wittgenstein L., 1983: *Remarques sur les fondements des mathématiques (1937-1944)*, Gallimard, Paris.

Wittgenstein L., 1987: *Remarks on Frazer's Golden Bough*, Brynmill Press Ltd.

Wittgenstein L., 2013: *The Big Typescript – TS 213*, German-English Scholar's edition, edited by Grant Luckhardt C. and Maximilian A. E. , Wiley-Blackwell.

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