



Analysis

Ecosystems, strong sustainability and the classical circular economy



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ABSTRACT

In this article I argue that notions such as ecosystem services and strong sustainability can be best understood and developed within the theoretical framework advanced by the classical political economists, in which a circular conception of the economy is provided. I also argue that the development of notions such as ecosystem services and strong sustainability has been constrained by the dominance of neoclassical economics, which provides a linear conception of the economy and leads to an emphasis on weak sustainability, which in turn springs from an emphasis on substitutability and aggregate capital. When assessing the relevance of classical political economy for studying ecosystem services and strong sustainability I consider not only the contributions of the classical political economists, but also more recent contributions which draw upon the classical perspective, such as Piero Sraffa's and Amartya Sen's.

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1. Introduction

I argue in this article that the classical circular conception of the economy leads to the development of a theory of value that highlights important differences between natural resources and manufactured capital, which can be combined with a conceptualization of strong sustainability in terms of the irreversibility of natural capital. This is so because in the classical circular conception, the emphasis is not on substitutability and aggregate capital, as in the neoclassical linear conception, but rather on the different logic behind the valuation of natural resources on the one hand, and manufactured capital on the other hand. By highlighting the different logic of valuation of natural resources and manufactured capital, the classical circular conception enables the development of a theory of value that takes strong sustainability and the irreversibility of natural resources into account within the very analytical core of the theory.

The neoclassical linear conception, in contrast, leads to a theory of value where valuation depends on the relative scarcity of aggregate capital regardless of whether it is natural capital or manufactured capital, and thus ultimately entails a notion of weak sustainability (Pelenc and Ballet, 2015). Ecological concerns must then be incorporated, if at all, through ad hoc assumptions, rather than within the very analytical core of neoclassical theory.

Furthermore, the neoclassical conception measures value in terms of a subjective mental metric, which means that the valuation of ecosystem services is centred on their impact on subjective human preferences,

rather than in terms of their impact in the circular process of biophysical and socio-economic reproduction. The neoclassical subjective theory of value stands in contrast to the classical theory of value, where value depends upon objective entities like land and labour time, which are shaped by the possibilities enabled by the ecosystem's biophysical processes.

The classical circular conception has not been entirely abandoned after the emergence of neoclassical economics as the dominant economic theory. Walsh (2000, 2003, 2008) and Putnam (2002) identify two important stages in a revival of classical political economy within the twentieth century. The first stage was undertaken by Piero Sraffa, who focused on the analytical structure of the classical circular conception. The second stage was undertaken by Amartya Sen, who focused on the classical moral philosophy (see also Putnam and Walsh, 2012; Martins, 2013b).

Sen's contribution led to the capability approach (Sen, 1999; Nussbaum, 2000), which has been further elaborated by various authors after the pioneering contributions of Sen and Nussbaum, and several textbooks have been published (Comim et al., 2008; Deneulin and Shahani, 2009) which capture such developments. A particularly interesting direction in which the capability approach has been developed has been in connection to sustainability economics (Rauschmayer et al., 2011; Ballet et al., 2011; Martins, 2011, 2013a; Scerri, 2012; Birkin and Polesie, 2013; Ballet et al., 2013; Demals and Hyard, 2014; Lessmann and Rauschmayer, 2014) and ecosystem services (Polishchuk and Rauschmayer, 2012; Pelenc and Ballet, 2015).

Some of these contributions to the capability approach have focused on key notions to be elaborated here, such as the classical circular conception (Martins, 2013a), strong sustainability (Pelenc and Ballet, 2015), and the valuation of ecosystems (Polishchuk and Rauschmayer,

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2012; Pelenc and Ballet, 2015). But no contribution so far has provided a unified view of how those notions can be successfully integrated into a theory that takes strong sustainability and the constraints posed by the ecosystem's biophysical processes into account in its very analytical structure. Here I shall focus on this aspect, by showing the relevance of the analytical structure of the classical circular conception for understanding strong sustainability and the valuation of ecosystem services.

2. Ecosystem Services and Economic Theory

Ever since the concept of ecosystem services started to gain prominence in the academic literature (Ehrlich and Ehrlich, 1981; Ehrlich and Mooney, 1983), it quickly became a central notion in framing our attitude towards the environment (Norgaard, 2010). Within the vast literature that emerged, it became convenient to systematise the various types of ecosystem services. An important notion in this regard is that of *supporting ecosystem services*, which refers to the internal functioning of natural systems, including the various natural cycles of nutrients, water, and changes in soil and atmosphere, for example (Pelenc and Ballet, 2015). Supporting ecosystem services provide a viable habitat for various species, including the human species, leading to what can be termed as *direct ecosystem services* (Pelenc and Ballet, 2015). Ecosystem services are also sometimes classified according to various *functions* performed by ecosystems, such as the regulatory, habitat, production and information functions (de Groot et al., 2002).

The notion of ecosystem services has been instrumental in presenting Nature as a stock of capital that can provide only a limited number of services (Costanza and Daly, 1992; Norgaard, 2010). But its use in connection to neoclassical economics led to a tendency to the commodification and monetization of ecosystem services, where this tendency is related to the very evolution of economic theory, from classical political economy to neoclassical economics (Gómez-Baggethun et al., 2010).

There are various ways in which the adoption of the neoclassical theory of value constrains our ability to address adequately ecosystem services and strong sustainability. Firstly, the use of a subjective mental metric in neoclassical economics leads to the valuation of ecosystem services in terms of subjective preferences that may change, and may not reflect the biophysical constraints at stake. In the classical conception, in contrast, value depends upon objective entities like land and labour time, which stand in a close relationship with biophysical constraints. Secondly, the use of homogenous aggregate capital in neoclassical economics, while assuming that there is a high degree of sustainability between natural and manufactured capital, leads to the neglect of the specific problems posed by natural resources, and towards a concern with weak sustainability only. In the classical conception, in contrast, the differences between natural resources and manufactured capital are taken into account into the analytical structure of the theory, in a context where only natural resources are scarce, while manufactured capital is of an entirely different nature since it is reproducible. This aspect of the classical theory means that a notion of strong sustainability can be more adequately accommodated in the classical theory of value. Finally, the overall representation of the production process in neoclassical economics is a linear conception, where supply is provided in order to satisfy human demand, which is characterized in terms of non-satiable subjective preferences. In the classical conception, in contrast, human beings are part of a circular process of reproduction that takes place within the limits set by natural constraints.

This means that the classical circular conception provides a more adequate approach to the valuation of ecosystem services, to strong sustainability, and to the overall representation of the production process as part of the biosphere. I will now elaborate these claims in more detail. To do so, I will now explain how the theory of value evolved throughout the history of economic thought, and the implications of this evolution for our conception of ecosystems, and for how we approach the specificity of natural resources and its implications for strong sustainability.

2.1. The Circular Conception of the Economy of the Classical Authors

The term *classical political economy* was coined by Marx (1867), who defined it as a tradition of economic thought going back to William Petty, which has Adam Smith and David Ricardo as its key exponents. The conception of the classical authors pointed towards land and human labour as the source of wealth and value, as can be found in the writings of Petty (1899), who famously argued that land is the mother, and labour is the father of wealth.

But Petty also argued that we could measure human labour in terms of the quantity of land that is necessary for the subsistence of the labourer (for obtaining food, cloth and lodging) during the quantity of time in which labour is performed. This means that according to Petty, we can actually measure wealth in terms of the quantity of land available, that is, in purely objective terms, where land is the key reference point for the explanation of wealth. The quantity of land required for production provides an objective measurement of the cost of production. We can find the value of rent, which constitutes the surplus, by subtracting the produce of land necessary to sustain the labourer and the overall activity of production, from the total produce of the land.

Richard Cantillon, drawing on Petty, also focuses on land and labour, and argues that land is the matter and labour is the form of wealth (see Berg, 2015). And like Petty, Cantillon also notes that we can measure labour in terms of the land necessary to sustain the labourer. That is, Cantillon also provides an approach where we can study wealth focusing on land as the key reference for measuring wealth and value. But Cantillon argues that we must go beyond the mere measurement of wealth, and look at the causes of wealth, while criticizing Petty for focusing on effects and failing to understand causes.

The topic of the causes of wealth was further developed by François Quesnay, whose key contribution, the *Tableau Economique*, contains many similarities to Cantillon's approach. Quesnay argues that land is the origin of the surplus. In particular, Quesnay sees agriculture as the only sector that produces more than what it needs to reproduce itself, that is, it is the only sector which produces a surplus, which can be found as rent. Quesnay sees artificers, manufacturers and merchants as unproductive classes, who merely reproduce whatever capital they receive. Farmers and country labourers employed in agriculture, in contrast, do not merely reproduce, but also generate a surplus, which appears in the form of rent. Quesnay provides the first systematic description of the economy as a circular process of reproduction, in which agricultural work on land is the basis for wealth and prosperity.

Smith (1999[1776], pp. 388) wrote that Quesnay's economic theory is probably the nearest approximation to truth that had ever been published in political economy. However, contrarily to Quesnay, Smith argues that it is not only agriculture, but also other sectors, that contribute to the economic surplus, through the division of labour. Smith notes that in more primitive communities, we can see more clearly the contribution of the labour of an individual to the value of the commodities produced and used by the individual. But as the division of labour becomes more complex, it becomes very difficult for an individual to produce all commodities needed. Therefore, many commodities will have to be purchased in a market, and the labour one can command becomes the more appropriate measure of value, which denotes the power an individual has to purchase the labour of others.

Smith's conception leads to a switch of emphasis from land to labour as the source of value, as Gómez-Baggethun et al. (2010) also note. This leads, in turn, to a conception where the emphasis is on the human efforts and power to control natural elements and other individuals (whose labour can be purchased). In fact, Smith (1999[1776], pp. 37) cites approvingly Thomas Hobbes's claim that wealth is power, that is, the power to purchase the labour of others. Smith notes that corn provides an approximate measure of value in the long (or indeed secular) period, but he also argues that labour commanded provides a more exact measure.

Ricardo (1821), drawing upon Smith, puts again much emphasis on agriculture, which is seen as the sector that governs the rate of profits for the whole economy. Ricardo, like all the classical authors who take agriculture to be the central aspect of economic theorising, sees the economy as a circular process (Sraffa, 1960). Within this circular process, agriculture is the only sector where outputs can be used also as inputs (in Ricardo's example, corn can be used to produce more corn which constitutes also the sustenance of the labourers). So even if competition lowers the prices of all outputs in all sectors, in agriculture a surplus can still be maintained since the cheaper outputs are also used as cheaper inputs (Sraffa, 1960). And if the rate of profits in a given sector becomes lower than in agriculture, the capitalists will transfer capital to agriculture instead, where this process, driven by competition between sectors, makes the rate of profits of all sectors tend to the rate of profits in agriculture.

The rate of profits in agriculture, in turn, depends upon the physical productivity of land. As the productivity of land decreases due to more intensive and extensive use (which at some point must force agriculture to move into less productive lands), the rate of profits of agriculture, and thus of the whole economy too, will also decrease (Martins, 2013b). This means that the fate of central economic magnitudes depends upon the ecosystem, since it is the physical characteristics of land that determines the rate of profits in the whole economy, and its foreseeable decline.

Ricardo also argues that the appropriation of natural resources, such as more fertile lands, enable the appropriation of rent, which Ricardo defines as the difference between the productivity of a given land and the productivity of the worst land cultivated. Whatever surplus rate the worst land yields is defined by Ricardo as the common or general rate of profits. More productive lands, in contrast, yield also a rent according to their productivity, in addition to the common or general rate of profits (Martins, 2013b).

Ricardo's contribution provides a development of the analytical structure of classical political economy where we find a theory of value that highlights the distinction between natural capital and manufactured capital. Ricardo (1821) notes that when more commodities can be manufactured, prices tend to the cost of production, since more demand can always be accommodated through an increase in supply. As Sraffa (1960) notes, the classical conception developed by Ricardo is one where manufactured capital that can be reproduced yields the common or general rate of profits if there is competition.

But land and natural resources, which cannot be further reproduced, yield, in addition to profits, a rent. And this rent is governed by different principles from those which govern the profits of manufactured capital. Land and natural resources yield a rent because they are scarce. Manufactured capital is not scarce, and thus its value is not governed by the principle of scarcity, but rather by the cost of production (Martins, 2013a).

Ricardo believed that the distinction between profits and rent, and the different principles that govern them, which are a consequence of the difference between manufactured capital and natural resources, constitutes the most important distinction in political economy. The classical theory of value includes the distinction between manufactured capital and natural resources in its very analytical core, in a context where this distinction becomes expressed in the difference between profits and rent.

Although elements of the circular conception appear already in the writings of Petty and Cantillon, they are outlined in a clearer way in Quesnay's writings, as Marx notes. Thus Sraffa (1960, pp. 93) writes "It is of course in Quesnay's *Tableau Economique* that is found the original picture of the system of production and consumption as a circular process, and it stands in striking contrast to the view presented by modern theory, of a one-way avenue that leads from 'Factors of production' to 'Consumption goods'." But once the circular conception is replaced by a linear conception leading from "factors of production" to "consumption goods", as in modern economic theory, the place of

ecosystems in economic theory, and the notion of sustainability used in economic theory, becomes radically different, as I shall explain now.

2.2. Supply and Demand in the Linear Conception

As noted above, Adam Smith's emphasis on labour as the source of value opens the way for a different attitude towards ecosystems. But the definitive abandonment of the circular conception starts with Thomas Robert Malthus, who criticises Ricardo's theory of value. Ricardo, like the classical authors before him, argues that prices tend to the cost of production, where production is seen as part of a circular process. Supply and demand, for Ricardo, as for Smith, are merely accidental forces that drive the market price away from the cost of (re)production, which governs the natural, or ordinary, price.

Malthus (1820), in contrast, argues that supply and demand are not merely accidental forces, but rather the ultimate causes of value. Malthus's position on this matter became the dominant position throughout the history of economic thought, especially after Marshall (1890) adopted the same view in his *Principles*. Marx (1867) employed the term *vulgar economy* to designate what he believed to be a superficial study of supply and demand stemming from Malthus, which stands in contrast to the classical study of the underlying conditions of socio-economic reproduction undertaken by various economists from Petty to Ricardo.

Once supply and demand become the key concepts in the explanation of value, important implications follow. In the classical conception, the human agent is seen as part of a circular reproduction process that transcends the human individual, and where ecosystems play a key role. To see the key role of ecosystems, one need only note that in the classical approach from Petty to Ricardo the fate of the whole economy depends upon agriculture, as it can be seen in a clearer way in authors where the circular conception is systematised more explicitly, such as Quesnay. The classical emphasis on land and agriculture can be easily and naturally extended to the contemporary analysis of direct and supporting ecosystems.

In the "vulgar" conception, in contrast, natural resources are part of a supply which exists in order to satisfy human demand, which is defined in terms of subjective preferences. Commodities, and the natural resources necessary to produce them, are now valued increasingly seen in terms of the satisfaction of the subjective human desires that they provide, rather than in terms of the objective natural resources consumed in their (re)production, as it was the case for the classical authors. In this context, the cost of production starts to be understood in subjective terms, namely, in terms of the subjective effort, or sacrifice, necessary to produce a commodity, by authors like Nassau William Senior or John Elliot Cairnes. This leads towards a conception where the cost of production is interpreted in terms of subjective sacrifices.

It is not only supply, but also demand that is increasingly interpreted in subjective terms. For classical authors like Smith and Ricardo, the effectual demand for a commodity is seen in objective terms, as the demand of those who possess the objective means of purchasing the commodity. But several contributions emerged afterwards in which demand is driven essentially by subjective factors. Hermann Heinrich Gossen and Jules Dupuit note the role of subjective preferences in shaping demand, and the role of demand on value. This aspect is further developed in the marginalist revolution undertaken by Stanley Jevons, Carl Menger, Léon Walras and Alfred Marshall, who argue that value depends upon the subjective preferences of the consumer. The marginalist revolution leads to the emergence of neoclassical economics, shaped around the contributions of the marginalist authors.

This leads towards a linear (as opposed to circular) approach, where economic activity is seen as a one-way avenue from supply to demand, that is, from factors of production to consumption goods, as noted by Sraffa (1960). The satisfaction of the subjective preferences of the human consumer becomes the goal of economic activity, and the appropriate measure of value. For the classical approach, in contrast, the goal

of economic activity is the efficient use of resources and commodities within a circular process of reproduction of socio-economic activity. As Maurice Dobb (1973, pp. 248) notes, the neoclassical approach which is developed after the marginalist revolution could be more aptly termed a “counter-classical” approach, given how opposed it is to the classical conception.

The contemporary emphasis on the subjective valuation of ecosystem services, which are commodified and monetised according to the subjective preferences of consumers, can be best understood in light of this transformation throughout the history of economic thought, after which ecosystems are no longer seen as the underlying condition of possibility for a circular process of socio-economic reproduction, but rather as the origin of the factors of production which are valued according to the satisfaction of subjective preferences brought by consumption goods that they enable one to produce.

As Gómez-Baggethun et al. (2010, pp. 1212) note, throughout the twentieth century land actually disappears from the factors of production in neoclassical theory, after Robert Solow (1956, pp. 67) provided the canonical neoclassical model of economic growth ‘assuming that there is no scarce nonaugmentable resource like land.’ This led to the neglect of natural capital which, unlike manufactured capital, is characterized by irreversibility (Costanza and Daly, 1992; Pelenc and Ballet, 2015). We can see how we have gone a long way beyond the perspective of such authors as Petty and Cantillon, who thought that all wealth could be measured in terms of land, or Quesnay, who thought that land is the source of all wealth, or even Smith and Ricardo, who placed agriculture at the centre of their analysis. Solow (1956, pp. 67) argues that including land in his model would lead to decreasing returns of a Ricardian type, and that it seems more natural to simply assume constant returns, while suggesting that more land can always be obtained at a constant cost.

Gómez-Baggethun et al. (2010, pp. 1212) note that Solow’s (1956) perspective presupposes that the ecosystem’s inputs can be substituted by manufactured capital. Substitutability between factors is indeed a central idea not only for Solow (1956), but for all neoclassical analysis (Marshall, 1890; Martins, 2013b). This leads to an emphasis on weak sustainability, where what matters is the sustainability of homogeneous aggregate capital (Solow, 1993), rather than natural capital in particular, as in the notion of strong sustainability (Pelenc and Ballet, 2015). This means that in neoclassical economics, notions such as critical natural capital, understood as the need to maintain the ecological functioning of natural systems above certain thresholds, are at best an external constraint, rather than an internal component of the theory. Within the analysis of the environment, the assumption of substitutability is emphasized in Environmental and Resource Economics, in line with the neoclassical approach, but not in Ecological Economics, as Gómez-Baggethun et al. (2010) note.

3. The Revival of Classical Political Economy

In the twentieth century, there was a revival of classical political economy, which had the Cambridge controversies in the theory of capital as its most important moment (Harcourt, 1972). In the Cambridge controversies, economists from the University of Cambridge (Cambridge, UK) such as Piero Sraffa and Joan Robinson advocated a return to the classical perspective, while economists from the Massachusetts Institute of Technology (Cambridge, Massachusetts) such as Paul Samuelson and Robert Solow, defended the neoclassical approach – see Harcourt (1972) and Martins (2013b) for an account of this debate. It is in the course of this debate that Solow (1956) presented his production function where labour and capital are the only factors of production, leaving land out of the production function.

The contribution of Sraffa (1960) within this debate can be seen as an attempt at a more systematic revival of classical political economy, as Ronald Meek (1961) argues – see also Joan Robinson (1985). Sraffa (1960) describes the economy as a circular process of reproduction,

and refers explicitly to Quesnay’s contribution as the first description of the economy as a circular process, as well as to the important developments of Smith, Ricardo, and also Marx, who Sraffa (1960) sees as the author who brought the classical perspective into its more advanced stage.

Sraffa’s (1960) conception of the economy as a circular process of production of commodities by means of commodities aims at a revival of the classical perspective while privileging the physicalist point of view of Petty, Cantillon and Quesnay (Martins, 2013b). Sraffa’s (1960) circular conception can be more easily combined with a study of the various biophysical cycles of ecosystems when addressing supporting ecosystem services, since the cost of production of the commodities used in the economic cycle is measured in physical terms, that is, in terms of the physical inputs consumed in the process.

A crucial question concerns which is the unit used to measure those physical inputs. As Kurz and Salvadori (2010, pp. 203) note, Sraffa mentions electricity in his unpublished writings. But Sraffa was aware that it is difficult to find one universal substance in terms of which everything else can be measured. For this reason, Sraffa (1960) advances the idea of a *standard commodity*, which is a mixed commodity, made up of the basic commodities necessary for the reproduction of the economy in a certain proportion. The prices of the basic commodities that constitute the standard commodity are those which ensure the sustainable reproduction of the system, within a *standard system* defined in terms of input-output analysis (Sraffa, 1960). Since the commodities included in the standard commodity are basic commodities, such a standard of value is consistent with the idea of strong sustainability.

Sraffa (1960) also recovers the classical distinction between the profits of manufactured capital and the rent obtained by land and natural resources, where the latter provides a more adequate concept for addressing the valuation of critical natural capital, connected to strong sustainability. Sraffa (1960) criticized the very idea of homogeneous aggregate capital advanced by Solow (which ultimately underpins the idea of weak sustainability), pointing towards an analysis of production that distinguishes various types of capital. Sraffa (1925, 1926) criticises the assumption that factors of production can always be easily substituted, and the Marshallian linear and subjectivist approach that became dominant within neoclassical economics (Martins, 2013b).

Walsh (2000, 2003, 2008) and Putnam (2002) argue that Sraffa’s contribution can be best interpreted as the first stage of a revival of classical political economy, centred on the analytical structure of the classical theory of value, while distinguishing between the basic commodities that are necessary for the circular reproduction process, and luxury commodities that constitute a surplus. An important question that arises in this connection, which Sraffa (1960) leaves open for further discussion, is the definition of a standard of living which is morally acceptable and consistent with the process of circular reproduction. Such a standard of living will have an impact on the valuation of commodities, due to the impact of wages on prices, and on the reproduction process as a whole, due to its impact on consumption, and thus on the quantity of commodities produced.

Walsh and Putnam argue that the capability approach advanced by Sen (1982, 1999) and Nussbaum (2000) can be seen as a second stage of the revival of classical political economy that addresses this problem, due to its concern with defining an adequate standard of living, while taking ethical values into account. Sen (2005, 2009) and Nussbaum (2003) agree with the interpretation of their capability approach provided by Walsh (2000, 2003) and Putnam (2002). Sen (2005) stresses, however, that a description of reality can be influenced by interests other than ethical values, and that our understanding of human well-being, while depending upon human conventions, must have some objective basis, a point also stressed by Nussbaum (2003).

Sen (1999, 2009) stresses his connection to Smith and the classical tradition more explicitly than Nussbaum (1992, 2000), who focuses instead on the connections to Aristotle and Marx. But Nussbaum also highlights important aspects for the connection of the capability

approach to classical political economy (especially if we include Marx in the classical authors, as Sraffa argues we should), and actually ends up doing so more systematically than Sen. In particular, Nussbaum (2000) argues that Sen should focus more explicitly on specific human activities when describing the standard of living. Nussbaum (2003) stresses the need to maintain a distinction between “basic commodities” and “gross luxuries”, a distinction that Sen also emphasized in his early work. Nussbaum (2003) accuses Sen of subsequently neglecting the distinction between “basic commodities” and “gross luxuries” by adopting a vaguer conception of freedom.

Basic commodities are those which enable the achievement of essential human capabilities, while gross luxuries are not necessary for such an achievement. Walsh (2003) notes that this distinction between basic commodities and gross luxuries corresponds to the classical distinction between the commodities which enable one to achieve a certain standard of living determined by necessity and custom, on the one hand, and the luxuries which are unnecessary for the achievement of such a standard of living, on the other hand.

Whatever is produced beyond the basic commodities necessary for the circular reproduction of the existing economy system constitutes a surplus, which can be reinvested in the transformation of the existing economic system, or wasted in luxury and unnecessary superfluities (to use Cantillon's expression). The subsistence wage, for classical authors like Smith and Ricardo, includes both the necessities and conveniences that enable the achievement of a certain standard of living, determined by custom, and does not denote bare biological survival. But it refers to an objective quantity, determined by the objective conditions of socio-economic reproduction in a circular process.

3.1. Scarcity and Surplus

When valuing surplus commodities, one must note that those commodities enable human beings to achieve certain functionings, where a functioning can be defined, according to Sen (1999) and Nussbaum (2000), as what a human being is or does. The set of human capabilities consists of the set of potential functionings that can be achieved by human beings, drawing upon the goods and services available. As Polishchuk and Rauschmayer (2012) note, the conversion factors highlighted by Sen and Nussbaum play an important role in transforming ecosystem goods and services into human well-being according to the capability approach, where human well-being is defined in terms of human capabilities.

As Sen (1982, pp. 367, *emphasis in original*) notes when first advancing the capability approach, “[m]y contention is that *even* the concept of *needs* does not get adequate coverage through the information on primary goods and utility.” Basic capabilities are aimed at providing the ground for a more objective discussion that takes needs into account as well. Sen's capability approach can be seen as an analysis aimed at answering the question of “what is human well-being?” (Martins, 2011). In such an analysis, Sen provides notions such as human functionings and capabilities, which help addressing the problem. But whatever is a valuable functioning or capability still depends on existing conventions in society, and thus must be discussed through public debate (Pelenc and Ballet, 2015).

Sen's idea of human capabilities is meant to provide a conception that takes into account value judgements made through public deliberation, noting how “personal preferences must be supplemented by certain established conventions of relative importance”, and where “ideas of relative importance are, of course, conditional on the nature of the society” (Sen, 1982, pp.368). As Sen (2009) came to recognize, such a process of public deliberation requires the possibility of achieving objectivity in public discussion. In this sense, democracy is important not only for ethical reasons, but also for epistemological reasons. Sen's (2009) perspective presupposes that we can achieve objectivity in such a debate, even if such objectivity is always a *positional objectivity*, that it, it depends upon our epistemological position.

The perspective advanced by Sen and Nussbaum, especially when interpreted as a revival of classical political economy, stands in contrast to the neoclassical approach, where it is assumed at the outset that human well-being is an irreducibly subjective phenomenon, and so subjective preferences must be taken as non-questionable data (that are revealed only through market exchange), rather than something to be further discussed through democratic debate. The capability approach can provide a different approach to our valuation of ecosystem goods and services, focusing on an objective discussion of the capabilities that those goods and services enable, rather than on a subjective valuation measured through a monetised metric.

The distinction between basic commodities and luxuries, recovered by Sen and Nussbaum (and also present in Sraffa's theory, as Walsh, 2003, notes), has important implications for our attitude towards ecosystems, which are radically different from those we reach if we take the neoclassical framework that emerged after the marginal revolution as a starting point. Under the neoclassical framework, subjective preferences are never satiated with any finite number of commodities. It is assumed that subjective marginal utility always increases when the number of commodities increases, albeit at a decreasing rate. Since the number of commodities in the economy is always finite, and so never sufficient to satisfy subjective preferences that, according to the neoclassical theory, are never satiated, in neoclassical theory all commodities are scarce. In the classical conception, in contrast, human beings become satisfied, or at least should become satisfied, with a finite number of basic commodities, which constitute the necessities and conveniences that enable the achievement of a certain standard of living, determined by custom, and to be distinguished from superfluous luxuries.

These different approaches lead to different attitudes towards ecosystems in a planet with finite resources. If we believe that human beings do become satisfied, or at least should become satisfied, with a finite number of basic commodities, we can approach the topic of sustainability in a different way than if we assume that human beings are never satisfied with a finite number of goods. Once we define the basic commodities that are essential for achieving a certain standard of living, the remaining part of production is a surplus, which can be used in luxuries, or reinvested in productive activities.

For the classical authors the central aim of political economy is the study of the distribution and use of the surplus, which has profound implications for the economy. As the classical authors argue, when the surplus is used essentially in productive activities, the economy flourishes. When the surplus is used essentially in gross luxuries, the economy and society enter into a stage of decadence. For the classical political economists the key analytical concept is the surplus, rather than scarcity, as in neoclassical economics. Scarce commodities, for the classical authors, constitute a particular case, such as that of rare commodities, artistic objects, and natural resources.

Land is the most prominent case of scarcity discussed by the classical authors. As Ricardo argues, more productive lands generate a rent because they are scarce. Scarcity is a specific property of natural resources, and this characteristic of the classical approach makes the finite nature of the planet's resources more prominent in the classical conception. Scarcity can then be seen as a notion connected to strong sustainability, understood as the need to maintain natural systems above certain thresholds to which the notion of scarcity can be applied. The value of critical natural capital within the capitalist process of reproduction can be more adequately captured in terms of the classical theory of rent.

In neoclassical economics, scarcity is not seen as a specific problem pertaining to natural resources, since every commodity produced is assumed to be scarce, in a context where natural and manufactured capital can be substituted for one another, and thus the relevant notion to address is aggregate capital. This leads to a notion of weak sustainability centred on aggregate capital, since the scarcity of natural resources is no longer highlighted. For in neoclassical economics, it is not only land that is scarce, but rather every single commodity. Since all commodities are

scarce in neoclassical economics, Robbins (1932) defined economics as the science that studies the allocation of scarce resources that have alternative uses.

The key reason for this trivialization of the notion of scarcity, rather than restricting it to natural resources and rare goods, is connected to the prominent role that non-satiable subjective preferences play in neoclassical economic theory, in a linear approach where all production is aimed at the satisfaction of non-satiated wants. Furthermore, as noted above, subjective preferences are simply taken as exogenous data that cannot be further questioned, especially after Robbins (1938) argued that there can be no interpersonal comparisons of utility. This also means that the market, rather than agriculture, becomes then the central aspect of economic theory, since it is through market exchange that subjective preferences are revealed. And every human activity uses ecosystems in order to satisfy those subjective wants, without highlighting the specific properties of critical natural capital.

3.2. Happiness and Well-Being

The differences between the contemporary neoclassical conception and classical political economy ultimately spring from the different conceptualization of human happiness implicit in both approaches. The key difference at stake here is between an Aristotelian conception of happiness, which underpins the classical perspective, and a utilitarian conception of happiness, which underpins neoclassical economics.

In neoclassical economics, happiness is explained in terms of irreducibly subjective preferences, often identified with subjective utility. The goal of human activity consists in the maximization of subjective utility. Since there is a monotonic relation between the quantity of commodities possessed and the quantity of utility achieved, happiness requires the maximization of the quantity of goods produced and possessed. This idea goes back to the utilitarian philosophy of Jeremy Bentham. John Stuart Mill developed utilitarianism in a more Aristotelian direction by distinguishing between different types of pleasure. But contemporary neoclassical economics did not adopt Mill's approach, and focuses on the maximization of subjective utility.

The classical conception, in contrast, adopted an Aristotelian conception of happiness. Some of the classical authors, such as Smith and Marx (if we include Marx in the classical authors, as Sraffa argues we should), had philosophical training, and were admirers of Aristotle. Other classical authors, such as Petty, Cantillon, Quesnay and Ricardo, focused essentially on economic theory. But the economic theory they developed, like the theory of Smith and Marx, is also broadly in line, even if implicitly only, with an Aristotelian conception.

In such a conception, happiness emerges through the performance of objective human activities. The latter can be seen in connection to the notion of human functioning developed by Sen and Nussbaum, both of whom stress the connection of this notion to Aristotle (Sen, 1999, pp. 289; Nussbaum, 1992, 2000). The aim is not the maximization of utility, but rather the training of dispositions that aim at the middle ground between two extremes. In the Aristotelian conception, virtue (or excellence) lies in achieving this middle ground, while vice consists in reaching for an extreme. The emphasis is thus on harmony, rather than on maximization.

The Aristotelian conception of human happiness points towards a conception of human happiness where a finite quantity of commodities does not prevent at all human development, since happiness springs from a harmonious use of existing commodities, rather than from the maximization of commodities possessed. In neoclassical economics, human agents are characterized exclusively in terms of irreducibly subjective preferences, which only each individual knows, and are simply taken as exogenous data. This means that there is no explanation of human well-being, but merely a statement as to the irreducibly subjective nature of human well-being, as something that only each individual knows, and cannot be further explained or debated. In an Aristotelian conception, in contrast, human well-being can be explained in terms

of objective notions such as dispositions, functionings and activities, which can be discussed through public debate.

The emphasis on subjective preferences as irreducibly exogenous data fails to take into account how subjective preferences can change as we engage in reasoned scrutiny of our goals and values, as Sen (2002) argues. For Sen (2002), rationality does not consist in following consistently a completely specified preference ordering (that may or may not represent our self-interest), but rather in the ability to revise our very goals, values and preferences. The possibility of revising goals, values and preferences leads to several limitations of the neoclassical subjective approach to valuing ecosystem services. For it becomes difficult to talk about how ecosystem services will be valued by future generations if the subjective preferences that determine such a valuation may change (Martins, 2011).

3.3. The Ontology of Ecosystems

The perspective outlined above provides a different approach to the valuation of ecosystems and the conceptualization of strong sustainability. In so doing, it constitutes part of a very different conception of the place of human beings in the biosphere. There is no space here to fully explain the overall ontology underlying such a different conception (Martins, 2011), but it will be useful to summarize some of its key elements before concluding.

The problems associated with the subjectivist approach of neoclassical economics are only an aspect of a broader philosophical problem, related to the neglect of ontology. Ontology played a key role in ancient and medieval western philosophy. But modern western philosophy has privileged epistemology while neglecting ontology (Lawson, 2003; Gonçalves, 2014). This means that the starting question for philosophical inquiry is the possibility of achieving knowledge, which is addressed in terms of the subject-object relationship. That is, the key philosophical question concerns the possibility of the human subject obtaining knowledge about an external object, where the answers to this question lead to different philosophical approaches.

By framing the key philosophical question in terms of the subject-object relationship, there emerges the tendency for seeing the human subject as someone who looks at the world from an outside perspective, that is, as a world that is external to the subject. Some contemporary philosophers, such as Martin Heidegger, provide instead a perspective that rejects the subject-object split, since the human agent is seen as a Being-in-the-World, which means, amongst other things, being part of a broader whole (Gonçalves, 2014). Heidegger's perspective puts ontology at centre stage again, since the human agent is part of the world, and not a subject separated from the perceived objects. For the very act of perceiving objects is constitutive of the subject's consciousness, who does not exist independently from the world.

The subject-object epistemology resonates with the linear conception of neoclassical supply and demand analysis, where the supply (of objects) exist in order to satisfy the demand (of the subject). The ontology of Being-in-the-World, in contrast, can be seen as a philosophical framework compatible with the classical circular conception. For the classical circular conception is centred on the conditions of possibility for a socio-economic process of continuous reproduction, where human agents are part of a broader whole. It was indeed in this way that Marx interpreted the classical political economists from Petty to Ricardo, moving beyond the idealist philosophies of Immanuel Kant and Friedrich Hegel.

Kant provided the key contribution to the modern epistemological approach by studying the conditions of possibility for the subject to achieve knowledge of an external world. Marx, in contrast, focused on the condition of possibility of socio-economic reproduction while placing human agents as part of this broader process, where even human subjectivity and ideologies are influenced by the material process of socio-economic reproduction. But Marx retained Kant's critical method, which consists in looking at the conditions of possibility for a given

phenomenon, and focused on the conditions of possibility of the circular process of socio-economic reproduction (Martins, 2013b).

Also, Marx agreed with Hegel's key ontological presupposition, which is the presupposition that reality is internally related, where an internal relation is a relation that is constitutive of the entities which stand in such a relation (Lawson, 2003). This means that the world is an interconnected whole, as Hegel believed. Marx applied this philosophical idea to the classical study of the process of socio-economic reproduction, while noting how various metabolic cycles within ecosystems are deeply interconnected (Foster, 2000). This interconnected process of reproduction opens several possibilities for human activity, and thus provides human agents with a set of capabilities.

These ontological aspects can provide important insights to the study of the valuation ecosystem services. It ultimately means that such a valuation cannot be a merely subjective valuation of how ecosystems can satisfy subjective demand, but rather a study of the value of ecosystem goods and services in terms of their contribution to the circular process of reproduction of various (human and non-human) Beings-in-the-World, who are reconstituted through this very process.

4. Conclusion

In the classical circular conception of the economy, the value of the ecosystem's goods and services can be seen in terms of their contribution to the circular process of socio-economic reproduction, and measured in terms of the physical inputs that constitute the cost of production, including the basic commodities that lead to the achievement of a certain standard of living that can be discussed through a public debate undertaken with (positional) objectivity. The key question to address, as it was for the classical authors, concerns whether the surplus, that is, the part of production above whatever is necessary for achieving a certain standard of living, is distributed and used (indeed, recycled) in an efficient way, or whether it merely creates economic waste (that is, wasteful luxurious consumption, which was much criticized by the classical authors), and physical waste (with negative impact on ecosystems).

The circular conception of the economy provides only a basis for further exercises in valuation, rather than an algorithmic model of valuation. But in so doing, it already provides a positive contribution, to the extent that it sets the debate in terms of the circular nature of the process of reproduction (rather than in a linear nature aimed at satisfaction of subjective preferences) while stressing the distinction between natural resources and manufactured capital in the very core of its theory of value (rather than focusing on aggregate capital). The distinction between rent and profits, an expression of the difference between natural resources and manufactured capital, provides a theory of value where scarcity is seen as a specific property of natural resources and studied in connection to strong sustainability.

As Sen (2002) argues, public discussion on these matters need not be framed in terms of irreducibly subjective preferences to be taken as data, as in neoclassical economics. Subjective preferences can be discussed and revised through reasoned scrutiny, and public debate can focus on notions that can be discussed with some objectivity, such as human functionings and capabilities. Human beings can change their mind, so subjective preferences cannot be a solid basis for a theory of value. Furthermore, biophysical processes have a logic of their own to which human beings must adapt if necessary, which means that it is biophysical processes, rather than subjective preferences, that must be seen as the ultimate and irreducible data in any theory of value. The classical circular conception of the economy, where agriculture is the starting point for the study of the economy, points towards this direction, and it can (and should) be further enriched by more recent research on supporting and direct ecosystems.

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