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The Sraffian *Methodenstreit* and the revolution in economic theory

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Here I address several questions raised by Ajit Sinha's book *A Revolution in Economic Theory: The Economics of Piero Sraffa*. I focus on the contribution brought by the book, and the way in which it is positioned against other contributions, especially in what concerns the methodology presupposed in Sraffa's contribution, within what can be termed a Sraffian *Methodenstreit*, given the role of theory and history in the controversies surrounding Sraffian analysis. In so doing, I address the geometrical approach advanced by Sraffa, which is emphasised by Sinha in his critique of interpretations of Sraffa drawing on the notion of equilibrium. I also address the connections between Sraffa and Ludwig Wittgenstein, which are discussed by Sinha, taking into special consideration what Wittgenstein saw as Sraffa's ethnological or anthropological approach, and its implications for the use of Sraffa's methodology in economics.

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1. Introduction

Piero Sraffa's contribution brought major changes to how economics and philosophy evolved throughout the twentieth century. He famously led Ludwig Wittgenstein to change his views, which in turn became widely influential in twentieth century philosophy. Sraffa was also at the heart of the Keynesian revolution, influencing key aspects of John Maynard Keynes' approach. He did all this essentially through his conversations at Cambridge, for he wrote remarkably little. But the little he wrote was enough to provide devastating critiques of Marshallian supply and demand analysis (Sraffa, 1925, 1926), Austrian business cycle theory (Sraffa, 1932) and the overall neoclassical theory of value and distribution (Sraffa, 1960), while also recovering the standpoint of the old classical political economists (Sraffa, 1960).

Sraffa's work continues to have great resonance at the moment, especially regarding the contemporary discussions on inequality, which are often addressed through the neoclassical theory of value and distribution, which Sraffa showed to be inconsistent.

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Contemporary discussions on inequality often focus on whether inequality is caused by human institutions that can be changed, or by irreversible technological change which brings differences in the marginal productivities of capital and labour, which in turn cause inequality as an unavoidable (and some would even say, salutary) consequence of technological progress. Sraffa (1960) showed that distribution cannot be consistently determined through marginal productivity theory, as in neoclassical supply and demand analysis, opening the door to explanations pointing towards institutional factors, and undermining explanations where inequality is the inevitable outcome of technical progress.

Sraffa (1960) also showed that we can either take wages to be exogenously determined (allowing for a given standard of living), thus setting the rate of profits and prices throughout the economy, or alternatively take the rate of profits to be exogenously determined (by the prevailing money rate of interest), thus setting wages and the prices throughout the economy. Increases in wages would inevitably lead to a reduction of the rate of profits, and vice-versa. Sraffa's idea that we must choose between focusing on the standard of living (as expressed in wages) or on the profits of the financial sector (as determined by the money rate of interest) certainly captures the contemporary dilemmas of an increasingly financialized world, where in the last decade States had to choose between bailing out banks or maintaining the standard of living of the population.

But interpreting Sraffa's theory has not been an easy task, especially given the methodological sophistication that underpins the work of one of the more influential figures in economics and philosophy of the last century. In his recent book *A Revolution in Economic Theory: The Economics of Piero Sraffa* (AG Switzerland, Palgrave/Macmillan, 2016), Ajit Sinha undertakes this difficult task, while addressing Sraffa's economics and philosophy, and providing his own interpretation of Sraffa. The book starts with a Foreword by Geoffrey Harcourt, who stresses the need of combining economics and philosophy when studying Sraffa, as Sinha does.

Harcourt (1981, 2003, 2006) has noted on several occasions the complementarities between various post-Keynesian conceptions. However, many post-Keynesians have focused instead on the differences between their various conceptions. One could expect that those differences would stem from focusing on different authors. But even when focusing on a single author, such as Sraffa, different perspectives have emerged. And those different perspectives do not always stem from divergent views on the best way of developing or applying Sraffa's theory. Rather, the divergence concerns also, and perhaps especially, what is the proper interpretation of what Sraffa really meant.

The interpretation of what Sraffa really meant, in turn, is not made easier given that most of what Sraffa wrote remains unpublished, and the archive containing the Sraffa Papers kept at the Wren Library in Trinity College, Cambridge, has only now started to be available online for anyone who wants to read it without having to visit the Wren Library. And even to anyone who has access to the full material, interpreting it is certainly not easy. These difficulties can partly explain the various controversies surrounding the interpretation of Sraffa's writings. Thus, a consensus seems far from approaching within the community of Sraffian scholars. Sinha's book provides yet another interpretation, one that can usefully be compared with other interpretations within the Sraffian literature.

Here I shall focus on the key aspects of Sinha's book, such as Sraffa's use of what he saw as the geometrical method, the relationship between Sraffa and Wittgenstein, and the critique of the notion of gravitation, which Sinha interprets in terms of a tendency toward equilibrium. The reason for referring to a Sraffian *Methodenstreit* will become clearer when addressing the role of specific context emphasised by Sraffa in his conversations with Wittgenstein, and when addressing the problem of gravitation, for it pertains precisely to the connection between theory and history, and the role of each in economic methodology, and in any possible revolution in economics. But before addressing the central topics of Sinha's book, I first provide a broad outline of the book.

2. A summary of Sinha's book

Sinha starts his book with a preface that sets out the key aspects of his thesis. In this preface, Sinha (2016, p. xii) notes that Sraffa's theory is concerned with achieving a geometrical description, rather than a causal explanation of the economy. This is indeed a very important aspect of Sraffa's theory, but it is not entirely clear what Sraffa means by a geometrical theory. It seems to me, and this seems to be Sinha's view as well (as expressed in this book), that Sraffa is contrasting geometry with mechanics, where causal explanations are associated with mechanics, while in geometry the explanation is not in terms of mechanical causation—it is important to note that for Sraffa (D1/9/2) causation is unidirectional and between particulars, while causality presupposes interdependence and holds between categories.

Sinha (2016, p. xii) also highlights Sraffa's scepticism regarding the use of psychological notions in economics. This is, according to Sinha (2016, p. xii), because Sraffa wants to build his theory drawing on observable variables, and so prefers to leave aside psychological aspects which are unobservable. Another aspect Sinha (2016, pp. xii–xiii) highlights is that Sraffa sees the economic system as an interconnected system, in which one cannot draw an arrow of causation from costs to prices. Thus, prices play no role in a causal explanation of equilibrium, and their only role is to account for the distribution of net output in terms of wages and the rate of profits. Sinha (2016, p. xiii) criticises Pierangelo Garegnani and his followers, and Paul Samuelson and his followers, for thinking otherwise, and trying to frame Sraffa's analysis in terms of a system of equilibrium in a competitive market economy. Sinha (2016, p. xiii) argues that Sraffa's assumption of an equal rate of profits was a logical necessity or a mathematical property, rather than the outcome of any tendency towards equilibrium.

After outlining his main thesis in the preface, Sinha provides in the first chapter of the book a prologue where he addresses the literature with which Sraffa engaged in the book, starting with what Sinha sees as the classical paradigm, and moving on to what Sinha sees as the post-classical paradigm that emerged after the marginalist revolution. The second chapter of the book explains Sraffa's thinking before outlining his equations in 1927 and 1928, the equations which ultimately led to his 1960 book. In the next chapter, Chapter 3, Sinha describes Sraffa's equations and the methodological issues underlying them, and finishes this chapter with a critique of the interpretation of Sraffa's methodology provided by Heinz Kurz and Neri Salvadori (2005).

Chapter 4 focuses on Sraffa's interpretation of his work on his equations and on their significance, in order to focus on the edition of the works and correspondence

of David Ricardo for the Royal Economic Society . In this chapter, Sinha also focuses on the relationship between Sraffa and Wittgenstein, while addressing many of the philosophical topics they discussed. Chapter 5 addresses Sraffa's subsequent work leading to his 1960 book, while highlighting the influence of Marx on Sraffa, and Sraffa's development of his Standard system. In doing so, Sinha criticises the interpretation provided by Gehrke and Kurz (2015) and by Kurz and Salvadori (2005) on Sraffa's adoption of a share wage concept. Sinha also criticises the interpretation of the Standard system provided by Garegnani and (what Sinha sees as) his followers, and also criticises (in this order) the interpretations provided by De Vivo (2003), Gilibert (2003, 2006), Bellofiore (2008) and Carter (2014).

In Chapter 6, Sinha discusses Sraffa's interpretation of the contribution of Ricardo, and in Chapter 7 Sinha finally addresses Sraffa's 1960 book, *Production of Commodities by Means of Commodities*. In this chapter, the role of the Standard system is again emphasised, and Sinha (2016, pp. 214–5) refers to interpretations of Sraffa by Joan Robinson (1985), John Hicks (1985) and Amartya Sen (2004) who, like Sinha, also do not relate Sraffa's condition of a uniform rate of profits to the assumption of equilibrium. The book finishes with a small epilogue, in which it is again emphasised that the key contribution of Sraffa was not pointing out the possibility of re-switching. Rather, Sraffa's contribution lies in the revolutionary economic theory he presents.

In this small epilogue, Sinha raises the question of how Sraffa's system adjusts when it is not in equilibrium in the very last paragraph of the book. Here Sinha (2016, p. 230) suggests a 'Keynesian quantity adjustment mechanism without any need of an unnecessary assumption of fixed prices,' while also noting the possible inconsistency between Keynes' emphasis on the role of psychology and Sraffa's emphasis on purging psychological elements from his theory.

After reading the book, one can see that Sinha disagrees with many scholars in the Sraffian community. But the greatest disagreement is with the perspective of Garegnani, and those that Sinha sees as Garegnani's followers. This disagreement concerns the use of the notions of gravitation and equilibrium. Sinha contrasts Garegnani's methodology with that of other scholars such as Amartya Sen and Joan Robinson whose interpretation of Sraffa, Sinha argues, is similar to his own in important aspects. To understand Sinha's thesis, and its context within Sraffian scholarship, it is now necessary to explain in more detail his interpretation of Sraffa, which is centred on the role of what Sraffa sees as the geometrical approach.

3. Geometry and mechanics

A very important part of the argument presented in Sinha's (2016) book is concerned with Sraffa's philosophical and methodological views, which are rightly seen as quite essential for interpreting Sraffa's theory. Sinha (2016, p. 194, n. 9) refers to Sen's (2003) remarks on how Sraffa was concerned with a broader notion of determination, where the emphasis is on the coherence of the whole system, and where by looking at a part of a system one can determine what is the case in other parts of the system. Thus, by looking at observable entities such as quantities produced according to a given technology and either the profit rate or the wage rate, one is able to determine the prices of the system. Such an exercise, Sen (2004) argues, is different from exercises drawing on causation. And to understand the difference between determination

and causation, it is necessary to understand the distinction between geometry and mechanics.

Sinha's interpretation of what Sraffa meant by the difference between a geometrical theory and mechanical theory becomes clearer in Chapter 3. A geometrical theory, as can also be seen by Sraffa's manuscripts, for example, those presented by Sinha (2016, p. 64), refers to an instant in time, and refers to a logical problem that must be solved by the theory of value. A mechanical theory, in contrast, refers to processes that happen in real time, in which causation is involved, and must be addressed through a theory of industrial fluctuations. This is also connected to the distinction between a difference between two instants (in which time is absent in each instant), and a change that takes place through time, also discussed by Sinha in Chapter 3, which is also expressed in Joan Robinson's distinction between logical time and historical time. Sinha argues that Sraffa's emphasis on a geometrical theory, in which time is absent, and in which the emphasis is on logic rather than causation, must be incompatible with the idea of equilibrium, which presupposes an adjustment that takes time, and is explained within a mechanical theory. Sinha also highlights how Sraffa's interest in natural sciences, and quantum physics in particular, influenced his development of a geometrical theory focused on logical relations.

Sinha addresses the distinction between geometry and mechanics drawing only on Sraffa's unpublished manuscripts, but in order to assess Sinha's thesis, it is perhaps useful to understand this distinction in a broader mathematical and philosophical context, which has been very influential in Cambridge since the days of Isaac Newton at least. In fact, the distinction between geometry and mechanics is very old and, as Newton notes in his preface to the *Principia*, goes back to the ancient Greek mathematicians, as can be found in a manuscript by Pappus which Newton discusses at the beginning of the preface of his *Principia* (in Cambridge, Cambridge Platonists like Ralph Cudworth were already basing their theories on the geometry of forms before Newton). Newton notes that geometry is often associated with perfect accuracy, while mechanics is associated with less accuracy. But according to Newton, it is the artificer (the person who performs mechanical activity), rather than mechanics itself, who is to blame for lesser accuracy. Geometry, for Newton, is founded on mechanical practice, and it is through mechanics that lines are drawn, while geometry presupposes lines to be already drawn. Geometry is, for Newton, a part of universal mechanics which accurately proposes and demonstrates the art of measuring, even if they are usually distinguished by taking geometry to mean exact measurement at an instant in time, while mechanics is not necessarily exact and refers to activities taking place through time.

This distinction between mechanical activity taking place through time, and geometrical measurement at a moment in time, seems indeed very close to what Sraffa has in mind when distinguishing geometry and mechanics. Sraffa's own approach to the problem is that rather than focusing on the effects of a given change on another change, as Alfred Marshall does through causal analysis, we should rather focus on the conditions for the reproduction of objective economic phenomena at a given moment (a given instant) in time. That is, we abstract from time, and look at an 'instantaneous photograph' of the economy—to the best of my knowledge, the idea that Sraffa's system provides an 'instantaneous photograph' of the economy, which is supported by textual evidence from the Sraffa Papers, was first pointed out by Alessandro Roncaglia (1978).

Sraffa's philosophical and methodological approach to the problem can be seen more clearly once we take into account Sraffa's interest in the ideas of various scientists who focus on the problem of interconnectedness: Those scientists come to the conclusion that there are no ultimate particles of matter, which means that forms or shapes described by equations seem to be, if any such exists, the ultimate nature of reality, as Sinha (2016, pp. 72–82) notes. That is, science ultimately studies not objects nor particles, but the relations, shapes and forms that emerge, which are to be described through mathematical equations, a point noted by Henri Poincaré when discussing the connections between mathematics and physics (Sinha, 2016, p. 73).

In this regard, Sinha (2016) notes that Sraffa read several contributions on physics, such as Erwin Schrödinger's (1952) *Science and Humanism* (Sinha, 2016, p. 73, n. 4), Heinrich Hertz's (1899) *Principles of Mechanics* (Sinha, 2016, p. 72), Percy Bridgman's (1927) *Logic of Modern Physics* (Sinha, 2016, p. 73), and in 1929 Sraffa read A. S. Eddington's 1927 Gifford Lectures, published in 1928 as *The Nature of the Physical World* (Eddington, 1928), and indeed met Eddington (Sinha, 2016, p. 75). Sraffa's study of Eddington's (1928) book (and Sraffa's interest in quantum physics in general) had also been noted before by Kurz and Salvadori (2005), who also point out how in April 1928 Sraffa studied and annotated in much detail A. N. Whitehead's *Science and the Modern World* (Whitehead, 1926).

In short, Sraffa's method is to focus on a given instant in time, where such an approach is seen as a geometrical one. The reference to geometry in this context fits well with Newton's remarks on measuring with perfect accuracy something at a moment in time. But the evidence provided by Sinha, and other evidence on Sraffa's unpublished manuscripts (Kurz and Salvadori, 2005) suggests that Sraffa's emphasis on a geometrical theory was developed not so much with Newton in mind, but especially after his readings on quantum physics, even if Sraffa also read more philosophical approaches to the topic such as Whitehead's (1926). So one can conclude that Sinha's (2016) reference to the geometrical approach certainly captures a very important aspect of Sraffa's philosophy and methodology (see also Martins, 2013, pp. 43–4, on Sraffa's geometrical approach).

4. The ethnological or anthropological approach

It must be noted that despite his references to a geometrical approach at a philosophical and methodological level, the branch of mathematics actually employed by Sraffa (1960) is arithmetic, within a constructivist approach to mathematics (Velupillai, 2008; Martins, 2013). Sraffa uses no differential calculus, and indeed seems to reject its use in economics, given his critique of Marshall's use of Newton's and Leibniz's differential calculus (Martins, 2013). And while Sraffa (1960) occasionally uses geometry, this is done only to illustrate arithmetical results. A geometrical approach is followed essentially at a philosophical or methodological level, and the central tenet of such a geometrical approach is that the theoretical measurement of proportions must be undertaken in an exact way, by looking at what happens at a moment in time .

An important question, however, is how to apply the geometrical method when studying the real world. This is not an immediate concern of Sraffa's (1960) theory. But it is a problem to be addressed by whoever wants to apply Sraffa's theory when studying the real world. Sinha (2016, p. 230) suggests, in the very last paragraph of his

book, that we draw upon Keynes's theory in this regard, while proposing it as a way for explaining the adjustment of Sraffa's system towards equilibrium. It must be noted, however, that the idea of adjusting to equilibrium that Sinha (2016, p. 230) seems to be presupposing may be conceding too much. It can happen that the economy is never adjusting to an equilibrium, if any such exists. I return to this topic below, when addressing Sinha's critique of the classical notion of gravitation, which Sinha interprets in terms of a neoclassical notion of equilibrium.

Furthermore, the role of psychology in Keynes's theory is another obstacle, given Sraffa's emphasis on purging economics from subjective aspects, as noted by Sinha (2016, p. 230). This raises the question of how to address the human element when drawing on Sraffa's contribution. If psychological aspects are to be left aside, how can we address human agency? Sraffa's discussions with Wittgenstein, which are addressed by Sinha (2016) in Chapter 4 of this book, can shed some light on this issue, especially if we take into account what Wittgenstein saw as the ethnological or anthropological perspective he learned from Sraffa.

As Sinha (2016, pp. 101–9) writes, Sraffa thought that in order to understand human behaviour, one would have to be in close contact with the specific situation a given human being is facing. Thus, as Sinha (2016, p. 102) notes, Sraffa points out that he cannot conceive of the idea of being a king, for he has no idea of what it means to be involved in such a social position. On the contrary, Sraffa writes that he certainly can say something about being a lecturer, since he is familiar with such a situation (Sinha 2016, p. 102). To better understand a social position, and the associated language game, to use Wittgenstein's (1963) term, it is important to be a part of it, as in ethnographical research often undertaken within social or cultural anthropology, where the subject is involved with the community being studied.

As Sen (2003, p. 1242) notes, drawing on Ray Monk's (1990) biography of Wittgenstein, Wittgenstein told Rush Rees that 'the most important thing that Sraffa taught him was an "anthropological way" of seeing philosophical problems.' Sen (2003, p. 1242) also notes that Brian McGuinness emphasises, when discussing Wittgenstein, 'the ethnological or anthropological way of looking at things that came to him from the economist Sraffa.' In this connection, it is important to remember that, as Gehrke and Kurz (2015, p. 149) note, 'Sraffa agreed with methodologists and ethnologists like François Simiand and Bronislaw Malinowski who had argued that the marginalist perspective of *homo economicus* on human nature and society could not be sustained,' even if, one should add, a study of Sraffa's manuscripts also shows that he was critical of Malinowski for not going far enough.

The critique of *homo economicus*, which is a critique of deductive economic theory built upon generalised premises on human psychology, is a recurrent theme in economics, which goes back at least to Cliffe Leslie's critique of economic theory based on a universal conception of the human mind. Leslie's (1876) critique was aimed at what Sraffa saw, following Marx, as a vulgarisation of political economy, which tries to deduce economic laws from certain universal postulates concerning the human mind. Leslie also stressed how Adam Smith had an approach that took historical context into greater account. The emphasis on historical context as opposed to universal economic theory deduced from universal psychological laws appears again in the *Methodenstreit* opposing Gustav Schmoller, who stressed the role of historical context, and Carl Menger, who provided a theory of value built upon human psychology.

Sraffa's critique of the use of psychological and subjective notions, together with his emphasis on specific context, seems to suggest that he would certainly not agree with any economic theory built upon subjective or psychological notions assumed to be universal. Rather, human agents must be seen in an ethnographical or anthropological perspective, in which one pays close attention to the overall context faced by the human agent, rather than assuming universal psychological laws regardless of ethnological, anthropological or historical context. It is probably for this reason that Sraffa was sceptical concerning Keynes' (1936) use of general psychological laws in economic theory.

Furthermore, as Sinha (2016, p. 107) notes, Sraffa told Wittgenstein that intuition, or subjective elements in general, are connected to a way of acting, and science is instead a way of knowing. For Sraffa, actions are an object of explanation, rather than something that requires a rational justification, as presupposed when explaining human behaviour in terms of whatever is regarded as rational behaviour. But this does not mean that one cannot draw upon Keynes's contribution when addressing the human agent in connection to Sraffa's objective and geometrical theory, as Sinha (2016, p. 230) suggests we should. While Keynes (1936) presents his theory in terms of psychological laws, as Sinha notes, I would argue that Keynes' approach is ultimately underpinned by his view of human conventions, a view that is very different from the view that underpins the notion of rationality presupposed in the *homo economicus*. And human conventions refer to the more stable and persistent aspects of human behaviour, shaped by a given social and cultural context, as emphasised by ethnographers when studying a given community.

So the ethnographical or anthropological mode of reasoning is not entirely disconnected from Keynes's own approach, if we focus on the role that conventions have for Keynes (1936), as highlighted especially in Chapter 12 of his *General Theory*, rather than on the psychological laws that appear in other chapters of the *General Theory*. This is, of course, connected to the well-known discussions in the post-Keynesian literature, on whether Chapter 12 of Keynes' *General Theory* must be seen as the key to understanding the whole book.

If we want to focus on human conventions, Chapter 12 must indeed be seen as the central chapter of Keynes' (1936) *General Theory* (Favereau, 1988). And once we put the emphasis on conventions, several key notions of economic theory used by Keynes must be interpreted consistently with such an approach. Thus, when suggesting drawing on Keynesian analysis in connection to Sraffa's theory, Garegnani (1979A) emphasises the need of adopting a conventional view of the rate of interest, rather than drawing only on psychological notions such as liquidity preference. Since Sraffa (1960, p. 33) leaves the rate of profits as an exogenous aspect to be determined by the money rate of interest, it certainly constitutes an appropriate entry point for combining Sraffa's theory and Keynes' analysis, which can be best achieved once the rate of interest is seen as a conventional phenomenon, not rooted in secure knowledge (Garegnani, 1979B, p. 186).

Sinha's (2016, p. 66) discussion on the connections between the rate of profits and the rate of interest in Sraffa's analysis and in classical analysis is not entirely clear, so it is difficult to know which route he would follow when addressing these topics. The connection between Sraffa and Keynes is, however, a topic that Sinha (2016, p. 230) leaves as a future challenge. Furthermore, the approach of Garegnani outlined above as

a possible solution for the synthesis between Sraffa and Keynes is one of the most criticised, if not the most criticised, interpretation of Sraffa's theory addressed in Sinha's (2016) book. However, this does not seem to be connected to Garegnani's emphasis on the role of human conventions. Rather, this happens because of Garegnani's use of the classical idea of gravitation, which Sinha interprets in terms of equilibrium. Sinha (2016) sees Sraffa's geometrical approach as essentially incompatible with gravitation, interpreted in terms of equilibrium. I turn now to this important question, which is quite central to Sinha's book, and to research on Sraffa's method in general. But before doing so, it is also necessary to discuss in more detail what the classical authors meant by gravitation, and the way in which gravitation was subsequently interpreted in terms of equilibrium.

5. Gravitation and equilibrium

The ethnographical or anthropological approach can also provide some guidance for finding out how to apply Sraffa's geometrical method in the real world. If we want to apply the geometrical method to empirical reality, a possibility consists in finding an analogue of an instantaneous photograph that persists through time. A possibility in this regard is to look at a normal position, which depends upon human conventions that persist. However, the word 'normal,' in this context, can only mean 'conventional,' that is, the outcome of conventional human activity, rather than an equilibrium which would be itself explained through mathematical analysis. In Sraffa's conception, mathematics is employed only to provide an exact description of the core conditions of reproduction of the economy at a given moment in time, rather than changes through time as human activity unfolds, as in mathematical descriptions of an equilibrium, or of adjustments towards an equilibrium. So the notion of gravitation around a normal position, if used at all, can then only mean a vague description aimed at capturing the fact that the economy is not always in the position outlined in the geometrical theory.

This conception of gravitation corresponds to the standpoint of the old classical economists from Smith to Ricardo, which is the standpoint Sraffa (1960, p. v) adopts. Gravitation, for the classical authors, meant a vaguely understood process taking place through time, rather than an equilibrium that can be mathematically modelled. The tendency to believe that all economic analysis must assume a mathematical form that presupposes closed systems, which is pervasive in contemporary mainstream economics, leads to the contemporary widespread belief that gravitation must be described in mathematical terms.

But closed systems exist typically in laboratorial situations, or in some aspects of celestial mechanics (Lawson, 2003). Gravitation can, at best, be described drawing upon a social analysis of human conventions that typically cannot be framed in mathematical terms, since when everything is changing at the same time in an interconnected world, we cannot employ mathematics (such as differential calculus) to model changes while assuming everything else to remain constant, as if we were in a closed system. Gravitation does not take place in the logical time of mathematical models, which the classical authors did not even use, but rather in historical time in which multiple factors often preclude any possibility of exact measurement.

The classical notion of gravitation was subsequently replaced by the neoclassical notion of equilibrium. The earlier conceptions of equilibrium of Walras and Marshall

were, however, still conceived in order to address processes taking place in the real world, through a long-period. This is especially the case with Marshall. But after Hicks' (1939) *Value and Capital*, the dominant notion of equilibrium used in neoclassical theory is no longer centred on the idea of a long-period equilibrium, but rather a conception in which the economy moves from a temporary equilibrium to the next one through a temporary equilibrium path. The Arrow–Debreu–MacKenzie approach to general equilibrium draws on this new approach to equilibrium (Petri 2004, ch. 4; Lazzarini, 2011, ch. 6; Garegnani, 2012; Dvoskin and Lazzarini, 2013; Martins, 2013, pp. 61–63). Such an intertemporal approach to equilibrium is even less realistic than the earlier notion of general equilibrium provided by Walras, and much less concerned with empirical reality than Marshall's partial equilibrium analysis.

In this context, it is then important to distinguish between: (i) the classical notion of gravitation; (ii) the earlier neoclassical notion of a long-period equilibrium; and (iii) the later neoclassical notion of an intertemporal equilibrium. The classical notion of gravitation cannot be adequately understood in terms of any of the neoclassical notions of equilibrium, even though it is often seen as similar to the early (Walrasian or Marshallian) neoclassical notion of equilibrium. But the only similarity between them is that both accept the idea that an average through time is relevant, a topic to which I return below. However, while in the classical approach gravitation is an historical process that cannot be explained in general drawing on mathematics, in the neoclassical approach mathematics is always seen as relevant for explaining changes towards equilibrium, either for explaining the conditions of equilibrium which shape the process through which adjustment processes must take place (as for Walras or Marshall), or the very process of adjustment from one intertemporal equilibrium to the next one (as in the Arrow–Debreu–McKenzie version of general equilibrium theory).

This is very relevant for understanding Sinha's (2016) critique of gravitation and the idea of a natural position, which is a central aspect of his book. Sinha (2016, p. 181) argues that the reason why Sraffa believes that classical political economy does not presuppose constant returns to scale is because Sraffa is trying to fit classical political economy into the 'frame' provided by Sraffa's theory, in which constant returns to scale are not assumed. But the reason may be that classical political economy, by not presupposing any notion of mathematical equilibrium at all, does not need the assumption of constant returns to scale, which would be necessary when providing a mathematical explanation of equilibrium.

In general, if outputs are regarded as an exogenous variable just as inputs are, as Sraffa (1960) assumes (within an approach aimed at capturing the standpoint of the old classical economists), there is no functional relation from inputs to outputs where the latter would be a dependent variable as it is the case in neoclassical equilibrium, and so the question of returns to scale is not even raised. Sinha seems to interpret this aspect of the classical theory in the same way as Samuelson, who always interpreted the classical standpoint in terms of a functional relationship from inputs to outputs that presupposes constant returns to scale—Samuelson's interpretation, which Sinha seems to follow in this regard, was probably influenced by his own research with Robert Dorfman and Robert Solow at the MIT on linear programming (Dorman et al., 1958).

In fact, the notion of gravitation that Sinha is criticising is a notion in which gravitation actually means equilibrium. This can be inferred from the fact that Sinha (2016, p. 120) refers to 'the equilibrium condition of classical economics' when arguing that

Sraffa's condition of an equal rate of profits is not connected to such an equilibrium condition. That is, gravitation is interpreted by Sinha in neoclassical terms, as a neoclassical equilibrium to be explained in (or through) the mathematical structure of the theory, rather than as an historical process that is not explained through mathematical analysis.

Furthermore, in the very last paragraph of his book, when suggesting a connection between Sraffa's theory and Keynes' analysis, Sinha (2016, p.230) actually raises the question of how Sraffa's system adjusts when it is not in equilibrium, which seems to presuppose that equilibrium must be brought into the analysis at some point, despite the fact that the mechanism which Sinha then outlines in this very last paragraph does not really presuppose any type of equilibrium. But in a strictly geometrical approach, the problem of adjusting to equilibrium would not even arise, and it can be argued that it is more reasonable to combine the geometrical approach with historical context (rather than with equilibrium analysis), as Joan Robinson (1985) suggests, and as is indeed done by Garegnani (1978, 1979a).

Of course, even if we accept that it is more reasonable to combine Sraffa's (1960) theory with historical analysis rather than with a mathematical equilibrium analysis, it still remains the case, as Sinha (2016) rightly emphasises throughout his book, that Sraffa (1960) is concerned with the mathematical properties of the theory in a geometrical approach, rather than with the historical processes that may be explained using the theory. In this regard, it is important to note that when Sinha (2016, pp. 202–3) discusses aggregates or averages in connection to Sraffa's (1960) system, he is describing geometrical proportions, such as what happens in the Standard system.

For example, when describing Sraffa's (1960) system, Sinha (2016, pp. 202–3) takes the average rate of profits to refer to a rate of profits in Sraffa's system which can be determined in a Standard system of certain geometrical proportions before prices are determined. But an average rate of profits in the sense of an average across industries at a moment in time in the Standard system is a 'geometrical' concept, which is different from an average rate of profits in the sense of an historical average through time, which is the average which is relevant for the notion of gravitation presupposed in the classical standpoint from Smith to Ricardo.

Marx, of course, refers already to an average across industries, and Sraffa's geometrical method, through which a Standard system is obtained, can be seen as a solution to this problem posed by Marx, which can then also be used for interpreting the standpoint of the classical authors from Smith to Ricardo. Thus, Sinha (2016, p. 171) notes that the evidence he found in Sraffa's notes of 1942–43 provides support to Pier Luigi Porta's (1986, 2012) long-standing thesis that Sraffa's interpretation of Ricardo is highly influenced by Marx's transformation problem. This is also connected to what Sinha (2016, p. 181) sees as Sraffa's tendency to fit classical theory into the 'frame' provided by Sraffa's (1960) theory.

But in order to avoid confusing Sraffa's geometrical theory with its possible application in historical time (such as the application undertaken by Garegnani drawing on the notion of gravitation), we must distinguish two meanings for the term 'average,' a term that Sinha uses when describing Sraffa's (1960) Standard system: (i) a 'geometrical' average pertaining to the properties of the (geometrical) Standard system, which is what Sinha (2016) means by 'average' when discussing Sraffa's system; and (ii) an historical average which is an average through historical time, which is the sense in

which 'average' is relevant for the classical authors from Smith to Ricardo, and is also employed by Garegnani, even if Garegnani's (1984) references to Marx often obscure this issue, since Marx also employs the term 'average' in the former sense in the context of the transformation problem. To see this more clearly, it is useful to address some further (and previous) discussions on the idea of 'averages' in economic theory and history, to which I now turn.

6. Geometrical averages and historical averages

In short, gravitation, as understood within the standpoint of the old classical economists from Smith to Ricardo, is connected to historical averages, rather than to geometrical averages. I am using the term 'geometrical average,' of course, not to denote what is usually meant in mathematics by a geometrical average (which requires multiplying numbers and then raising them to a fraction of one divided by the quantity of numbers multiplied, rather than summing them and dividing them by the quantity of numbers added as in an arithmetical average). In the mathematical sense, both (geometrical and historical) averages are arithmetical averages. Rather, I am using the term 'geometrical' in the philosophical sense Sraffa uses, to denote an arithmetical average concerning what Sraffa sees as 'geometrical' proportions in his system, that is, proportions at a given instant in time, which can be measured in an exact way, as in geometry.

As Sinha (2016) notes, Sraffa (1960) was essentially concerned with a geometrical approach when presenting his system of equations. Sinha's critique of the use of the notion of gravitation in terms of an equilibrium is very useful because it shows the inconsistency between the notion of equilibrium and Sraffa's geometrical approach. But this does not mean that gravitation, understood as an historical rather than an equilibrium phenomenon, is not a valid concept to use when applying Sraffa's geometrical theory in historical time, something that can be seen more clearly once we distinguish between a geometrical average and an historical average.

Since Sinha (2016, p. 214) mentions Joan Robinson's interpretation of Sraffa as an interpretation similar to Sinha's in some respects, while criticising, amongst others, especially Garegnani, it is no surprise that the issues at stake had already appeared in an exchange between Garegnani (1979B) and Robinson (1979), following Garegnani's (1978, 1979a) explanation of his approach to effective demand. In this exchange, Joan Robinson (1979, p. 180) argues that Garegnani's notion of long-period, and of a normal rate of profits in particular, is a difficult one to grasp, since it is not clear whether it is a future rate of profit, a past rate of profit, or a rate of profit that 'float[s] above historical time as a Platonic idea.' Garegnani (1979B, p. 185) stresses, in his response, that his normal rate of profits is the rate which being realised in the present as an average between firms and over time by those using the dominant technique.

But since Sinha's (2016) book is concerned with Sraffa's geometrical theory only, rather than with its application in historical time, he does not focus on averages over time, which are a notion relevant for the possible application of economic theory in the real world, to real historical processes involving causation, rather than a part of Sraffa's theory. It must be noted, however, that Sraffa did refer, in various notes from the summer of 1929, to the notion of 'average' when addressing causation. In line with his concern with purging economics from subjectivist or psychological notions, Sraffa argues that averages should be used for replacing expectations, since expectations depend on

averages, and averages are the objective fact from which subjective expectations are built (Martins, 2013, pp. 31–32; Marcuzzo, 2014).

Sraffa argues that what happens on average is the cause of expectations. Thus, rather than focusing on subjective expectations as the cause of an event, one can focus on the cause of the cause, that is, on averages, which are the cause of expectations, the latter being unnecessary for analytical purposes, since they are determined by averages, that is, by what happens on average. In fact, Sraffa goes as far as arguing that the average is a real entity, with an impact on human agents. This impact is felt on human conventions, which can be best understood through an ethnographical, or anthropological, approach, as noted above. The average is felt by human agents drawing on existing conventions, as the conventional, normal, or natural, situation.

In some of his unpublished notes, Sraffa interprets Smith's reference to natural prices as a reference to a purely physical relation, in the sense of a geometrical proportion, which is a fundamental aspect emphasised by Sinha. But there is no reason to believe that such a geometrical proportion cannot be found in historical time. Indeed, it is very clear that when Smith refers to ordinary or natural prices, for example, he refers to whatever is dictated by habit and custom. So only by allowing for the possibility of applying a geometrical theory to historical processes in the long-period would we be able to reconcile Sraffa's interpretation of Smith with what Smith actually wrote. This interpretation of 'natural' in terms of 'conventional' is also shared by Antonio Gramsci:

> Human nature is the ensemble of social relations that determines a historically defined consciousness, and this consciousness indicates what is 'natural' and what is not [and human nature is contradictory because it is the ensemble of social relations]. People also speak of "second nature"; a certain habit becomes second nature, but was the "first nature" really "first"? Is there not in this commonsense mode of expression some indication of the historicity of human nature? (Gramsci, 2007, p. 321)

This approach to what is 'natural' or 'human nature' is certainly in line with the ethnological or anthropological approach, in which human agency is understood in terms of specific historical context, which constitutes a real entity out of which averages are constructed—see Davis (2002) and Sen (2003) on how the ethnological or anthropological approach that Sraffa discussed with Wittgenstein can be traced back to Gramsci, and Martins (2017) on how the very idea of *form of life* usually associated with Wittgenstein (1963) was also used by Gramsci.

Averages are constructed out of unstable phenomena, due to the need of human beings for conventions and stability in general. In fact, as Garegnani writes in a joint paper with Attilio Trezzini, long-term averages and trends are the result of short-period fluctuations (Garegnani and Trezzini, 2010, p. 120), even if the latter are also influenced by the overall tendency reflected in the long-term trend, as Michal Kalecki (1971, p. 166) notes while regretting his own neglect of those long-term averages in his analysis of business cycles throughout his career, which are essential for understanding a dynamic system as a whole.

The connection between averages and cycles is also addressed by Sraffa, as Sinha (2016, p. 66) notes, when discussing how rates of profit can remain equal across industries without relying on theoretical explanations based on the notion of equilibrium. As can be found in a note from Sraffa that Sinha (2016, p. 66) discusses, Sraffa found the idea that capitalists move their capital towards more profitable industries when rates of profits are unequal too rationalistic, and this would certainly not be consistent with

his ethnological or anthropological approach, and the resulting critique of rationality assumptions underlying the *homo economicus*.

Rather, Sraffa found that a more convincing justification would be that when the value of a product is too high, its capital gets more rewarded with more interest. There follows an increase in the value of capital which compensates the increase in the value of the product, and thus an equal rate of profits, or rate of interest, is maintained across industries. This presupposes that capitalists keep consuming as usual, according to their conventional behaviour, in spite of higher profits, leading to higher investment. So there is no need of assuming that capital moved as the outcome of a decision of the capitalist when explaining the equality of the rate of profits, or rate of interest, across industries.

The fragment that Sinha (2016, p. 66) transcribes in his book comes from a note written by Sraffa while preparing *Production of Commodities* (the note is in the file D3/12/9, according to the catalogue prepared by Jonathan Smith, archivist, at the Wren Library, Trinity College, Cambridge). Sinha (2016, p. 66) refers to the text in page 9 of this file and part of the text in page 10 of the file. But the note continues through pages 10 and 11, and this other text that Sinha does not transcribe in his book (understandably since it is not directly relevant for the point Sinha is making in pages 66 and 67 of his book) is relevant for understanding Sraffa's overall approach at this stage. In page 11 of the file Sraffa notes that the idea that capitalists keep consuming according to conventions even when profits increase can be used to explain the accumulation of capital. In page 10 of the file Sraffa notes that the industries that have higher profits and accumulate more capital also increase the supply of the product, but presumably not enough to compensate for the fall in the rate of profits caused by the increase in capital and price variations. So Sraffa seems to presuppose a mechanical process through which rates of profits are equalised across industries, rather than taking it to be only a logical property of his geometrical theory. Sraffa is presupposing that the geometrical theory must be applied to the mechanics of the real world, where rates of profits are not always equal across industries, and an explanation of the mechanism through which they tend to become equal is necessary.

But this equalisation is explained by Sraffa in terms of conventional behaviour, rather than in terms of rational movements of capital across industries in an attempt to maximise profits, as in neoclassical equilibrium analysis. In fact, in this note Sraffa also argues that if there is any such movement of capital it simply hastens something that is already in itself a mechanical fact (the increase in the value of capital), and it creates a new phenomenon, which is the trade cycle. In this note, Sraffa presupposes that the increase of investment that initiates a trade cycle (a topic also addressed by Kalecki and Keynes, and quite central to post-Keynesian theory) springs from the differences between rates of profits across industries, which lead investment away from less profitable industries towards more profitable ones.

This seems to suggest that the trade cycle, a mechanical fact, can be explained drawing on the geometrical description of the economy provided in Sraffa's (1960) theory. The reference to the trade cycle above means that Sraffa seems to think that one can even explain mechanical aspects connected to change drawing on the geometrical description of the economy he provides. This means that even when studying processes taking place in time, the geometrical theory can still be of use. But it remains necessary

to distinguish between the geometrical theory, and the historical analysis that may be undertaken using it.

One can certainly agree with Sinha's (2016, p. 141) thesis that Sraffa's emphasis is on the idea that the 'distribution of income or the net output in terms of wages and the rate of profits could be taken as "given" from outside independently of prices,' an idea that opens the door for combining economic theory with an analysis of distribution where distribution is not determined by marginal productivity laws, as in neoclassical economics, but rather by institutional factors. But once we see distribution as an exogenous aspect from the point of view of economic theory, to be determined by institutions, we can then study those institutions, and human conventions in general, from an historical, ethnographical and anthropological approach.

This leads to a distinction between two modes of analysis when applying Sraffa's theory to processes taking place in time, which is in line with the two steps method suggested by Garegnani (1984, 1998) and Luigi Pasinetti (2005). Garegnani (1984, 1998) argues that Sraffa's theory provides a 'core,' at the level of 'pure theory,' to use Pasinetti's (2005) expression, which must be supplemented by what Pasinetti sees as further 'institutional analysis' or, as Garegnani (1998, p. 419) writes, by 'what Marshall used to call "specific experience"' (1920, p. 637). Marshall's (1923) emphasis on specific experience, and on having first-hand contact with industrial activity, is certainly in line with an ethnographical perspective, despite his use of a mathematical methodology which is criticised by Sraffa.

The role of human conventions, stressed by Garegnani (1978, 1979a), is also emphasised in Hicks (1985, p. 306) when interpreting Sraffa, an interpretation to which Sinha (2016, p. 214) also refers to in favourable terms. Hicks (1985, p. 306) notes that anyone familiar with price-fixing will know that the rate of profits used to establish a mark-up is a conventional one, and suggests that drawing on this insight one can interpret the uniformity of the rate of profits in Sraffa's system in terms of an uniformity of convention.

It may then be possible to reconcile the idea of an instantaneous photograph within a geometrical analysis of the economy with the idea of gravitation of market prices around natural prices. This can be done by taking gravitation to mean an accidental or temporary fluctuation around whatever convention dictates, a fluctuation which need not be explained in terms of equilibrium, nor in mathematical terms at all for, as Smith and Ricardo saw clearly, it may not even be possible to trace exactly the steps through which this accidental or temporal change takes place.

The distinction between geometrical averages and historical averages is relevant not only for the possibility of reconciling gravitation with Sraffa's geometrical theory, but also for the discussions surrounding Sraffa's hypothesis regarding 'geometrical' proportions between inputs and outputs (and its implications for the rate of profits), which Sinha (2016, pp. 138–44) addresses while criticising Kurz and Salvadori (2005), Gehrke and Kurz (2015), De Vivo (2003), Gilibert (2003, 2006), Bellofiore (2008), Carter (2014) and those Sinha (2016, p. 140) sees as the 'Followers of Garegnani' in general. These various discussions are ultimately connected to whether Sraffa's hypothesis concerns only his Standard system, or also its connection to the real world, where those proportions would be found. But this problem cannot even be framed before explaining the difference between the geometrical proportions of the Standard

system, with which Sraffa is concerned as Sinha (2016) notes, and what happens in the real world situated in historical time.

Sinha (2016, p. 142) writes when criticising Bellofiore: 'I'm inclined to think that here the major problem perhaps is with the language.' Albeit Sinha is referring to a more specific issue here, I would suggest that language is indeed a key problem. Language depends much on context, as Sraffa stressed to Wittgenstein, and a distinction between two meanings for the term 'average,' geometrical average and historical average, so as to distinguish geometrical theory and historical analysis, as Garegnani (1984, 1998) and Pasinetti (2005) suggest, can perhaps help reconciling the various ways of applying Sraffa's theory to the real world. While it is certainly true that Sraffa's emphasis was on a geometrical theory, as Sinha (2016) argues, there is also the need to connect such a theory to the real world, as Garegnani (1984, 1998) and Pasinetti (2005) have done, amongst others.

7. Concluding remarks

Like in the earlier *Methodenstreit* that took place between Gustav Schmoller and Carl Menger, and in many other instances in the history of economic thought, the divergence between Sinha and other Sraffians he criticises seems to lie in differences concerning the role of theory and history and, in this specific Sraffian *Methodenstreit*, between the role of geometrical theory, in which time plays no role, and historical time. Also, an emphasis on criticising opponents which is widespread amongst Sraffian authors, rather than on a construction of a consensus for an alternative economic theory, seems also to be a key tone of the Sraffian *Methodenstreit*, as it was the case between Schmoller and Menger.

Sinha's (2016) book is centred on a key aspect of Sraffa's theory, which is the geometrical method behind Sraffa's reasoning. By focusing on Sraffa's own method, Sinha's emphasis is on the proper way to interpret Sraffa's philosophy, methodology and theory. The key controversial aspect of Sinha's thesis would be, as the emphasis of his book seems to suggest, his critique of the notion of gravitation. But this is a result of Sinha's interpretation of the classical notion of gravitation in terms of the neoclassical notion of equilibrium.

This is, of course, a very widespread interpretation. But it does not seem to be Sraffa's interpretation, since Sraffa (1960, p. v) refers to his own standpoint as being the same standpoint of the old classical economists from Smith to Ricardo. And one can argue that it is not so much that Sraffa is misinterpreting classical political economy in terms of the frame provided by Sraffa's own theory, as Sinha suggests, but rather that classical political economy is often interpreted anachronistically in terms of neoclassical equilibrium analysis, and we certainly find this tendency in Sinha's book as well. If this is the case, we can also find that one important contribution of Sinha's (2016) book is to show that an equilibrium approach is inconsistent with Sraffa's view. But this also means that Sinha's critique is directed essentially at the neoclassical notion of equilibrium, rather than at the classical notion of gravitation.

It seems more consistent with Sraffa's (1960) approach, and with Sinha's (2016) overall thesis, to provide a purely geometrical theory, while bringing in time when undertaking historical analysis, rather than equilibrium analysis. Thus, Joan Robinson (1985, p. 165), whose perspective Sinha (2016) sees as broadly consistent

with his, argues, after providing a minimalist description of Sraffa's theory, that '[t]here does not seem to be much point in making further systematic generalisations,' for in Sraffa's theory we have 'a broad frame within which detailed studies of actual history can be carried out,' and '[t]his is where Sraffa leaves us and hands us over to Keynes.' For her, the end point of economic analysis should be conducted in historical time, and so there is need of no more than the minimalist sketch of economic theory she provides drawing on Sraffa's geometrical theory, which focuses on a given instant in time.

One could go even further, and argue that Sraffa's theory, rather than a revolution in economic theory as Sinha (2016) suggests in the title of his book, was essentially a prelude to a critique of economic theory, as Sraffa (1960) wrote in the subtitle of *Production of Commodities*. And the critique of economic theory would lead to a more historical, ethnological, and anthropological approach. This is connected to the old questions addressed in the *Methodenstreit*. We can certainly agree with Sinha (2016) when he writes that Sraffa rejects the idea that we can build an economic theory based on universal psychological laws of the human mind, a conception that was rejected by the historically oriented economists during the *Methodenstreit*, who wanted an economic theory built on the objective analysis of data, rather than subjective psychological laws.

But then again, a rejection of economic theory based on subjective or psychological laws need not mean a rejection of any possibility for economic theorising, nor that Sraffa would reject any type of economic theory. As Sinha (2016) notes, Sraffa was a great admirer of quantum physics, which seems to have inspired his geometrical approach. In this regard, one may wonder whether Sraffa would see his equations as an equivalent contribution to economics, in which case the aim would be not so much a rejection of all economic theory, but rather a rejection of subjective or psychological elements in economic theory, in order to give rise to a more objective economic theory. Numerous notes from the Sraffa Papers, including many that Sinha provides in his book, certainly hint in this direction. But Sraffa's published writings do not maintain this emphasis. In any case, we may say that whether Sraffa's contribution was a revolution in economic theory, as Sinha (2016) suggests in his book, or merely a prelude to a critique of economic theory, as Sraffa (1960) wrote, is still an open question.

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