

# Piero Sraffa's Non-Economics: An Introduction

Graham Joncas

## Introduction

In its break from political economy, economics as a discipline was able to make use of the most sophisticated mathematical techniques of its time. However, in adopting this form (doubtless to achieve the status of a science), it has come under fire for its tactic of applying an effectively closed system of mathematical relations to a set of market phenomena which, as contemporary microeconomists show, is growing ever more comprehensive. This in itself would not be a problem if this did not run the risk of distorting its objects: economics is lambasted for many of its heuristic presuppositions (and ‘metaphysical’ concepts such as utility) which appear blatantly untrue in practice, but nonetheless work well in making sense of empirical data. Milton Friedman famously declared that as long as a methodology works, it does not matter whether its presuppositions are correct, but to those who remain unsatisfied by this claim, the question arises of *why* the theorems of economics, despite their deficiencies, work as well as they do—whether it may be possible, by means of a new perspective, to gain an almost meta-economic view by way of starting from the phenomena themselves and only from there building a theoretical edifice.

The first steps toward an answer may be found in the economic theories of a man who not only convinced Ludwig Wittgenstein to change the views put forth in his *Tractatus Logico-Philosophicus* but who also provided the pens and paper (not to mention much of the reading material) with which Antonio Gramsci wrote his *Prison Notebooks*—namely, an economic methodology which does not require marginalist concepts of supply, demand, equilibrium, or capital. The initial part of this essay aims to outline in brief the life and work of Piero Sraffa (1898-1983), to unravel some of the theoretical implications of his work for the research programme of marginalist economics, and to portray in a new manner the import of his research programme: as a Non-Economics.

## 1 Sraffa

“Mr. Piero Sraffa, from whom nothing is hid...”

~Keynes (1963: 115)

Sraffa was born in Turin in 1898, his father an influential Professor of commercial law and his mother a highly cultured woman from a distinguished family. He was given a liberal education, being taught French, English, and German by his mother, in addition to his first language of Italian. He was characterized, in a polemical paper by his friend Gramsci, as having a “democratic-liberal

intellectual background, that is to say, normative and Kantian, non-Marxist and non-dialectical” (Potier, 3-4), though this account cannot be accepted without reservations; the intellectual milieu of his day was “dominated by ‘neo-idealism’ or neo-Hegelianism, represented by the thinking of Benedetto Croce (1866-1952) and Giovanni Gentile (1875-1944)” (ibid., 3). He went on to study Law at Turin University, near the latter portion in his studies (1919) striking a friendship with Antonio Gramsci, who studied linguistics at the same university, which would continue until the latter’s death (ibid., 5). Shortly after this meeting, Sraffa joined the editorial team of the journal *L’Ordine Nuovo* and had friendly relations with the main journalists.

During the same period, Sraffa worked on his doctoral thesis on inflation in Italy since the first World War, a text which “reveals a profound knowledge of the literature on monetary and banking problems; not only the Italian...but also the English and American...and Swedish literature” (ibid., 6). The research for Sraffa’s thesis eventually led to a polemic against the banking practices of his time, then under the fascist policies of Mussolini. This rather “salty” essay (as described by the Italian committee which later awarded Sraffa the status of professor) enraged Mussolini, who demanded a retraction, which was not given because, Sraffa told his father, the paper was based on verifiable facts. Sraffa is also known to have debated via an exchange of letters with Gramsci at that time in matters of politics, one exchange being published in *L’Ordine Nuovo*. Sraffa’s trenchant criticism was not only directed at the fascist government of his day, however, but also at the methodological orthodoxy beginning to pervade economics departments throughout Italian universities; this culminated in an essay entitled “On The Relation Between Cost and Quantity Produced,” revealing several flaws in the work of Alfred Marshall, at that time the paragon of mainstream economics.

Jean-Pierre Potier (1991: 13-14) provides a summary of this essay (which was to earn Sraffa a full professorship at the University of Cagliari in Sardinia) that is fairly lucid even to the layperson in economics:

Between 1924 and spring 1925, Sraffa worked on a major essay that attacked the foundations of the orthodox analysis of the great English neo-classical theorist, Alfred Marshall.... Sraffa examined the law of non-proportional returns in Marshall’s model of static partial equilibrium, which established a symmetry between relations of demand and supply as regards the value of commodities. Previously, classical economists had given prominence to two separate laws of returns. The law of *increasing* returns was created by Adam Smith and associated with the process of the division of labour in industry—a problem of dynamics, in the category of ‘production’. The law of *diminishing* returns, on the contrary, set forth by Turgot, then by David Ricardo in connection with the problem of agricultural rent, is also a problem of dynamics, but in the category of ‘distribution’. Marshall tried to combine these two orientations in a single law of non-proportional returns, to set up his theory of prices. This law can be represented by a U-shaped curve, connecting average

cost and output. The situation of a firm is studied, independently of that of other firms, in a framework of free competition. In this model, the normal case is that of diminishing returns (or increasing costs).

Sraffa foregrounded how Marshall's explanation concerning the exceptional existence of increasing returns (diminishing costs) evolved '*internal* economies' followed by '*external* economies' of the firm. He nevertheless developed his attack to focus criticism on the problem of diminishing returns. In Marshall's theory, the supply curve of a firm is independent of the supply curve of other firms and moving from the firm to the industry, the aggregate means a simple transposition. According to Sraffa, this analysis is unacceptable, because it does not take the interdependences into account: the conditions of production of a firm necessarily have an effect on those of its competitors. After having shown the incompatibility between the case of diminishing returns and the conditions of particular equilibrium, Sraffa concludes by considering, for the particular industry, 'the case of constant costs as being normal, rather than that of increasing or diminishing costs', in keeping with the opinion of Ricardo. This situation is, to his mind, the only one compatible with the equilibrium of free competition, or at least a 'first approximation of reality'.

Sraffa was later invited by Keynes to write a summary of this essay in the *Economic Journal*—a prestigious opportunity granted due to the quality of an English version of his paper on the Italian banking crisis published several years before—which he entitled "The Law of Returns Under Competitive Conditions." It is worth noting that Arthur Pigou was willing to reconsider his whole position in the light of this paper (Potier, 1991: 17). In addition to his summary, Sraffa attempts in his paper to "reformulate and rehabilitate" the concept of 'surplus'—first developed by William Petty in the 17th century—and the notion of the economy as a circular process, first introduced by the physiocrat François Quesnay in the 18th century (Roncaglia, 2000: 31-2).

## 2 Gramsci

*"You used to rebuke Piero constantly for his excessive scientific scruples that prevented him from writing anything; it seems that he has never cured himself of this illness, but is it possible that ten years of journalism have not cured you?"*  
~Tania Schucht, in a letter to Gramsci, August 28, 1931<sup>1</sup>

Back in Italy, however, in November of 1926, Gramsci was imprisoned, which would last until his death in 1937. Due to his above-mentioned polemic against Italian banking practices, Sraffa feared that the same would be done to him, so Keynes arranged for Sraffa's emigration to Cambridge; save for several trips abroad, Sraffa lived in Britain for the rest of his life. Nevertheless, for the ensuing 11 years, Sraffa offered financial and moral support, opening up an unlimited account for Gramsci at the bookstore in Milan, since Gramsci was allowed by

his captors to read and write (Potier, 1991: 24), as well as supplying the pens and paper on which Gramsci wrote his notebooks.

Sraffa was one of the few persons who maintained contact with Gramsci (Bharadwaj, 1984: 1237), and eventually in 1974 Sraffa donated his collection of letters and other documents related to Gramsci's imprisonment (until then safely hidden in Cambridge) to the Gramsci Foundation (Potier, 1991: 38). It was only due to Sraffa's constant efforts—as well as those of Tatiana Schucht, who physically recovered the *Prison Notebooks*—that Gramsci's work is available to us today.

Gramsci's major contribution to intellectual history, drawing heavily from the Marxist tradition, was to build upon the concept of ideology. In order to understand the implications of Gramsci's work, however, it must be contrasted with that of Marx. Ideology can perhaps most cogently be defined as the set of premises upon which members of a given society base their reasoning. As premises, ideology by definition goes unnoticed until new premises become available; as well, since a premise is an unquestioned, pre-logical axiom, it can also be the case that some of the premises constituting an ideology are false or misleading, which can lead to views which will later (under a different ideology) be considered irrational. Though it is obvious that there can be many diverse and conflicting worldviews shared among members of a society, Marx and Engels had drawn attention to how, overwhelmingly, these tend to share fundamental similarities—whether in the form of positive assumptions, or a simple avoidance of specific important issues (for example, the abject poverty in the English working class in the early 1800s, as investigated by Engels).

Marx and Engels said that *in the last instance*, the behaviour of agents is determined by economic relations of production: in other words, the structure of the economic sphere, which has been built according to the interests of the ruling capitalist class. This theory is easy to misrepresent, and is often degraded as 'vulgar' by cultural theorists, but it is easier to do it justice when we think of it in terms of structure versus agency, with the help of an economic illustration.

Just as the average consumer is unable to influence the price of a certain good by themselves no matter how much or how little they buy, the economic sphere must also be taken as given for the average person. In the example of a good's price, if there is a competitive industry for that good (i.e. numerous firms are competing against one another, and new firms can arise at any time) the price of a good is determined by each firm according to their costs of production; in a monopoly, however, price is chosen according to which price will maximize profits, keeping in mind the decreasing demand as the price goes up. Since the economic sphere is determined largely by capitalist elites, Marx thought, these elites are effectively placed in the position of oligopolists (monopoly with several colluding firms) and can structure the economy according to their interests. Agents (normal people) are thus forced to act within these structures, and since there is no Archimedean point outside of this structure where agents can make their decisions, their actions, habits, and thoughts are determined within the boundaries set by the elite, and thus contribute to supporting the elite's interests.

This is not to say that Marxism eliminates agency—that is, the capacity of agents to make spontaneous decisions—entirely, but rather that agents’ capacity for spontaneity is curtailed within the limits set by capitalism. The reason that Marx and Engels said that the economic sphere and no other possesses determination-in-the-last-instance is because no other sphere (cultural, scientific) then possessed the monopolistic structure that capitalism did: folk culture was commonly integrated into art to create a ‘nationalist’ tone, and scientists from working class origins such as Michael Faraday were able to penetrate into the upper echelons of science by offering perspectives that no one else had considered. Even in more contemporary times, where the cultural and scientific spheres seem significantly more exclusive, they still remain meritocratic enough to accept even revolutionary contributions from outside academia; Einstein, to take the most iconic example, was, after all, a patent clerk at the time he developed special relativity. In short, Marx and Engels *did not* endorse a crude economic determinism, but rather stated that any given action can ultimately be traced back to its place within the structure of incentives provided by the economic sphere.

Thus the economic structure of a society serves as its ‘base’, on which is erected a ‘superstructure’ (culture, politics, religion) intended to maintain it. In order to bring lasting change to the superstructure, Marx reasoned, it is necessary to change the base—to provide a new economic structure to society, namely, communism.

What Gramsci added to the notion of ideology/superstructure was what he called ‘hegemony’, which has been described as “the very fulcrum of his thought” (Lawner, 1989: 42). This concept extended the idea of the coercive power of ideology, stating that when one class becomes dominant in its society, its interests will become tacitly transmitted into the other classes by means of a new ideology, to the point where the lower classes of a society will willingly go against their own interests in order to serve the interest of the dominant class. The period during which a particular class remains dominant over a society is called by Gramsci an ‘historical bloc’, and it is crucial to note that the whole hegemonic process takes place on an entirely tacit level, to both dominant and dominated classes. Gramsci had seen this process vividly illustrated in the rise of Italian Fascism, as intellectuals and workers alike joined Mussolini in nationalist fervor, and any sort of political opposition was gradually being dissolved. Gramsci was at that time in the vanguard of the Communist Party, regularly writing incisive journal articles about the political situation in Italy.

This can also be illustrated in terms of the development of capitalism. Following the industrial revolution, wages had improved to the point where the working class could afford to purchase luxuries; likewise, with decreasing capital costs, entrepreneurs were able to start businesses for the purpose of satisfying the growing consumer demand. Rather than production processes being imposed by the masses from above, producers were now forced to take into account consumer preferences. The era when Henry Ford could say that “Any customer can have a

car painted any color that he wants so long as it is black” was fast approaching its end.

The implications of Gramsci’s concept of hegemony are profound: it dispenses with the idea of the economy being a static structure of incentives which agents are forced to work within: according to the theory of hegemony *even if agents are still tacitly serving the interests of the ruling class, there is still room for spontaneous creation of new incentives not part of the old model*. That is to say, agents are able to create new portions of society’s structure, even if these fully fit in with the logic of capitalist exploitation. Thus the categories of structure and agency cannot always be sharply demarcated from one another in Gramsci’s work. In other words, not everything can be traced to a point of origin in the economic sphere—even though everything necessarily has a place within that sphere—because portions of that sphere have their origin in the spontaneous actions of agents.

This is all very abstract, but this admixture of agency into structure is exactly how Sraffa’s later work differs from both orthodox Marxism and marginalist (orthodox) economics. Just as Marxism states that the economic relations of production possess determination-in-the-last-instance over the actions of agents, marginalist economics states that in the last instance, agents will do whatever action they perceive will maximize their utility. In other words: economics—Marxist and marginalist alike—privileges structure over agency by reducing human actors either to one-dimensional pragmatists or to utility-maximizers, respectively. It is reasonable, then, to surmise that Gramsci played a key part in encouraging Sraffa to eschew deterministic models of human behaviour.

The methodology that Sraffa would develop in his book *Production of Commodities by Means of Commodities* does not rely on a theory of human nature, nor does it possess any overarching element which may be construed as a ‘determination-in-the-last-instance’. Rather, by a combination of mathematically inquiring into the nature of value and of tracing the production processes immanent to the economy, Sraffa develops a model of the economy as a self-replicating system, in which the only presupposition about agency is that it requires a set of commodities (food, etc.) to maintain its own self-sustenance. While Marxism and marginalist economics subordinate agency to structure, Sraffa isolates the areas of the economy which are functionally independent of human agency, creating a non-reductive science. As he states in a 1934 note: “Actions do not require a rational justification — they are *objects* of explanation” (in McGuinness, 2008: 229).

### 3 Hayek

*‘Dr. Hayek as it were builds up a terrific steam-hammer in order to crack a nut—and then he does not crack it. Since we are primarily concerned in this review with the nut that is not cracked, we need not spend time criticising the hammer. The part which its description plays in the book is little more than that of obscuring the main issue; a maze of contradictions makes the reader so*

*completely dizzy, that when he reaches the discussion of money he may out of despair be prepared to believe anything.* ~Sraffa (1932a: 45)

In 1932, Keynes, in response to a negative review by Friedrich Hayek of his *Treatise on Money*, asked Sraffa to step in. Hayek was at that time the main exponent in the English-speaking world of the Austrian school of economics, which drew from such different literature than did the British schools of economics that it was seen as excitingly esoteric, yet very difficult to understand because of its different conceptual vocabulary, as well as different meanings for the same words. Both Keynes and Hayek viewed one another's thought as hopelessly muddled, and there appeared to be no common ground by which the two theories could be compared. Sraffa, it turned out, was one of the few English-speaking economists equipped to mediate between the two theories, being intimately familiar with the work of Keynes (he had translated Keynes' *Tract on Monetary Reform* into Italian in 1925 [Marcuzzo, 2005: 429]) as well as "being familiar with both Vilfredo Pareto's theory of general equilibrium and the Austrian theory of capital and interest of Böhm-Bawerk and Wicksell" (Kurz, 2000: 283). What resulted was a trenchant critique of Hayek's book *Prices & Production*, one still considered to be one of the most formidable critiques of the Austrian school, and it remains unrefuted.

The Sraffa-Hayek debate is the most technical and difficult to understand part of Sraffa's oeuvre, despite its being limited to a 12-page review, a 13-page reply, and a three-page rejoinder. Frank Knight is hardly alone in the sentiment he shares in a letter to a colleague (quoted in Kurz, 257): "I wish that he [Hayek] or someone would try to tell me in a plain grammatical sentence what the controversy between Sraffa and Hayek is about. I haven't been able to find anyone on this side who has the least idea." Lawlor & Horn (1992: 318) delineate how "[a]ccording to which of the authors one reads, the Sraffa-Hayek debate may resemble any of the following:

- 1) A difficult to interpret and ambiguous way-station between Sraffa's early work on the distributional aspects of monetary policy, and his later full-blown critique of orthodox economic theory (Panico, 1988).
- 2) The analytical basis of Keynes' most elaborate *General Theory* analysis of the 'essential properties of interest and money' (Deleplace, 1986; Majewski, 1988; Kregel, 1982; Mongioli, 1990; Potestio, 1986; Rymes, 1978).
- 3) The opening shots by Sraffa of a planned counter-revolution against subjectivism which culminated 30 years later with the *Production of Commodities by Means of Commodities* (Lachmann, 1986; Caldwell, 1986).
- 4) An early discussion of the true problems associated with the attempt to integrate money into a Walrasian general equilibrium model, and the forerunner of the modern mathematical treatment of the issue (Desai, 1982; McCloughry, 1982).<sup>2</sup>

Such divergent interpretations are largely due to the combination of Sraffa's taciturn style of writing and Hayek's tendency to often change his position: in

the former case, it is necessary to supply “motivations and implications he never provided”; in the latter case it is necessary to fit this particular argument within Hayek’s inconsistent oeuvre. The following description (simplified as much as possible for the sake of readability) will focus on the arguments explicitly made by Hayek and Sraffa; due to its technicality, the lay reader may prefer to skip the remainder of this section entirely.<sup>3</sup>

Hayek’s argument centers on the relation between interest rates and the amount of capital used by firms. Following the work of Wicksell, Hayek adopts the notion of the ‘natural rate of interest’—an equilibrium rate which will equalize the supply of capital with the demand for the products it creates. If the rate of interest set by the bank is lower than the natural rate, Hayek proposes, producers will have an incentive to borrow money from the bank to invest into capital, since they will pay less on interest than they would normally. This increase in capital allows the firm to improve its production capacity, but since demand has not significantly changed, any extra goods that it produces will not be purchased unless it lowers the price, which would reduce the firm’s profit. Therefore, the firm instead uses its extra capital to produce higher-quality goods which require more capital for their production, and which the firm will correspondingly be able to sell for a higher price. This also, Hayek (following Böhm-Bawerk) points out, requires a “lengthening of the period of production,” and in the interim where no goods are being sold, consumers have no choice but to save their money. Hayek refers to this as “forced saving,” and denounces it for interfering with individual freedom. There are other, more insidious results of ‘forced saving’, however:

Eventually incomes will rise; and since preferences of agents have not changed, consumption demand will go up. Prices of consumer goods will rise, indicating to producers that it is profitable to adopt less roundabout [i.e. time- & capital-intensive] processes of production. As a consequence, capital has to be reduced again – a process that “necessarily takes the form of an economic crisis” (Hayek 1931: 53). After a costly roundtrip, and on the assumption that the banking system will eventually correct its error, the system is bound to return to its original equilibrium.

As a result, Hayek advocates a policy where banks keep the interest rate equal to the ‘natural rate’, both in order to preserve individual freedom (i.e. ‘voluntary saving’) and to prevent economic crisis (Kurz, 1999).

Because of his familiarity with the theories of Wicksell, the economist who invented the concept of a ‘natural rate of interest’, Sraffa knew that one of the properties of the ‘natural rate’ was that it was the rate that would obtain in a non-monetary barter economy. Hayek explicitly had this property in mind throughout his argument, but as Sraffa points out, it contains an inherent blunder: Hayek had reduced the role of money to solely serving as a means of exchange, leaving out its crucial property as a store of value—Hayek has thus equated the role of money in his economy with that of any other commodity, meaning that his model was formally identical with a non-monetary barter economy. Since Hayek’s ‘emasculated money’ was presupposed from the start,



his model should have provided different results than a monetary model, but for some reason it did not. Therefore, Sraffa proposes, something extraneous must have been introduced into the model to account for Hayek's results.

One such element is "the alleged *permanence* of the capital accumulated in the voluntary [saving] case as opposed to the 'inevitable' destruction of that accumulated in the forced saving case" (Lawlor & Horn, 1992: 326). Hayek thus assumes a mechanism that will re-establish the proportions of money income saved and consumed *after* the expansion to the level they were before the expansion. Sraffa, for the sake of critique, supposes that such a mechanism did exist. He then finds a problem in distinguishing the results of forced saving from those of voluntary saving: "[f]or Sraffa, one income has been redistributed by...inflation and saved in the form of capital assets, [and] there is nothing to distinguish those assets from 'voluntarily' accumulated assets" (ibid., 327).

This, as Hayek himself admits, is the central point of his theory: if the capital accumulated by the firm does not dissipate due to an 'inevitable' economic crisis, then 'forced saving' will bring about just about the exact same results as will voluntary saving. Such dissipation would need to happen as a result of a redirection of income from producers to consumers through an increase of spending on the consumer's part, and a decrease on the producer's part, the quantity of money being held constant. Sraffa then notes that "[i]f the essential element of the story is the change in proportions of the spending stream, it cannot be monetary expansions themselves that account for the crisis," showing that "something other than monetary effects are in fact responsible for Hayek's conclusions" (ibid., 328). Sraffa concludes that the mechanism directing the proportionate spending of consumers and producers is "the supposed power of the banks to settle the way in which money is spent.... As Voltaire says, you can kill a flock of sheep by incantations, plus a little poison" (Sraffa, 1932a: 49).

Lastly, Sraffa goes on to show the problems inherent in the concept of a 'natural rate' of interest. Recalling that Hayek's model is formally identical with a non-monetary barter economy, it follows that any commodity could conceivably be used as the 'standard' by which everything else is valued. What this means in practice, however, is that as many different rates of interest could obtain in that economy as there are commodities—and these would all by definition be 'natural rates', though they would not be equilibrium rates. Consequently, Hayek is incorrect in automatically identifying the 'natural rate' with the equilibrium rate. In fact, in an expanding economy there will be no one equilibrium rate, since 'natural rates' of interest will be different for different commodities. Accordingly, the idea that 'forced saving' is caused by an interest rate (set by the bank) below the natural rate *makes no sense*, since there is no single natural rate with which the bank rate should (optimally) be equal.

This leads to the death blow for Hayek's theory (Kurz, 1999):

In his reply Hayek admitted that "there would be *no single rate* which, applied to all commodities, would satisfy the conditions of equilibrium rates, but there might, at any moment, be as many 'natural' rates of interest as there are commodities, *all* of which would be *equilibrium*

rates” (1932, p. 245). In his rejoinder, Sraffa noticed Hayek’s admission with satisfaction, but he asked him to draw the consequences for his ideal maxim for monetary policy – the proposition that they “*all...*would be equilibrium rates”. Sraffa commented: “The only meaning (if it be a meaning) I can attach to this is that his maxim of policy now requires that the money rate should be equal to all the divergent natural rates” ...

Though such an esoteric debate may seem largely inconsequential to the contemporary reader, according to Ludwig Lachmann, Hayek’s graduate assistant at the time of the debate, Sraffa’s blistering refutation played a critical role in eclipsing Hayek from the spotlight of economic theory during the 1930s. The encounter forced Hayek to rethink his positions, which eventually led to the publication of his *Pure Theory of Capital*, but Sraffa’s critique struck so deeply into the core of Austrian doctrine that even contemporary Austrian economists (most notably Robert Murphy) are forced to work around the flaws in their concepts, which to some extent even affect their theory of business cycles.

## 4 Wittgenstein

*“I wish to say one more thing: I think that your fault in a discussion is this: you are not helpful! I am like a man inviting you to tea to my room; but my room is hardly furnished, one has to sit on boxes and the teacups stand on the floor and the cups have no handles, etc etc. I hustle about fetching anything I can think of to make it possible that we should have tea together. You stand about with a sulky face; say that you can’t sit down on a box, and can’t hold a cup without a handle, and generally make things difficult. – At least that’s how it seems to me.”* ~Wittgenstein, in a letter to Sraffa (01.31.1934)

Ludwig Wittgenstein (1889-1951) was a philosopher who focused his attention on the problems of logic and language, and is widely considered to have revolutionized philosophy, principally through his book *Tractatus Logico-Philosophicus*, which he was later to repudiate. In brief, the object of Wittgenstein’s book was the following: starting from the initial proposition that the world consists of the totality of facts, he goes on to theorize that these facts can be reduced to irreducible component parts (‘simples’), each in the form of a proposition—furthermore, if we know all of these ‘simples’, then we can explain the entirety of the world of facts by means of induction. Wittgenstein uses sophisticated arguments from formal logic to develop a strict definition of language (the apparatus with which we make and organize propositions), and after this concludes that many of the traditional questions of philosophy (e.g. “whether the Good is more or less identical than the Beautiful” [4.003]) do not fit in within this definition, and are thus ‘ungrammatical’ and ‘senseless’. His final proposition is therefore “Whereof one cannot speak, thereof one must be silent” [7], meaning that the traditional questions of philosophy are beyond the scope of human language, and that there is no point in philosophizing about them since they cannot be communicated, but only shown.

Through the mutual acquaintance of David Ramsey, Sraffa and Wittgenstein became acquainted with one another in 1929 and soon began to converse regularly. There is ample evidence that Wittgenstein immensely enjoyed these conversations, particularly due to Sraffa’s remarkable erudition, underscored by Kurz (2009: 264), who describes how “Sraffa participated in discussions with world-renowned scholars coming from different disciplines, including philosophy, mathematics, chemistry, physics, anthropology, and ethnology.” Wittgenstein and Sraffa would also discuss world events, though due to the fact that Wittgenstein did not read newspapers, Sraffa was forced to recapitulate them before any discussion could be had (Bharadwaj, 1983: 5). It is then, all things considered, not particularly difficult to imagine why Wittgenstein stated that conversations with Sraffa made him feel like a tree from which all branches had been cut (Malcolm, 1958: 15). One conversation in particular marked a fundamental turning point in Wittgenstein’s thought (Roncaglia, 2000: 23):

[I]n the *Philosophical Investigations* Wittgenstein abandons the idea of language as axiomatic representation of the world, and the idea of the ‘unspeakable’. Discussions with Sraffa seem to have played their part in his abandonment of the latter. In this connection, there is an anecdote that Wittgenstein himself liked to tell his pupils, one of whom – Malcolm [1958: 9] – recounts it thus in his biography of the master: one day, as they were travelling together on the train from Cambridge to London, ‘Sraffa made a gesture, familiar to Neapolitans and meaning something like disgust or contempt, of brushing the underneath of his chin with an outward sweep of the finger tips of one hand’.

The gesture can only acquire a specific meaning from the context in which it is performed, thus contradicting Wittgenstein’s idea that every proposition had to have a precise place in the axiomatic order of rational language, independently of the various contexts in which it may be employed.<sup>4</sup>

Sraffa’s influence on Wittgenstein is well-known due to the unusually effusive praise bestowed on the former in the latter’s preface to the *Philosophical Investigations*.<sup>5</sup> Though the full extent of this influence is as yet unclear, there have been several attempts at a reconstruction of this influence, most notably by Sharpe (2002)<sup>6</sup> and (more recently and rigorously) Engelmann (2012).<sup>7</sup> Wittgenstein commented to Rush Rhees, however, that Sraffa’s greatest influence on him was to make him think in an ‘anthropological’ manner.<sup>8</sup> The two eventually drifted apart from one another in 1946, the last known words exchanged between the two (apart from a couple of letters from Wittgenstein) being “I won’t be bullied by you, Wittgenstein” (McGuinness, 2008: 9), overheard by Yorick Smythies.

## 5 Ricardo

“don’t treat too ill my David” ~Sraffa, regarding Keynes’ essay on Malthus<sup>9</sup>

Sraffa did not particularly like teaching, as he was extremely fastidious regarding his lectures and complained that they allowed him little time for his own research. (As well, it is speculated that Sraffa did not want to have to teach a theory—namely, the marginal theory of value—that he found wanting.) Hence, Keynes created *ex nihilo* for Sraffa a position as Librarian at the Marshall Library, which was “the official position by which Sraffa always designated himself among colleagues” (Bharadwaj, 1984: 1237), and he was also placed in charge of the Cambridge program of graduate studies in economics. As well, Sraffa took up the immense philological task of compiling and editing the collected works of David Ricardo, who had at that time been consigned to a century of near-oblivion following the introduction of marginalism. The meticulousness and protractedness of this process elicited teasing even from such economists as Joseph Schumpeter, who, “[i]n his *History of Economic Analysis*, published posthumously in 1954,...expresses the hope that ‘Some day, perhaps, we may see the completion of Professor Sraffa’s comprehensive edition of Ricardo’s works, which we have been eagerly awaiting these twenty years’” (Roncaglia, 2000: 31). The eventual 10-volume publication, through the years 1951 and 1955, of Ricardo’s works (with an index published in 1973 comprising the 11th volume) is still praised for its astonishing philological rigor, for which Sraffa received the Söderström gold medal of the Royal Academy of Sciences—which antedated the Nobel Prize for Economics—in Sweden (Potier, 1991: 60-1).

David Ricardo (1772-1823) was an English political economist commonly viewed as the intellectual heir to Adam Smith. Smith’s work, however, had been more topical than systematic, hence Thomas De Quincey (1822: 54) is quite justified in effusively praising Ricardo as follows: “Mr. Ricardo had deduced, a priori, from the understanding itself, laws which first gave a ray of light into the unwieldy chaos of materials, and had constructed what had been but a collection of tentative discussions into a science of regular proportions, now first standing on an eternal basis.” Ricardo was the first to utilize abstract models in order to note the effects of different economic variables upon one another, a method which is often criticized by laypersons, but it nevertheless allowed Ricardo to develop many theories which would otherwise be inaccessible, most notably that of comparative advantage, which is still misunderstood by many educated people to this day. In effect, it means that if two countries specialize in producing goods in which they have a comparative advantage in producing (i.e. which are cheaper to produce relative to the other goods that they could produce with the same amount of labor, and as compared to the same calculation done by other countries), and trade these with other countries that do likewise for different goods, there will be an overall gain for both parties as compared to working by themselves. These gains occur even if one of the countries has a production capacity inferior in all counts to that of the other country: because the concept of comparative advantage relies on *relative* prices, a given country (even if it is very poor) will *always* have a comparative advantage in producing *some* goods relative to another country, except in highly unrealistic scenarios

such as all of the productivity (and prices, etc.) being uniform for all goods in both countries, where no relative efficiency exists *per se*.

Gradually, however, economists gravitated toward more sophisticated mathematics, particularly the use of calculus. In the early 1870s, three books were published which were to bring about the ‘marginalist revolution’ in economics: William Stanley Jevons’ *The Theory of Political Economy* (1871), Carl Menger’s *Principles of Economics* (1871), and Léon Walras’ *Element of Pure Economics* (1874). Though the three authors were quite different in their approach (Mengers did not use sophisticated mathematics and Walras published his findings independently), subsequent theorists (most notably Alfred Marshall) were able to integrate their work into a coherent whole that was nevertheless entirely different from the methodology of classical political economy. In brief, Mengers abandoned the labor theory of value, instead insisting that the value of a commodity is a function of consumers’ willingness to pay, rather than any ‘inherent’ source; Jevons developed the theory of marginal utility, measuring one’s utility in terms of quantitative units (‘utils’), and focused on the difference in utility brought about by an increase or decrease in one’s amount of a good; and Walras worked on general equilibrium theory, developing a series of equations which would reconcile firms’ production capacity with consumers’ desire for consumption, given such variables as the wage rate, interest rates, etc. Though insights such as the theory of comparative advantage were duly integrated into marginalism, the vast majority of Ricardo’s work was rejected as primitive due to its reliance upon the labor theory of value in addition to unsophisticated algebra. However, Sraffa, as will be expanded upon below, noticed some highly problematic elements of this new paradigm, therefore electing to return to first principles through a hermeneutic reading of Ricardo, of whom, at that time (Roncaglia, 2000: 30):

the most commonly accepted interpretations were those of Marshall (1961, Appendix i), who saw Ricardo as a – somewhat imprecise and limited – precursor of modern theory (in that he took account of the cost of production, i.e. supply, but not of demand in the determination of prices), and Jevons (in the Preface to the second edition of the *Theory of Political Economy*, 1879), who found Ricardo responsible for having perniciously diverted economics from the path of true science. From either interpretation, there was no reason to waste time on Ricardo’s works.

The process of compiling and editing Ricardo’s *Collected Works* was to last from 1930 to the publication of vol. 10 in 1955 (*ibid.*, 29). As befits such a long period of gestation, Sraffa’s scholarship (in addition to that of Maurice Dobb, who eventually joined Sraffa as co-editor) was quite fruitful, and the two managed to overturn several deeply-held misconceptions about Ricardo. In a 1950 letter to a colleague, Dobb<sup>10</sup> summarizes the more interesting of their discoveries as follows:

...I think we conclusively establish (in opposition to the traditional Hollander–Marshall–Cannan view) that there was no ‘weakening’ of Ricardo’s

enunciation of the labour theory [of value] as time went on: that in fact he reached at the end of his life a position rather close to that of Marx, so that the true line of descent is certainly from Ricardo to Marx, and not from Ricardo to cost-of-production theory as in Mill to Marshall as the bourgeois tradition has it. A minor scoop is the unpublished (and unfinished) final paper which he was writing just before his death on ‘Absolute Value and Exchangeable Value’, showing that he was at the last still exercised with a notion of an Absolute Value (=embodied labour) as something distinct from, but underlying, exchange-value: in fact the notion and the distinction is *more* explicit in this last paper than in the ‘Principles’.

Sraffa’s familiarity with the Classical research programme would serve him well as he worked on what would become his first book-length publication, a thin text that could nearly be confused for a pamphlet, yet which contained the seeds for an incisive attack on orthodox economics which would change the way economists viewed their discipline.

## 6 Production of Commodities by Means of Commodities

*“It took me more than thirty years to write this book; obviously you need more than a few months to understand it!”*  
~Sraffa<sup>11</sup>

Sraffa, despite his aforementioned conversational ability, was nonetheless quite sparse in his own publications: he only published one book in his lifetime, entitled *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*, in 1960, and is known to have been working on the book since at least 1928, when he asked Keynes to read “an opening draft of the propositions’ contained in his study” (Potier, 1991: 53-4).

The marginal theory of value is currently the most orthodox theory of value, having been taught since Max Weber’s time. It ceased to look for any ‘inherent’ source of value and instead focused on consumer choices & preferences. It is most well-known for its ability to be graphed and tabulated: a marginal benefit curve can also be thought of as a willingness-to-pay curve, just as a marginal cost curve can be thought of as an opportunity cost curve (i.e. showing what one has to give up for another unit of  $x$ ).

The marginal benefit curve slopes downward because of the *principle of decreasing marginal benefit*: to illustrate, if a consumer has multiple units of a product (an apple, say) the second unit does not provide as much pleasure (or overall ‘utility’) than the first, and so on. The amount of money that the consumer is willing to pay for each subsequent unit tends to decrease at regular proportions. The marginal cost curve slopes upward, however, because of the *principle of increasing marginal cost*: when a firm chooses to produce more of one particular good, the value of all the other things that could be produced *instead* of that particular good (i.e. the opportunity cost of said good) increases

at a regular pace. In the middle, however, there is a point where marginal benefit equals marginal cost—equilibrium. This is the most desirable point because the consumer is able to balance their willingness to pay with the maximum opportunity costs to which the firm will concede.

The main problem with the marginal theory of value is that it is *post facto* only: we can graph the results of past purchases, but there is no way of knowing for sure that these patterns will stay the same even for a day, hence marginalist economics is forced to heuristically presuppose consumers to be atomistic agents (their preferences uninfluenced by those of others) in a constant quest to maximize their utility. Despite the evident empirical shortcomings of this premise, marginalist economics has progressed exponentially further than the research programme of the classical economists, and microeconomists such as Steve Levitt (co-author of *Freakonomics*) have shown the diversity of fields to which the conceptual tools of economics are applicable.

Though the marginalist tradition interprets Classical economics as constituting a less sophisticated and only approximately correct version of marginalist analysis, Sraffa posited that marginalism constituted a fundamental break with the research programme of Classical economics. In this view, several significant problems of the Classical methodology had been left unanswered, particularly that of finding an invariant standard of value; up to Marx, this problem was viewed primarily in terms of how much labor went into the production of a given commodity, an approach that proved intractable (as demonstrated by the diamond-water paradox as well as McCollough's wine cask problem) and was abandoned in favor of willingness to pay (i.e. marginal benefit). Sraffa, in light of the inconsistencies of marginalism confronted in his earlier essays, set out to reconstruct the Classical research programme, and was able to do so by solving (at least in part) the problem of an invariable standard of value relative to which all other commodities can be valued.

Sraffa was able to do this by means of a conceptual distinction between 'basic' and 'non-basic' commodities. A basic commodity is one which factors (directly or indirectly) in the production of all other commodities, including its own: if the price of steel or gasoline increases, then the prices of all other goods will likewise increase, since all production processes depend to some extent on steel and gasoline. Non-basic commodities, conversely, are only factors in the prices of some commodities. Sraffa utilizes this distinction to construct what he calls a 'standard commodity', a mathematical formulation constructed in such a way that when relative prices<sup>12</sup> change, the value of the standard commodity will remain invariant. Keeping in mind that Sraffa, like Ricardo (and Marx after him), posits an inverse relationship between the profit rate and wage rate, perhaps the most accessible exposition of this process is given by Joan Robinson (1988: 84):

[A]s the wage reckoned in terms of this standard rises, the prices of some of the commodities composing it (in which wages are a higher proportion of cost) rise, and others (in which profits are a higher proportion of cost) fall, to just such an extent as to balance each other, and leave the ratio of the value of the surplus to the value of the means of production

unchanged. This provides a technically determined ratio of surplus to means of production which is independent of the surplus between wages and profits.

This allows Sraffa to surmount one of the main problems of Classical theory, namely, an invariant measure of value.<sup>13</sup> Economists up to Marx had considered labor to be the source of this value, and marginalism allowed a way to circumvent the difficulties provided by this former theory, though in a *post facto* manner. In fact, Ludwig von Mises (1963: 78) states that it was upon hearing of the invention of the marginal theory of value that Marx decided not to publish the remaining volumes of *Das Kapital*, though the veracity of this claim is uncertain.

## 7 Prelude to a Critique of Economic Theory

*“[Marshall’s] theory cannot be interpreted in a way that makes it logically self-consistent and, at the same time, reconciles it with the facts it sets out to explain. Mr. Robertson’s remedy is to discard mathematics, and he suggests that my remedy is to discard the facts; perhaps I ought to have explained that, in the circumstances, I think it is Marshall’s theory that should be discarded.” ~Sraffa<sup>14</sup>*

In his preface to *Production of Commodities*, Sraffa specifies how his notation was chosen so as to make his exposition “easy to follow for the non-mathematical reader” (1960: vii); nevertheless, the extreme conciseness of his text as well as the extent to which it goes against the prevailing orthodoxy in economics have prevented it from reaching a wide audience. The text’s conciseness—which to a large extent calls upon the reader to unravel on their own its implications—has led to greatly diverging interpretations of the work, some economists claiming that its formulas have no relation to the real world and others claiming that it constitutes a basis for comparative analysis of economic systems. The Neo-Ricardian school of economics bases itself upon the work of Sraffa, and his work has also informed the study of Marx (via Pierangelo Garegnani), Adam Smith (via Sylos Labini), and the work of more orthodox figures as John Maynard Keynes and Joan Robinson.

Roncaglia interprets Sraffa’s text as a multidimensional work, hinging on the reader’s assumption of returns to scale.<sup>15</sup> In his introduction, Sraffa warns the reader not to assume constant returns to scale, though he admits that “[i]f such a supposition is found helpful, there is no harm in the reader’s adopting it as a temporary working hypothesis” (1960: v). Roncaglia states that if we *don’t* assume constant returns to scale, then the text may be read as an extension of the research programme of Classical economics; if we *do*, however, then the text becomes a critique of the marginal theory of value.<sup>16</sup> Though this may seem confusing, we should recall the statement above that many of the points Sraffa makes are implicit.

Still, the interpretation of Sraffa’s work as an extension of the Classical research programme demands one crucial caveat: in order to solve the problem of an invariant standard of value, Sraffa is forced to abandon the labor theory of



value. Intriguingly, some of Sraffa's unpublished papers in fact argue that the marginal theory of value does not hold unless the labor theory of value is correct (see Kurz, 2009: Appendix 1).<sup>17</sup> Another Classical influence which Sraffa has salvaged is the notion of the economy as a circular flow, an idea which reaches back to the Physiocrats. Marginalist economics views the circuit of money as a circular flow, yet production is seen as a linear journey from factors (resources) to consumers. Sraffa, however, conceives production to be circular as well, with the commodities sold to consumers acting as inputs for their labor, which acts as an input for new commodities, *ad infinitum*.

One of the most remarkable elements of Sraffa's theory is that it dispenses with the marginalist concepts of supply, demand, equilibrium, and capital. However, though Sraffa does not utilize these concepts, it is nonetheless possible to read them into his theory; perhaps more appropriately, then, it could be said that he redefines their use so that they more closely resemble their Classical counterparts. Sraffa's prime concern here was to avoid any concepts which could be construed as 'metaphysical' or 'subjective'; it is noteworthy to mention that Sraffa even ceased collaborating in Keynes' *General Theory* when the latter used the subjective concept 'propensity to consume'. Likewise, utility functions, expectations, elasticity, etc., have no bearing in Sraffa's work. Rather, the empirical merit of Sraffa's work is primarily in its ability to take 'objective' variables—such as costs of production, the wage rate (relative to profit), and the amount of profit necessary for a firm to continue production—and show how these directly translate into market prices. As Robinson (1988: 87) argues, "Sraffa does not deny any sensible arguments that can be expressed in marginal terms. His treatment of diminishing returns from land and of the choice of technique makes room for legitimate uses of the concept of a production function." He is, however, reluctant to give way to the tendency of marginalism to make blatantly untrue methodological presuppositions (such as that of invariant utility functions, as described above) in order to make the facts fit the theory, a tendency which is all the more flagrant for questions of demand. In the realm of supply, however, Sraffa does nevertheless show "that there is no such thing as a 'quantity of capital' which exists independently of the rate of profit" (*ibid.*), a discovery which would go on to provoke much vitriolic debate.

## 8 The Cambridge Capital Controversy

*"What [Sraffa] demonstrates decisively (though doubtless the deaf adders will take no notice) is that there is no such thing as a 'quantity of capital' which exists independently of the rate of profit."*  
~Joan Robinson

The publication of Sraffa's text led to a debate which came to be known as the Cambridge Capital Controversy, primarily between Sraffa and Joan Robinson at Cambridge University and Robert Solow and Paul Samuelson at MIT, in Cambridge, Massachusetts. Sraffa's primary contention here was that the concept of marginal product of capital (i.e. the amount of productivity gained by an increase

by one unit of capital) is circular. Capital (the set of machinery required for the process of production) usually requires a heterogeneous array of machines, each differing in size, productivity, lifespan, etc., and there is no objective way to submit them all to a universal measure. As a result of this heterogeneity, the process of measuring capital in terms of ‘units’ relies on a process of mathematical abstraction, which is where the problem lies. As Sraffa describes, “to determine the rate of profit we must first know the q[quantity] of capital; to measure the q. of cap. we must first know the period of production; and to find the period of prod. we must first know the rate of profit” (in Kurz, 1999). Another one of the issues at stake was more abstract issue that can only be made lucid by way of a lengthy description: the reswitching problem. To illustrate this, I shall quote Murphy (2003), who himself draws heavily from Samuelson (1966):

Technique *reswitching* refers to a situation in which one mode of production is profitable at a high rate of interest, then unprofitable at an intermediate rate, but then profitable again at a very low rate of interest. Samuelson used a simplified example to illustrate the concept:

Suppose there are only two techniques for producing one unit of a certain good. Technique A requires 0 units of labor input the first period, 7 units of input in the second period, and 0 units in the third period. After this time, one unit of output is produced. (We can interpret the last period, which requires no additional input, as waiting for the unfinished capital good to “ripen” into the output good.)

Technique B, on the other hand, requires 2 units of labor input in the first period, 0 units in the second period, and 6 units in the third period. After these are applied, one unit of output is produced.

Now the question is, for a given wage rate and price of output, which of these two techniques should be used? It depends on the interest rate. For a rate higher than 100 percent, technique A is more profitable. For interest rates between 50 and 100 percent, technique B is superior. But once the interest rate slips below 50 percent, once again technique A becomes more profitable.

(The intuition for these results is that at very high rates of interest, the interest rolling over on the initial outlay for 2 units in technique B dwarfs other considerations. On the other hand, at very low rates of interest, the fact that B requires a total of 8 units of labor, versus the 7 required by the other process, makes it unprofitable again. Only for intermediate rates of interest is technique B more profitable.)

The meaning of this, Samuelson stresses pointedly: “It is no longer literally true to say, ‘Society moves from high interest rates to low by sacrificing current consumption goods in return for more consumption later’” (1966: 582). In effect, this theoretical possibility abolishes the myth of consistent linear relationships

among economic variables, at least as a pattern to be assumed by default. Mathematical phenomena such as the fact that the square root of a number can be either positive or negative allow multiple equilibria to be valid alternatives for particular kinds of production or consumption functions, even if these equilibria are qualitatively quite dissimilar.

An auxiliary issue was the ‘aggregation problem’, i.e. whether it is possible to generalize the results of any one firm for society as a whole, jumping from microeconomic to macroeconomic analysis. This latter problem reaches as far back as Sraffa’s essay “On The Relation Between Cost and Quantity Produced,” which Sharpe (2002: 139-40) admirably summarizes as follows:

In that article, Sraffa dealt, *inter alia*, with the problems that long-run rising (falling) costs cause for a partial equilibrium-Marshallian-analysis of competitive industry behaviour. He begins by noting that, if costs are rising (falling) it must be because some factor is becoming relatively (less) scarce. Yet all factor prices are supposed to be constant under the *ceteris paribus* assumption of long-run Marshallian analysis as are the prices of competitor industries. So it must either be the case that the factor whose price is rising (falling) only enters as an input into the industry in question, or we have to take into account the effect of the increasing (decreasing) factor scarcity on the costs and prices of other industries in order to assess the overall effect on the industry in question. But this then requires us to expand the definition of what constitutes the ‘industry’ under analysis to include these other, previously separate, industries. This, however, just increases the likelihood of coming across yet other factors of production whose prices will be rising (falling) in those industries excluded from the current (broader) definition, so that a further widening of definition is required. And so on. This then means that, in the end, for non-constant returns to scale industries, we have to analyse the whole economy at once—or at least we have to analyse the interrelations of all those commodities that enter into the production of all other commodities in the economy [i.e. what Sraffa would later call ‘basic goods’]—if we are to say anything concrete about changes in values as quantity produced changes.

With this, Sraffa attacks the *ceteris paribus* clause—ubiquitous in economic theories endeavoring to show the influence of a change in one variable on all the other variables (a method known as comparative statics)—showing that it is distortionary: it can no longer be relied upon that, ‘all else being equal’, change in a given variable causes such-and-such an effect, since this presupposed equality is achieved only by a process of abstraction which can receive no empirical justification. Comparative statics is at best an approximation: even Milton Friedman’s celebrated formula  $MV = PY$  (etched triumphantly on his license plate), though theoretically true when we start from the definition  $V = PY/M$ , cannot be viewed as complete when it and its variants do not always hold empirically; though remarkably successful, there are still improvements to be made, and to

ignore this can only be harmful. Similarly, the Cambridge Capital Controversy has deep repercussions for the marginalist research programme, but the fact that mainstream economics has nevertheless ignored these problems, which still remain unresolved, may turn out to be harmful in the long-term.

## Conclusion

Although Sraffian economics and marginalist economics apply to the same medium (namely, the economy), it is clear that they operate according to different axioms, which are themselves shaped by differing definitions: Sraffa has no need for the principles of decreasing marginal benefit and increasing marginal cost, and Sraffa's surplus-based approaches are equally as meaningless to marginalism. This relation is remarkably analogous to the difference between Euclidean geometry and Non-Euclidean geometry: despite similar methodologies, the differing axioms and definitions of each geometry restrict the former to measuring the properties of flat surfaces and the latter to measuring the properties of spherical (or hyperboloid) surfaces. Both are internally consistent, and neither contradicts the other, hence neither is 'more correct' than the other. Furthermore, in many circumstances Euclidean geometry can very closely approximate measurements on curved surfaces: in measuring a triangle drawn on the ground, for instance, the curvature of the earth is so negligible that unless said triangle is the size of a continent, there will be little difference in the results of each geometry's measurements. Nevertheless, there are surfaces for which Euclidean geometry is simply ineffective, just as marginalist economics is ineffective when analyzing portions of the economy (such as international trade) in which capital is an integral element.

In this light, Sraffian economics may have the potential to serve as a 'Non-Economics', bearing the same relation to marginalism as Non-Euclidean geometry to the work of Euclid. Perhaps economics needs a non-economics to comprehend it, and if, as Anwar Shaikh (2000: 591-2) has found, a modified Sraffian model can account for 86% of market prices—all the while without relying on 'metaphysical' concepts—then Sraffa's work may offer an avenue toward a metatheoretical account of marginalism's empirical findings, as well as offering an opportunity to introduce new conceptual possibilities (such as technique reswitching) which marginalism may be (heuristically) inclined to overlook. Marginalist economics, after all, constructs a transcendent, logically consistent system of relations which it then applies to market phenomena, while Sraffian economics, conversely, endeavours to discover processes which are immanent to the economy.

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## Notes

<sup>1</sup>Quoted in Gramsci (1989: 205-6, n. 1).

<sup>2</sup>For these references, the reader is directed to Lawlor & Horn (1992).

<sup>3</sup>The most lucid view of the Sraffa-Hayek debate has been provided by Lawlor & Horn (1992), and Kurz (1999). The lay reader is also directed to Wapshott, N. (2011). *Keynes Hayek*. New York: W.W. Norton & Co., Ch. 8.

<sup>4</sup>According to Malcolm (1958: 69), the object of the discussion was Wittgenstein's idea "that a proposition and that which it describes must have the same 'logical form', the same 'logical multiplicity'"; according to von Wright, as Malcolm reports in a footnote, the object of the discussion was the idea that each proposition should have a 'grammar'. In a conversation (21 December, 1973) Sraffa confirmed the anecdote, telling me that von Wright was right. [Roncaglia's note (2000: 44)]

<sup>5</sup>"For since beginning to occupy myself with philosophy again, sixteen years ago, I have been forced to recognize grave mistakes in what I wrote in that first book. I was helped to realize these mistakes—to a degree which I myself am hardly able to estimate—by the criticism which my ideas encountered from Frank Ramsey, with whom I discussed them in innumerable conversations during the last two years of his life. Even more than to this—always certain and forcible—criticism I am indebted to that which a teacher of this university, Mr. P. Sraffa, for many years unceasingly practised on my thoughts. I am indebted to *this* stimulus for the most consequential ideas of this book." (Wittgenstein, 1958: viii)

<sup>6</sup>At the time when Sharpe's essay was written, much less information was available than has now come to light. His denial that Sraffa provided any positive contribution to Wittgenstein's thought is made very doubtful by Sraffa's unpublished papers. Though Sraffa later downplayed his influence on Wittgenstein (Potier, 1991: 43), such an action

is hardly uncharacteristic of Sraffa, who also asked to have his name omitted from the preface of Keynes' *Treatise on Money* (1930) after finding out that Keynes intended to thank him for his criticisms (ibid., 44).

<sup>7</sup>Engelmann's 2012 essay states in its abstract that "Sraffa's criticism led Wittgenstein away from the calculus conception of language of the *Big Typescript* (arguably, an adaptation of the calculus of the *Tractatus*), and towards the 'anthropological view', which structures both the opening sections of the *Philosophical Investigations* and Wittgenstein's later philosophy of mathematics."

<sup>8</sup>Monk (1990: 487), quoted in Sharpe, 114.

<sup>9</sup>Quoted in Marcuzzo (2005: 442).

<sup>10</sup>Quoted in Pollit (1990: 524).

<sup>11</sup>Quoted in Roncaglia (2009, x).

<sup>12</sup>If all prices (along with incomes) were to be multiplied by two, there would be no significant change in spending except nominally. Relative price changes occur when the proportions of prices change, e.g. if the price of one good doubles and another triples, relative to wages.

<sup>13</sup>The standard commodity does not remain invariant through technological changes; hence Sraffa's analysis is one in which technological change is held constant. Pierangelo Garegnani, however, has developed a measure of value which remains invariant through technological change, but not through changes in relative prices. Finding a standard that remains invariant through both technological change and changes in relative prices is perhaps the fundamental problem of the Neo-Ricardian school, though this does not prevent them from analyzing many issues within the purview of marginalist economics.

<sup>14</sup>Sraffa, Robertson, & Shove (1930: 93).

<sup>15</sup>If I double the amount of input  $x$  needed to produce output  $y$ , will I get  $2y$ ? If I get less than  $2y$ , then I have decreasing returns to scale; if I get more than  $2y$ , I have increasing returns to scale. If  $2x$  gives me  $2y$ , then I have constant returns to scale. In mathematical terms, this means that for a given production function—say,  $y = 3x^2$ —if,  $3(2x)^2$  does not give the same number as  $2(3x^2)$ , then the formula does not provide constant returns to scale. In our example formula we have increasing returns to scale, since when we double the amount of inputs, we get  $2^2 = 4$  times what we originally had, rather than the 2 corresponding to the doubling of inputs.

<sup>16</sup>"In synthesis, *Production of Commodities by Means of Commodities* may be the object of two quite different readings. On the one hand, we may draw from Sraffa's book a number of analytical results that can be used for a critique from within demolishing the traditional marginalist theories of value and distribution; in this context, other parts of the book – such as the discussion of the 'standard commodity' – may appear pleonastic or esoteric. On the other hand, we may read Sraffa's book as a decisive contribution for an analytically solid reconstruction of the classical approach. The distinction between these two different readings is connected to recognition of the existence of two clearly distinct representations of the working of market economies, the classical one based on the circular flow of production and consumption and on the notion of the surplus, and the marginalist one based on the one-way avenue leading from factors of production to consumption goods and the satisfaction of consumers' preferences." (Roncaglia, 2000: 65-6)

<sup>17</sup>At the risk of appearing bombastic, the history of science provides an interesting parallel to this methodological circumvention: just as Einstein developed his theory of special relativity without needing a theory of whether light is a wave or a particle (relativity holds in either case), so Sraffa solved the transformation problem without a theory of value (i.e. without having to choose between marginalism and labor).