

**ACKNOWLEDGING NATURE IN ECONOMICS:
AN APPROACH INSPIRED BY CLASSICAL ECONOMICS AND
KEYNES¹**

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ABSTRACT

*This article presents a conceptual and theoretical interpretation of the interrelationship between nature and the human economy, an interpretation that is presented in systematic detail in the author's 2024 book, *Nature and Economic Society: a Classical-Keynesian Synthesis*. The interpretation is informed by the author's decades of research into classical economics and Keynes. To that extent, it serves as an illustration of how research in the history of economic thought can inform contemporary economic theory and policy.*

Keywords: *Classical-Keynesian approach, exhaustible natural resources, discounting the future.*

Jel Codes: *B12, B50, E12, Q50*

1. INTRODUCTION

The purpose of the lecture from which this article derived was to present a conceptual and theoretical interpretation of the interrelationship between nature and the human economy, an interpretation that is presented in systematic detail in my 2024 book on that subject. What was left unsaid or tacit in the lecture, and may be stated here as a preliminary comment, is that the interpretation of the nature-economy interrelationship derives to a very substantial extent from my own immersion in history of economic thought (HET) research and scholarship for forty years and more, prior to 2024. Although not primarily HET, the book is deeply and widely informed by my decades of research into classical economics and Keynes. To that extent the book – and the summary statement of its approach to the nature-economy interrelationship, as presented here – might serve as an example for those who engage in HET research with a view to its relevance for contemporary economic theory and policy. I may add that I have offered an argument for the relevance of HET for contemporary economic science in the lecture I presented in my capacity as the 2024 recipient of the European Society for the History of Economic Thought annual Award of Honorary Member, delivered at the 28th ESHET Conference, University of Turin, May 2025. That lecture provides a detailed account of connections between my corpus of earlier published research and the 2024 book (Aspromourgos, 2026). Note also that the term “Classical-Keynesian synthesis” (or Classical-Keynesian approach), as used in the lecture, may be regarded as interchangeable with “Sraffa-Keynes approach”, as used in the Summer School title.

2. DRAWING ON CLASSICAL ECONOMICS AND KEYNES

¹ This article was originally presented as a lecture to the “Summer School on the Sraffa-Keynes Approach: History, Theory and Applications”, Azim Premji University, Bengaluru, India, 2–5 April 2025 (sponsored by the Economic Development Working Group, Young Scholars Initiative of the Institute for New Economic Thinking, and the Azim Premji University). I am indebted to an anonymous referee for comments.

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What I want to do here is sketch some fundamental aspects of my recent little book, *Nature and Economic Society: a Classical-Keynesian Synthesis* (Aspromourgos, 2024). The motivation for my writing that book was, in the first instance, a belief that it might serve a useful purpose to publish an account of what has come to be called "the Classical-Keynesian approach" to economic theory – more particularly, a comprehensive *introductory* overview, in the sense that it would be accessible to a reader with neither prior advanced economic knowledge nor high-level mathematical proficiency. But because I had become increasingly engaged by the problems of environmental crisis, I determined that it would be unacceptable to publish such an essay without systematically accounting for the interrelationship between nature and the human economy. In the end, Part I of the book, which provides a comprehensive overview of the Classical-Keynesian approach in the forms in which it is usually presented – *without* incorporation of nature and natural resources in human production and consumption, or at least, without explicit acknowledgement of the human economy's dependence upon nature – turned out shorter (about 28,000 words) than Part II, which then provides an integration of all the forms of interrelation between nonhuman nature and the human economy (about 42,000 words).

The Classical-Keynesian approach constitutes a synthesis, by way of rational reconstruction, of the approach to production and distribution of the classical economists from William Petty to Karl Marx – with Adam Smith, David Ricardo and Marx, the key figures – and the approach to aggregate economic activity levels of John Maynard Keynes and Michał Kalecki. It entails combining the classical approach to functional income distribution and commodity prices, as reconstructed by Piero Sraffa (1960) and those who have followed his lead, with a formulation of Keynes's "principle of effective demand", purged of marginalist elements and applying demand-side determination of activity levels to long-period economics and growth, as well as to short-period analysis – in contrast to the supply-side approach of conventional marginalist or "neo-classical" economics.

I may add that the key to the Classical-Keynesian approach's departure from marginalist orthodoxy is the same for the two elements of the approach – rejection of the marginal productivity theory of distribution. The marginal productivity theory is, or at least aims to be, simultaneously a theory of functional income distribution, in which the distributive variables are uniquely determined by narrowly economic data, and a supply-side theory of aggregate economic activity levels: the balancing of supplies of and demands for factors of production jointly determines functional distribution (in particular, rates of wages and profits) and full employment of the factors of production – and so also brings about a full-employment level of aggregate economic activity. Repudiating the marginal productivity theory therefore opens the way to two unorthodox theoretical steps: on the one hand, within the framework of Sraffa's classically-inspired price and distribution system, with its "degree of freedom" for the determination of distribution, the determination of distribution and prices is opened to wider and historically changing social, political and economic forces, beyond the narrow economic parameters of the marginal productivity theory; on the other hand, abandoning the supply-and-demand approach to distribution enables rejection of supply-side determination of aggregate economic activity and allows for Keynes's alternative, of aggregate demand taking the leading role in determining activity levels.³

For the purpose of considering the interrelationship between nature and the human economy in the framework of the Classical-Keynesian approach, which is my focus here, it is the classical element which is the more pertinent dimension to focus upon. It is a striking feature of the classical approach that it focusses upon the circular character of production as an input-output system generating a "social surplus", with the Sraffian reconstruction showing how the production and distribution of the surplus can be treated in the particular framework of a decentralized capitalist economy, where the realization of the distribution of the surplus is in terms of wages and profits in particular, and via prices and markets. The most obvious manifestation of this circular character of production is the pervasive presence of produced means of production in economic systems – commodities that are both outputs

³ For a fuller and formal statement of how the modern reconstruction of the classical, surplus approach to determination of distribution and prices proceeds, and how it can be formally combined with a Keynesian, demand-side approach to determination of activity levels and economic growth, see chapters 3–4 of Aspromourgos (2024). In order to render it as accessible as possible, the formal analysis there is undertaken in the framework of two-sector modelling; but further and more advanced relevant literature is detailed at Aspromourgos (2024, pp. 3–5, 13–14, 22–25, 44–48).

and inputs of the system, "capital" in the context of a capitalist economy, as well as necessary labour consumption. But in foregrounding the circular character of production (and consumption) – that is, the *reproduction* of socio-economic systems – it also points to the problem of the *incomplete circularity* of the human economy, which is *the ultimate source of all the environmental problems arising out of the interrelationship between nature and the human economy*.

This naturalness with which the environmental problem, the incomplete circularity of the human economy, can be framed within the classical, circular conception of production is circumstantially evidenced by a notable historical thread of intellectual development. In a quotation that I employed as an epigraph for Part I of my 2024 book (at page 7) Sraffa draws a contrast between the classical approach and the marginalist approach, by reference to François Quesnay's original, mid-eighteenth-century formal representation of a circular production system (Kuczynski & Meek, 1972):

The connection of this work with the theories of the old classical economists has been alluded to in the Preface. ... It is ... in Quesnay's *Tableau Économique* 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". (Sraffa, 1960, p. 93; emphasis added)⁴

Quesnay's contribution was in turn an inspiration for Wassily Leontief's enormously fruitful twentieth-century contribution to applied economics, the development of input-output analysis. Leontief (1941, p. 9) characterized his seminal contributions to input-output economics as "an attempt to construct, on the basis of available statistical materials, a *Tableau Économique* of the United States for 1919 and 1929". His preliminary input-output paper, Leontief (1936, p. 105), opens with virtually the same sentence. The book also has a Quesnay epigraph (page 2). Subsequently, input-output methods have been extensively and powerfully applied to environmental issues, by Leontief himself and many others (for an overview, Guilhoto, 2021).

3. CONCEPTUALIZING THE NATURE-ECONOMY INTERRELATIONSHIP

So, how to acknowledge and incorporate the nature-economy interrelationship within this classical approach to production and consumption? Quesnay's seminal circular production system, at least at first glance, appears to be a *perfectly* circular system. But the 18th-century French economy Quesnay theorizes is dominated by agriculture and therefore is very obviously dependent on nature. How can this evident fact be reconciled with the apparent perfect circularity of the *Tableau Économique* formal representation? The short answer is that land can be playing an essential but tacit role in that production system, *if the quantity and quality of the land as it enters production as input, is entirely preserved as it leaves production at the end of the same production time-period*. In other words, if the natural resource, land, is identical as input and output, then it cancels out so to speak, being preserved unchanged and forming no part of the system's social surplus. Land is a natural resource; and it is a *scarce* natural resource, in the classical sense, if the quantity of good quality land is limited relative to the social demand for its output; but it is a renewable, although also exhaustible, natural resource. Strictly non-renewable natural resources, at least potentially, pose a more serious economic problem.

As already partly indicated, following an introductory chapter, Part I of my book, in six chapters, provides a comprehensive overview of the Classical-Keynesian approach, in the usual manner of economic analysis, without systematic incorporation of nature. Part II, in six further chapters, then systematically addresses the nature-economy interrelationship, with the human economy now being understood as a circular flow but an incompletely circular system. It is crucially dependent upon nature both as a source of finite non-renewable, and renewable but exhaustible, natural resources for human production and consumption, and as the destination or "sink", *also a*

⁴ I emphasize "and consumption" for reasons that will become clear in the discussion of "outputs that are not inputs" below.

finite natural resource, for the waste and pollution from that production and consumption. This is nicely summed up in a quotation I employed as an epigraph for Part II of my 2024 book (at page 75):

Much of the conventional economic analysis is implicitly based on the twin assumptions of the free gifts of nature and the free disposal of wastes. Accordingly, the environment is envisaged as being simultaneously a horn of plenty and a bottomless sink. (Kurz & Salvadori, 1998, p. 313)

In fact, the whole Part II conceptualization is provided, in a summary form, in the opening chapter 8 of Part II, comprehensively incorporating the nature-economy interrelationship into the classical circular representation of production via four mutually exclusive and collectively exhaustive channels.

Inputs that are not outputs. Along with produced means of production (capital goods) and labour, inputs to production (or for direct consumption) now include also unprocessed, nonhuman natural resources that are not humanly producible – inputs that cannot be outputted by the human production system, implying *negative* elements of the social surplus. At least some of them can be recyclable, although always with some loss.

Outputs that are not inputs. There are two subcategories to be distinguished here.

- a) There is the class of products that are not humanly useful, but rather, either harmful or merely useless.⁵ Any such outputs are only knowingly going to be produced as *joint* products: by-products of processes or production methods that generate also products regarded as useful and in demand (also by-products of direct consumption). By-products may be directly harmful to humans or harmful to nature in ways which then rebound adversely upon human well-being – and on society and polity as well, not just economy. Pollution is the paradigm, notably, greenhouse gas emissions; indeed, for us today, the most pressing element of nature as a scarce natural resource for the dumping of human waste is the finite capacity of the Earth's atmosphere to absorb greenhouse gas emissions, at anything like current scale, consistent with ongoing human well-being. These products add to the social surplus, outputs that are *bads* or "discommodities". Again, it is possible for recycling to turn an output that is otherwise a harmful by-product or harmless waste into a usable production input or consumption good.⁶
- b) The second subcategory is the class of products that are reproducible and humanly usable but are not capable of serving as inputs to production or as elements of *the conventionally determined necessary consumption of a people*. In including here a notion of "necessary consumption" I am reformulating the classical notion of socially necessary consumption in a specific time and place as the consumption necessary to sustain and reproduce the labour force, the content of which was always understood by the classical economists to be conventionally determined by historical, social, environmental factors and so on (and recall the Sraffa quotation earlier: "the system of production *and* consumption as a circular process"). What I do is to interpret "necessary consumption", *somewhat* loosely, to refer to the ordinary or average mode of living decently in a society (compare Smith, 1976 [1776], pp. 869–870, where necessary consumption is defined to include *social dignity*). Then the luxury consumption of the rich is the paradigm for this second subcategory. In a sense, this consumption is thereby being treated as waste, indeed, harmful waste, equivalent to pollution – and this characterization could be applied even beyond the luxury consumption of the rich (for example, to "fast fashion").

Inputs that are outputs. Then there are also renewable or reproducible natural resources employable as inputs to production (for example, solar energy) or produced for direct consumption (for example, fisheries sustained by marine ecosystems). This category covers those natural resources *which can be replenished by natural processes*, with or without also some humanly managed or organized process. In humanly processed form they can function

⁵ No waste is strictly harmless, to the extent that disposal is always costly.

⁶ Joint products that are *bads* may or may not be externalities. The extent to which discommodities can be disowned by their producers depends upon technological characteristics of their production, as well as the structure of property rights and other elements of law and legal process (for example, how accessible recourse to law is). For a fuller account, see Aspromourgos (2024, pp. 102–104). There is nothing essentially marginalist about the concept of externality.

like any other produced means of production or capital goods, with the quantity of them that is produced adjusting to demand for them, derived from the demand for the outputs in which they are used as inputs, or adjusting directly to demand for them for final consumption. Of course, the crucial qualification to this is that if the resources are renewable but exhaustible – fisheries, again, are a typical example (also species extinction as *collateral* damage from human production and consumption) – then they can be depleted or extinguished by excessive rates of exploitation.

Valuing nature for its own sake. I noted above, in relation to “outputs that are not inputs”, that by-products may be directly harmful to humans or indirectly harmful, via impacts upon nature that rebound adversely upon human well-being. There is also the possibility that human production and consumption causes harm to nature, without adversely impacting human well-being – in particular, harm to other life (for example, species extinction).⁷ If this is regarded as having ethical significance then it has policy implications for societies that embrace such ethics. It is not self-evident that expansion of human population and consumption should be preferred to the avoidance of largescale extinction of other species, even when that extinction does not rebound adversely upon humanity.

The first three of these channels are examined in detail in the three chapters immediately following the opening chapter of Part II, chapters 9–11, with the fourth channel being only occasionally recalled in passing, beyond chapter 8. Chapter 12 then provides a theoretical summing up of the arguments and the penultimate chapter 13 is a relatively long chapter on policy (about 11,600 words, out of the total book length of 70,000 words). Before turning to some aspects of the policy analysis, let me try to crystallize the central issue with respect to reconciling the human economy with environmental sustainability.

Since the eighteenth century, the key question for the developing modern economy with rising output per capita and expanding population has been how far expansion of the human economy could go, or for how long it could continue, and also how far it *should* go – the latter, a normative question first raised in the tradition of political economy by John Stuart Mill (1909 [1848], book IV, chapter VI, pp. 746–751). Since Adam Smith (1976 [1776], book I, chapters i–iii, xi), the answer to the descriptive question – how far and for how long can expansion of the human economy go? – has turned on the capacity of human ingenuity expressed in technical change or innovation to overcome tightening natural resource constraints in the face of expanding human demands upon nature. Smith advocated growth and rising consumption per capita but believed that eventually, an end to growth would come and the human economy would approach a stationary state (Smith 1976 [1776], pp. 111–112). Keynes (1930, pp. 325–326, 331), like Mill, regarded the stationary state as a *desirable* outcome, at least once a society reached a certain level of economic maturity.

In the 1970s, in response to increasing claims of impending limits to growth, the notion of human ingenuity overcoming natural resource constraints found expression in the appeal to “backstop technologies” (for example, Solow, 1974): the idea that, as technologies in current use become unviable due to depletion of natural resources upon which they depend (including diminishment of nature’s capacity to serve as a sink for waste and pollution from those technologies in current use), alternative technologies are available or become available to replace them, possibly as a result of induced innovation *in response* to the tightening natural resource scarcities. In fact, something like this assumption or belief has been embraced across both orthodox and at least some unorthodox economics.⁸ In one sense, recourse to something like this supposition is almost inescapable. If something is unsustainable in the strict sense – if a set of human arrangements, processes or outcomes is incapable of persisting indefinitely – then an alternative *must* be found, or else there is the ultimate alternative, human extinction.

My conceptual resolution of the backstop technology idea is to adapt to the contemporary situation of environmental crisis, the earlier mentioned classical concept of socially necessary consumption as consumption of

⁷ Perhaps, strictly speaking, species extinction is not harmful to the members of a species; but extinguishing certainly could be, notably, for social animals. Death is not a part of life but dying is, pertinent not only to one’s own dying but also to one’s experience of the dying of others.

⁸ For recourse to essentially the same kind of backstop supposition by Sraffa, in his unpublished papers, see “Papers of Piero Sraffa”, Trinity College, Cambridge, document D3/12/42: 33, quoted in Aspromourgos (2024, p. 84). Digital copies of the Sraffa Papers are available via the website of the Wren Library at Trinity College, under “Modern Manuscripts”.

ordinary decency associated with the (re)production of human life in a particular, customary form of social economy. This can then be conceived of as a "consumption technology" for socio-economic reproduction *and alternative modes of social consumption that are more environmentally sustainable can be incorporated under the notion of backstop technologies*. To be sure, technical innovation in the usual sense of the term – innovation that provides environmentally superior outcomes, for *given* modes of human consumption – is to be welcomed. But the development and implementation of environmentally superior alternative modes of consumption should take a place beside it as *at least* as desirable and worthy innovation as well.

4. SOME POLICY IMPLICATIONS

The point of departure for the policy analysis in the penultimate chapter of my book is the need to reconcile environmental sustainability as a policy objective with other fundamental economic policy objectives. Echoing the opening sentence of the final chapter of Keynes's *General Theory*, the two further objectives I posit are *limiting economic inequality*, understood to include ensuring a minimum standard of living for all, and *full employment*, possibly expressed in an economic growth objective.⁹ Apart from ensuring material well-being and satisfying sheer human decency, the reconciliation of these three objectives is crucial for facilitating sufficiently wide social and political acceptance of vigorously pursued policy for environmental sustainability. As is evident, for example, in elements of widespread working class reactionary sentiment underpinning right-wing politics in the USA, and in the so-called *gilets jaunes* or yellow vests movement in France, if environmental policy is (or is perceived to be) fundamentally prejudicial to a substantial part of the population, it will flounder politically.

Due in particular to the prevailing inequalities across nations (along with those within nations), at a global level, differing social norms concerning the consumption consistent with human decency, involving very different demands on the globally available natural resources, are likely to come into comparison and conflict, in the face of global environmental crisis (compare Piketty, 2024, pp. 73–79). There is no magic formula for devising a policy programme that reconciles the three objectives. I outline a menu of policy options in the framework of a continuing mixed economy, but an economy needing to be of a distinctly social-democratic character in terms of the balance between collective action and private enterprise – including some critical scrutiny of marginalism, particularly with respect to use of quantity-setting versus price-setting policy instruments and "pricing nature".

I conclude with some comments on just one aspect of all that: the issue of discounting the future. In conventional assessment of the costs and benefits of environmental policies a discount rate is applied in order to reduce costs and benefits at different dates forward to a common standard. To take the most salient example of the issue, in contemplating devoting resources "today" to avoiding or repairing environmental degradation, what weight should attach to the costs of the degradation that will otherwise fall upon future generations? Two fundamental elements commonly enter into determining a discount rate: pure time preference and changing productivity per capita over time. Both are supposed as pointing to a positive discount rate: the former, on the basis that individuals place a greater valuation on the same consumption (or "bads"), the sooner in time it is available (or they are borne), a dollar today being preferred to a dollar tomorrow; the latter, on the *assumption* that there is ongoing positive growth in productivity per capita over time. For the purposes of intergenerational comparisons, the rationale for a positive rate of pure time preference can be dismissed, on the basis that the current generation has no right to positively discount the welfare of future generations. A counter to this is to say that human beings across time are fundamentally alike and we have no better basis for giving quantitative expression to time preference than by reference to the revealed preferences of the current generation.

But where is time preference revealed? The orthodox answer is to appeal to the marginalist theory of interest rates, whereby the equilibrium level of interest rates is understood to be a result of a balance (at the margin) between, on the one hand, *the capacity* or productiveness of investment "today" (which requires foregoing consumption

⁹ "The outstanding faults of the economic society in which we live are its failure to provide for full employment and its arbitrary and inequitable distribution of wealth and incomes" (Keynes, 1936, p. 372).

today) to make consumption available "tomorrow" or in the future, and on the other, *the willingness* of individuals collectively to forego consumption today in favour of consumption tomorrow. In this way, the interest rate that supposedly balances investment and saving is understood to give objective expression to time preference, as a measure of the compensation required for saving (foregoing of current consumption) to be forthcoming, to supposedly enable the investment that will give effect to those intertemporal preferences.

Now, in outlining earlier how the nature-economy interrelationship may be incorporated into a Classical-Keynesian synthesis I have made little reference to the Keynesian dimension. But I indicated (section 2) that the key to the Classical-Keynesian approach's departure from orthodoxy is the same for the two elements of the approach – rejection of the marginal productivity theory of distribution. The marginalist theory of interest is just the marginal productivity theory of distribution as applied to the rate of return on capital. Keynes rejects that theory of interest by showing that in the framework of his demand-side approach to economic activity levels saving and investment are brought into balance by variations in economic activity levels, and possibly the price level, without any systematic involvement of interest rate levels (Aspromourgos, 2024, chapter 4, especially pp. 27–28, 29, 34–35, and further, pp. 57–58, 64, 72). On that basis, the prevailing level of actual interest rates provides no standard for time preference; it is purely conventional or arbitrary from an ethical standpoint.¹⁰ The marginalist theory of interest is not a valid obstacle to applying a strictly egalitarian standard and setting pure time preference at zero.

But what of the second element that is supposed to justify positive discounting? The core meaning of ongoing positive growth in productivity per capita as a justification for positive discounting is the idea that every generation has greater economic capacity per capita than the generation prior to it, so that positive discounting equalizes the value of potential output and consumption per capita across generations. But is indefinite continuation of productivity growth really plausible? And as I argue in *Nature and Economic Society* (pages 87–88), environmental degradation is causing technical *regress*. Negative labour productivity growth would imply *discounting the present* relative to the future – a negative discount rate. To the extent that productivity growth in this context is really aimed at capturing future well-being per capita, then even without declining labour productivity (as measured at an aggregate level), future environmental degradation as a deterioration in the quality of future human life would also imply an element of discounting the present relative to the future.¹¹

5. CONCLUSION

I began this article by noting the importance of my work as a historian of economics in the making of my *Nature and Economic Society* (2024). There are a variety of approaches to the study of intellectual history – involving a variety of motivations – and I do not need to regard any such other ways of approaching intellectual history as inferior to my own. But for my part, the primary motivation is the usefulness for contemporary economic analysis of neglected ideas from the history of the discipline. It should not surprise that in an ideologically fraught area of research like economics, good ideas might have been discarded by the mainstream of opinion for other than scientific reasons. In relation to what is arguably the most pressing issue facing humanity today – the sustainability of the nature-economy interrelationship – I hope to have shown here a little of how classical economics, together with Keynes, may inform conceptualization, understanding, analysis and policy.

¹⁰ See especially Keynes (1936, pp. 202–204):

It is evident, then, that the rate of interest is a highly psychological phenomenon. ... It might be more accurate, perhaps, to say that the rate of interest is a highly conventional, rather than a highly psychological, phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be. *Any* level of interest which is accepted with sufficient conviction as *likely* to be durable *will* be durable; subject, of course, in a changing society to fluctuations for all kind of reasons round the expected normal.

¹¹ With a negative discount rate, the present value of a future cost is greater than the future cost – the discount factor becomes a multiplier. One could then reject the idea of negative discounting on the basis of an apparent *reductio ad absurdum*: that in the limit, as one contemplates a cost further and further into the future, its present value approaches infinity. The rejoinder to this is that if the current economy ceases operating in a manner that makes life and the world worse for future generations, then negative discounting can be abandoned. Nevertheless, for the case of a strictly finite, non-renewable natural resource, even a zero discount rate, insofar as it implies an equal distribution of the resource across an infinite number of generations, implies an absurdity: the quantity accruing to each generation approaching zero.

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