The (constructivist) Ontology of Science and its Consequences through the Case of Economic Equilibrium

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"2.022 It is clear that however different from the real one an imagined world may be, it must have something—a form—in common with the real world.

2.023 This fixed form consists of the objects."

Wittgenstein, *Tractatus*, Ogden and Ramsey's translation

"[T]he meaning of a word is its role in the calculus of language."

Wittgenstein, *Philosophische Grammatik* 1974 [1969], 31[67]

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1. SUMMARY

[Spanish]

Bebiendo de la ontología histórica de Ian Hacking i de la metafísica aplicada de Lorrain Daston, este trabajo presenta la biografía del equilibrio económico como fenómeno que pasa a existir y a relegarse como objeto de investigación en economía. Se empieza presentando la primeriza presencia del concepto de equilibrio económico en un plano inferior a la superficie en la cual la ciencia se encuentra: como mano invisible y su posición en el sistema de creencias occidental en general y con las corrientes de la ilustración en particular. Se sigue analizando la presencia en teoría económica hasta su punto álgido con la teoría de equilibrio general avanzada por Debreu y Arrow, donde se argumenta que adquiere un carácter incluso material, lo que se caracteriza como hipóstasis, y se concluye con su reposicionamiento en un plano con cierto grado de desmaterialización desde la caída del interés en el programa del equilibrio general.

De esta biografía se extraen análisis respecto la posibilidad epistemológica del pensamiento económico neoclásico —lo que puede y lo que no puede estudiar— y, comparándolo con escuelas heterodoxas, se extraen conclusiones en favor del pluralismo ontológico y del pluralismo científico como necesidad para expandir las posibilidades de análisis científico.

[English]

The aim of this piece is to introduce the idea of *hypostatisation* —meaning to attribute real existence— to better conceptualise the ontology of scientific objects and to make the case for ontological and scientific pluralism[2], which in the end tries to push for a more tolerant and plural concept of knowledge —both knowledge-as-science and other kinds of knowledge. This tolerant view is useful for expanding the possibilities of what can be known by presenting a framework in which considerations alien to the dominating paradigm (Kuhn) —in reference to scientific knowledge— and the existing episteme (Foucault) —in reference to a broader and more situated concept of knowledge— can take a stance on its own in knowledge rather than being presented as addendums or corrections to the actual idea of knowledge-as-science[3]. As example, one can think about decolonial considerations. To ground and thus better understand what is proposed, the narrative will be developed around the case of the economic equilibrium and economics as a discipline. The analysis explores how the equilibrium is a hypostasis, searches the epistemic limits in the actual paradigm related to such hypostasis, and exemplifies how this limit can be outstripped with the proposed framework.

The first section will start by reviewing the relevant literature in philosophy of science, which will be used as a backbone for the piece. Then the concept of the hypostasis will be presented, linking it with the previous section and with the subsequent one, which will be the study of the history of economic equilibrium in economic theory through how it relates to the hypostasis. The focus is on the use and role of the concept of economic equilibrium, not its specific meaning for each author, school, and period. Finally, a wrapping up section serves to see the general picture drawn and what can be learnt from it, proposing a framework to understand economic theory and knowledge.

2. INTRODUCTION AND PHILOSOPHY OF SCIENCE BACKGROUND

There has been a long-lived tradition in philosophy of science which regards science in contrast with the Enlighted-like view of the ultimate truth bearer, first-line soldier of the reason in the quest to know sterile reality. This ranges from radical (social) constructivism, which rejects the

[2] For other works on scientific and ontological pluralism see Danks (2015), Kellert *et all*. (2006), Chrobak (2013), Ruphy (2016), Ludwig, D. (2022), Ludwig, D. & Ruphy, S. (2021), Ludwig, D. & Boogaard, B. K. (2021).

[3] Works with a specific aim in integrating local or other non-scientific knowledge can be found in other disciplines like ethnobiology (Ludwig, 2020), psychology (Ludwig, 2015), agriculture and gender innovation (Lopez, D. E., Frelat, R., & Badstue, L. B., 2022) or genetics (López-Beltrán, C., Nieves Delgado, A., González-Santos, S. P., & García-Deister, V. 2022).

idea of an external world that we can know, to more mild positions that drink from both constructivism and realism, which entails the idea that scientific objects are discoveries, unexplored territories waiting to be mapped.

These trends have dealt with topics such as knowledge, methods, productivism of science and many more, and eventually made their space in the study of scientific objects, not understood as *material* things but objects in generals, which includes *"material" objects, classes, kinds, or ideas* (Hacking, 2002, 2), thus including *non-existing objects*, or the ones with subsistence (*Bestand*) as mode of being — although not existing — using Meinong's terminology (1904).

We can identify two proponents in this line: historical ontology (Hacking, 2002; Rose, 1996), which studies things which do not exist in any recognizable form until they are objects of scientific study, so the coming into being of objects via its positioning in the scientific domain; and applied metaphysics —or historical meta-epistemology, according to Hacking (2002)— (Daston, 2000), which looks at the coming into being of objects of study, i.e., how objects become objects of study and pass away as such. If constructivists assert that scientific objects are eminently historical, but not real, this "applied metaphysics assumes that reality is a matter of degree, and that phenomena that are indisputably real in the colloquial sense that they exist may become more or less intensely real, depending on how densely they are woven into scientific thought and practice." (Daston, 2000, 1).

Both positions entail the idea that "one cannot speak of anything at any time" (Foucault 1971, 44; in Hacking, 2002, 17). Thus, scientific objects have their existence constrained in time, are not permanent[4].

The capital relevance for studying the ontology of science is that in order to research something, *science needs to identify its objects of study*, identify this something that is looking at. Biology identifies life; physics, matter, and energy; neurology, the nervous system; sociology, social relations and institutions, and economics identifies resources and its management, the economic reality. If one understands that scientific objects — including effects, "material" objects, classes, categories, and concepts — are something not given, but contextually dependent, one can also understand that what can be looked at is also historically dependent and thus, logically, the image of the word — what is perceived, how it is perceived and how is interpreted — is historically dependent.

[4] We see this thesis in an economic domain, and concretely in economic equilibrium, in Mirowski (1989, 448).

This can go from the extreme case of the *Hall effects*, which refers to "new things in the world, brought into being in the course of human history" when science literally creates phenomena that had no existence before it[5].

But this can also refer to *concepts* that never existed before they entered the domain of science. We can rely again on Meinong's distinction (1904): we are talking about objects which do not exist in the sense that they cannot be found while taking a walk in the park, but that have a being, since are objects of thought. Thus, we could say we refer to non-existing objects which have some sort of being. And, more concretely, to the ones appearing in science, which sometimes can only be represented or modelled when trying to make them present in the real world. Examples of these could be multiple personality disorder (Hacking, 1998), scientific facts in itself (Schaffer and Shapin, 1985), or symbolic numbers, which can be said to emerge in a particular institutional setting even though the object itself is notoriously abstract and universal (Feldha, 2000). They have some sort of being even if they are non-existent, they are *homeless objects* (Meinong, 1907; Chisholm, 1982), those to which no substantive ontological status of existence can be granted.

But there are also scientific objects which were not invented or constituted by science, but whose reality expanded into a continuum, those which "grow more richly real as they become entangled in webs of cultural significance, material practices, and theoretical derivations" (Daston, 2000, 13). Examples of this could be child abuse (Hacking 1991, 1992), physic trauma [Young, 1995; Leys, 2000), child development (Wong, 1995), a specific concept of culture foundational for anthropology (Sahlins, 2000), the concept of society foundational for sociology (Wagner, 2000), or the concept of intelligence (Danziger, 1997).

In short, we can summarize this by saying that "*scientific objects have a history*." (Daston, 2000, 13), and I would add also that they have a *story*. We will overview the historical nature of the economic equilibrium and the history of its being and existence to derive consequences for the state of the art in economics[6].

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[5] The Hall effects refers to what happened when a graduate student at the John Hopkins university in 1879 found while studying a remark Maxwell wrote in his *Treatise on Electricity and Magnetis* that said that "when a conductor carrying a current is under the influence of a magnetic field, the field acts on the conductor but not on the current" (Hacking, 1983, 224). From here, Hall experimented to find that "passing a current through gold leaf, in a magnetic field, produces a potential at right angles to the field and to the current." (Hacking, 1983, 225). But this phenomenon did not exist before 1879, Hall brought this phenomenon into existence, never happened before. Another example is lasers. Nothing lased in the universe a century ago, while today lasers can be found all over the world.

[6] The arguments developed here are in line with similar or conterminous works like Düppe and Weintraub (2014) —but instead of focusing on the importance of credit, focusing on knowledge possibilities— Weintraub (1991), Mirowski (1994, 1998), Ingrao and Israel (2015 [1987]), Ingrao (2004) and even Stigler (1978).

It is valuable to point out that the study of economic equilibrium as concept and object of study of economics' history of ideas was already done by Philip Mirowski in 1989. In here, we revisit the topic employing the modern developments in history and philosophy of science, which allow a more concrete

3. "HYPOSTASIS" TO UNDERSTAND WHAT SCIENCE DOES

In this paper, the key term integrated into this line of studies is the *hypostasis,* or, more specifically, *to hypostatise*. This term, borrowed from philosophy and religion, refers— among its several meanings— to ascribe material, actual or personal existence to something, to construe a conceptual entity as having real existence. A useful example is the idea of Jesus in Christianity, which is the *hypostasis* of God in the sense that is interpreted to be its materialization, its realisation. Another example would be that of concepts such as the Renaissance in art history. The eminent art historian Heinrich Wölfflin —whose classifying principles were key in enabling formal analysis of his discipline— explained that art historians would be incapable to characterise different age's art if they did not possess some fundamental categories in art description which one encounters when studying and analysing the different modes and possibilities of artistic expression (Cassirer, 1968, p. 110), but from these fundamental categories needed to proper identify its object of study one cannot derive that they exist. In this sense, the *Renaissance* did not exist as one would picture by reading an art history textbook, simply because it was not something established as a monolith. As Cassirer says, a hypostasis would be to confuse scientific truths with reality in itself, like the Pythagorists did with numbers (Cassirer, 1968, p. 110-111, 121).

From here on, and using the concepts previously presented, we could ask in which point of the continuum gradient of reality scientific objects are hypostatised, i.e., are treated as having actual existence even though being mere ideas, maybe categories or friction-free, vacuum parts of experience which are useful to understand the world. In the end, these objects and their representation would assume and project certain metaphysics, because, as Bergmann noted, when discussing the concept of "the unconscious" in psychology, "any ontological hypostasis […] is hopelessly metaphysical" (Bergmann, 1940, p. 425)

Thus, we could identify certain historically situated scientific objects as entering the realness from the abstract domain, using but also dissolving the distinction of concrete —or *actual* in Whitehead's ontology (1929)— and Quine's abstract objects (Armstrong 2010; Quine 1980). What is relevant is that even if a mental, abstract, non-existing object has, redundantly, no existence (*Existenz* [Meinong, 1904]), its being can be a ladder for which this non-existence is twisted so that its considered or treated as existing.

4. EXEMPLIFYING IT WITH THE ECONOMIC EQUILIBRIUM

and defined study, and thus transposing them to history of economic thought with a more consistent narrative which allows for philosophical considerations, putting special emphasis on the question of the very status of metaphorical reasoning in science and its ontological consequences.

We take the economic equilibrium as a case study to observe how a "dispersed set of phenomena is transformed into a scientific object that can be observed and manipulated, that is capable of theoretical ramifications and empirical surprises, and that coheres, at least for a time, as an ontological entity" (Daston, 2000, 5). Expanding the argument beyond the mere abstract space, we will observe how economic equilibrium— and scientific objects— is hypostatised: takes a form in reality — the concept is projected into the real world — with its most prominent instance being when it is productive in reality — that its existence means it can affect and change reality.[7]

Equilibrium, stability, balance, has had a prominent role in western cosmology and ethos. One can trace this back from ancient Greek's principles of absolute static as a primary presupposition and negation of a creative process in a world without essential change, which derives from the different names that the distinction between the immutable and the mutable has had: the essential, the form, timeless substance, versus the contingent, the material[8].

This conception is obviously still present in todays' imaginary, and affects not only religion or aesthetics, but crosses all social imaginary to knowledge and science itself. And is crucial to realise, as Francovich notes, that "for the last three centuries, this static conception has become *materialist*, providing an image of the world based on Newton's cosmology", such that "final wisdom has been presented as the immutable contemplation of an immutable reality" (Francovich, 1951, 63-64; citing Whitehead, 1938).

And, indeed, as Ingrao and Israel did (2015), one can identify an origin of the history of equilibrium in economics during a time and place strongly influenced by Newtonian cosmology: the French Enlightenment[9] (Brunet, 1931; Casini, 1969; Koyré, 1968; Cassirer, 1932).

For what it concerns, a good historical example for us of Newton's influence is found in how Smith's consideration of sympathy in the *Theory of moral sentiments* can be seen as the equivalent

[7] Examples of similar works analysing concepts as being hypostasis in other disciplines and domains are scarce but relevant and illustrative. We could cite quantum teleportation and the teleportation protocol, Timpson arguing that the puzzlement it creates have origin in part in "the familiar error of hypostatizing an abstract noun (in this case, 'information')" (Timpson, 2006), in our case, (economic) *equilibirum*; Meyerson generalises further to describe the way in which we construct conservation laws and physics lay by explaining that "the mind fixes on certain processes in nature which it hypostasises; i.e. it turns these processes into substances or things whose total quantity it then assumes to be constant"— in the case of conservation laws. Thus, "energy is hypostasised motion and position within a field of force (kinetic and potential energies)" (Zahar, 1980, p. 11). Zahar even points at how mathematics also uses the hypostasising process (*ibid.*, p. 12) Other examples can be the concept of "culture", which Bierstedt warns of its hypostatised use by some writers, for example when pretending it to be a "dynamic unity, moving through definite phases of development" (Bierstedt, 1938); or the notion of the actor— the "doer"— behind the doing— Žižek exemplifies it with the racist as author of racist insults, which is only a symbolic fiction (Žižek, 1996).

[8] When it comes to the history of economic equilibrium, the third principle inherited from the Greek Golden Age applies with all its meaning: the eminent reality of mathematical abstractions (Francovich, 1951, 63).

[9] See Cohen (1994) for a study on Newton's influence and relevance on social science and economics which makes also the case for the contrary, how in a strict sense, Newton could not influence directly

in the social sphere of the principle of universal gravitation in Newton's model of the physical world (Dellemotte, 2002). A century and a half later, Marshall invoked Newton and Leibinz to support the negligibility of indirect effects, transposing it from astronomy (1919, appendix A). With this we see the impact of the Newtonian conception to the incipient social sciences, its close contact with physics —we will see below how this is a continuous narrative in the history of economics—, the importance of stability, and to which extent the concepts developed have a certain materiality ascribed. All this through the history of economic equilibrium as an object of science.

a. FIRST EQUILIBRIUM: BEING INTO EXISTENCE (HISTORICAL ONTOLOGY)

Mirowski (1989) identifies two concepts of equilibrium in modern economics, one which he baptizes as "Laplacean determinism" and a second one which accounts for the representation of a balance of forces, which "evokes the image of a scientific model" (*ibid.,* 448). But in the period of prehistory of modern economics the notion of equilibrium was not that concrete. It was not until the late 19th Century that the economic equilibrium became an object in itself[10]. Before that, the notion of equilibrium, and then economic equilibrium, was used to study the economic reality — whatever that meant for each author and period —, but no one studied it, it was rather taken as assumed in a way that provided operational possibility for subsequent theory. At some point, some authors came close to study the equilibrium by and of itself instead of taking it as granted —for example Isnard—, but its consistent first appearance happened much later in history.

Before that, from Aristotle to the 19th century, the economic equilibrium remained a background concept, something which operated in the shadows of the economic reasoning, but which had no presence, no singular corporality.

We find a rudimentary conceptualization of equilibrium in the scholastic period, basically focused on value, cost and price. When it comes to this last topic, Aristotle's *just price* was taken by some authors, like Saint Thomas, to refer to a sort of normal competitive price (Schumpeter, 2015, 131-132, 348). Schumpeter credits Duns Escoto for having first developed the intuition of the law of cost, a later condition for competitive equilibrium (*ibid.* 132), and Boisguillebert deepened in a conception of the economic organism as an equilibrium of interrelated economic magnitudes — thus coming close to modern conceptions with the idea of a proportioned equilibrium— but avoided to define or analyse its properties (*ibid.,* 259). Turgot even "explicitly used [the term 'equilibrium'] to denote the levels of production, of the employment of labour and of remuneration which tend to establish and maintain themselves on the market" (Ingrao and Israel, 2015, 47),

[10] In this context we mean an object of study.

Cantillon took on the scholastic approach by basing his theory of normal price or value on costs, which also did Smith (Schumpeter, 2015, 262, 621, n. 51). Also, like Cantillon, Smith presented an embryonic equilibrium system based on exchange value (*ibid.,* 357), and Schumpeter considers he prompted the use of the concept of a *stationary state* around English economists, which was considered as a future realization, rather than a conceptual construction (*ibid.,* 627). So, modern economics, or economics as a science, is still to be found, but in contrast with Schumpeter, we will argue that the conceptual analytical instrument of economic equilibrium came to be as material as this conception of a future real *stationary state* was for English economists.

Galiani also developed an equilibrium value based on labour quantity and unveiled the concept of long-term equilibrium and its benefit mechanism (*ibid.,* 351). Anticipating the marginalist revolution, Pietro Verri had a clear *yet undeveloped* notion of economic equilibrium based on pleasure and pain. And importantly, Schumpeter credits Isnard as the precursor of Walras in being the first to try a primitive mathematical definition of equilibrium, a moment he finds crucial (*ibid.,* 260).

Importantly, Thünen and Cournot were the first to glimpse a general equilibrium, the general interdependencies between economic magnitudes and the necessity to have its equational system (*ibid.,* 526. Cournot 1838 volume Recherches sur les Principes Mathématiques de la Théorie des Richesses), and Say's vague and diffuse conception of equilibrium is key to arrive at Walras (*ibid.,* 553). And finally, Mirowski puts in Canard (1801) the point where, in a nascent form, we can find "the full complement of connotations of the equilibrium concept" (1989, 448).

For what concerns us, and as a summary, Schumpeter says that

> "like the leading theorists of the preceding period, the 'classics' *sensed the existence* of what we now call economic equilibrium and, if *they did not try to prove its existence*, they made it, as it were, plausible, embodying their *intuition* in certain empirical rules, such as the tendency of 'profits' to be roughly equal in different but similarly conditioned lines of business." (1986, 562. Italics added).

b. SECOND EQUILIBRIUM: SALIENCE AND HYPOSTATISATION (APPLIED METAPHYSICS)

From here on, the historiography strongly links the development of the concept of equilibrium from its appearance up until its maturation with the appraisal of the physics and mathematics concept of equilibrium (Weintraub, 2002). Ingrao and Israel (2015) identify a first conceptualization of economic equilibrium derived from classical mechanical physics, and a second one stemming from axiomatic mathematisation. Mirowski (1989) argues similarly, saying

that both its emergence and its rise is dependent on the appropriation and imitation by economists of physics theory and concepts (Mirowski, 1984).

It is these rapprochements that we start to find the object presented and determined. It is here that it starts to be an object in and by itself, and the vaporous metaphor found since then —which was connected to many other social disciplines like law or ethics (Ingrao and Israel, 2015)— started a process of condensation up to being solid, to the point where it was possible first to identify it and then to consider its material reality; is in here that the hypostatisation path started.

Schumpeter has the opinion that "the first discovery of a science is the discovery of itself. But this does not spell discovery of its fundamental problem. That comes much later. In the case of economics, it came particularly late." (1986, 233). Truly, we could put in Walras (Schumpeter, 2015, 287, 1054) —who is considered the first to present a General Equilibrium Theory[11]— when we first find economic equilibrium as a sufficiently defined object of study in itself for economics[12], where we can refer to the clear *salience*, in Daston terminology. In this movement, economic equilibrium's reality is intensified by becoming the object of study instead of an assumption rooted in a much deeper position in cultural and social imaginary.

The study of economic equilibrium in this period accounts for a thriving field, and there are examples of great contributions which developed the concept, its capacities, and domains. From the 1870's up until the 1930's the concept of economic equilibrium was gradually consolidated, finding its summit position in the end of the 1950's. We could cite, apart from Walras (1874) —including works on non-competitive markets—, Bertrand (1883), Pareto (1897), Pigou (1912, 1920), Edgeworth (1897), Marshall (2013 [1890]), von Neumann (1971), Samuelson (1941), Hicks (1935, 1946), or Sweezy (1937).

There were different models and conceptions, some of them focusing on specific instantiations of the problem, like Marshall's labour market, some of them on the general problem, like subsequent works of the last part of this second period which we are referring to, from the late 1930's on. We refer to the developments of Debreu, Arrow and McKenzie. Weintraub account of the cohesion of the literature in connection with mathematization (1991) serves illustratively to note this last point of ontological solidification.

In brief, from the convulse history of economic equilibrium, Ingrao and Israel (2015) identify some important common features:

[11] Ingrao and Israel, like Schumpeter, directly relate Walras work with the previous period, seeing it as a fruit of the Enlightenment tradition (2015, 86).

[12] Also, although Walras' general economic equilibrium model might be said that lived a tumultuous dissemination path (Centurião, 2022) it is widely considered the keystone for modern economics.

1. The use of mathematics as its basic tool in describing and analysing economic reality to transform economics into a rigorously quantitative discipline, into a mathematical science on a par with astronomy and physics
2. The constant aim to demonstrate the existence, the uniqueness, and the global stability of the equilibrium

But the final outcome of the general equilibrium research program, consolidated with Arrow, Debreu and McKenzie, was the subsequent:

   a. Existence investigation is satisfactory: it is possible a state of compatibility of the actions of economic agents in competitive markets
   b. Uniqueness can only be obtained on assumptions so restrictive as to appear unacceptable. This poses problems regarding comparative-statics analysis.
   c. Global stability, market's ability to attain equilibrium, is negative.

The two last points are crucial to continue the narrative up to a third moment of the history of the economic equilibrium as a hypostasis.

Both Wald (Ingrao and Israel, 2015, 272) and Sonnenschein's (1972) showed the difficulty of doing any progress when it comes to both uniqueness and stability. Needing very strong hypothesis in the first case, finiteness theorems seemed a possible alternative path (Ingrao and Israel, 2015 281); as Debreu put it, "[the] uniqueness property […] has been obtained only under strong assumptions and […] economies with multiple equilibria must be allowed for" (1970, 387). This is a severe limitation of the Arrow-Debreu-Mackenzie model (Duffle and Sonnenschein, 1989, 574), which renders its fruitlessness (Sonnenschein, 1972).

Schumpeter notes its importance when saying that "without any possibility of proving the existence of a uniquely determined equilibrium—or at all events, of a small number of possible equilibria—at however high a level of abstraction, a field of phenomena is really a chaos that is not under analytic control." (1986, 935). But this level of abstraction is not necessarily at par with its relegation to strictly an analytical tool without ontological entity, as seen above.

For the second problem, again, its solution is crucial to be able to carry out a satisfactory comparative-statistics analysis (Samuelson, 1941, 135). Its central ideological core, and one essential feature of the concept of general economic equilibrium, is the idea that "a social system moved by independent actions in pursuit of different values is consistent with a final coherent state of balance." (Arrow and Hahn, 1971, 1), a notion gravitating "around the basic idea underlying Adam Smith's image of the invisible hand" (Ingrao and Israel, 2015, 287). It is the

conception of the inherent force of the market that pilots the economy towards a state of compatibility between different agents' operations.

The literature during the end of the 1950's in trying to solve the stability problem, for example Arrow and Hurwicz (1958) and Arrow, Block and Hurwicz (1959), "were not very promising, especially when combined with subsequent work by Scarf showing that examples of 'unstable' economies could easily be produced, though not demonstrating the necessity of the hypotheses on which they were based (Scarf, 1960)"[13] (Ingrao and Israel, 2015, 273). And no significant results have been drawn ever since.

Thus, Arrow–Debreu–McKenzie equilibria, while being fundamental to ground subsequent works of equilibrium, the basement for the contemporaneous concept and imaginary of the economic reality and its study, cannot be expected to be unique, nor stable.

c. THIRD EQUILIBIRUM: RELEGATION, LOSING INTENSITY

What is surprising is the fact that, although the scientific program encountered a dead end, an *impasse*, in trying to cement its fundamentals (Mirowski, 1989; Ingrao and Israel, 2015), it is still used as a framework in theoretical and empirical applications.

In any case, the Walrasian general equilibrium remained as the backbone of economic theory for example in the natural rates, in the rational expectation's revolution, in new classical macroeconomics to deal with fluctuations in the business cycle; and the equilibrium is still today one of the main identifiers of what an "economist" studies. Lucas might be the perfect instantiation of these, he suggested "that equilibrium theorising is a discipline for the economist, and he has effectively argued that equilibrium is "a property of the way we look at things" (De Vroey, 2002, p. 420; in Ingrao 2002), and argued that "all observed states of the economy must be modeled as equilibrium states", which is why "all unemployment is best modeled as voluntary unemployment" (Lucas, 1985; in Weintraub, 1991). For the experimental part, from the birth of econometrics to the explosion of empirical work from the credibility revolution in the 90's it is prevailing the use in some part the equilibrium framework as its substance —even if used to contradict the usual theoretical findings of equilibrium theory, like Card and Krueger's work—. This is the case for example from Philip G. Wright's *The Tariff on Animal and Vegetable Oils* (1928) —where IV was first developed— to Stock and Watson's textbook, and this is also the case for computational experiments in macroeconomics, where is usual to use a dynamic stochastic general equilibrium framework (Angrist and Pischke, 2010, p.18). All this happens although the

[13] Although the 1958 paper by Arrow *et al.* was often erroneously cited as having "solved" the problem of stability (Mirowski, 1989, 458).

general equilibrium framework is known to be unrealistic in its core, in the sense that no such thing as equilibrium in markets can be said to be found. Stigler argued this happens because "theories never perish" (Stigler, 1978, 200) and, relevant for us, "There is no obvious method by which a science can wholly rid itself of once popular theories" (*ibid.,* 201). This is not only for the case of theory's internal problematics, but even adverse empirical evidence is also not a decisive factor for the rate of decline of a theory.

All in all, this is the last movement of the position that equilibrium has in economics, being relegated again from a primordial object of study culminating in Arrow-Debreu in the 1950's and 1960's, where the maximum hypostasis was attained, to an assumption, where it remains as a hypostasis insofar as it is assumed to be found in some degree in the empirical world. A last proponent example of this which also shows the productivism of the idea of equilibrium is Alvin Roth and Paul Milgrom's work in market design and subsequent implementation. Is in this case that Cassirer intuition that "truth is to be understood as a social product because humans are world-creators— creators of art, religion, language, or science worlds—" becomes as real as possible in our domain (Cassirer, 1968, p. 21)[14].

4. METAPHOR AND HYPOSTASIS

a. HYPOSTASIS OF THE SECOND PERIOD

It is relevant to point out that during the first steps up until Walras the concept of economic equilibrium usually confused its positive and normative sense (Ingrao and Israel, 2015). It was during this period from the late 19th century to the mid-20th century that the normative baggage was dropped and the mechanical equilibrium— "mechanistic reductionism" in words of Ingrao and Israel— was changed to an axiomatic one.

Economic equilibrium in its axiomatic form is in some sense the secularization of the old notions of stability, immobility found in the western cosmology in general, but also in old economic texts. This goes hand in hand with the mathematical direction Ingrao and Israel pointed out as a common guide during its history, in trying to bring economics closer to physics in a sort of scientism, an effort to create "a physics of social behavior" from the 19th century (Beinhocker, 2006; Hodgson and Thorbjorn, 2010).

[14] Here, we can also mention that Cassirer gives us a hand to link this with the previous point on the Newtonian cosmology— as related to society in general— and paradigm— as related to science in particular—: he rejected the identification of physics with Newtonian physics, which he regards as constituting one physical world rather than the only possible one. He holds, moreover, that man is the maker of not only one type of world, but of worlds of different types, including, apart from the world or worlds of physics, the world or worlds of Language, religion, and art. (Cassirer, 1968, xiii)

As Mirowski puts it,

> "the trajectory of the rise to predominance of the metaphor of equilibrium in economics is identical to that of the asymptotic approach of mathematical economics to mathematical physics" (1989, 448).

This "rise to predominance of the metaphor", blooming from a buried bulb only found when excavated — and largely found strictly as a metaphor — to a shiny flower planted for everyone who pass by to see, is obviously and inevitably linked with the physics metaphor. The equilibrium in the physics conception of the world presented the perfect set up for a vivid image of the equilibrium in the economic world. So not only the concept of equilibrium was taken out of the box of metaphors when it started to be an object of study, but its possible objectivization via the appraisal of the physical concept made it more substantial. It means the direct transposition of a concept used in the study of matter, its constitution, and its motion, what else could be more substantially charged? More convenient to throw away the metaphor and welcome its material existence?

This is in sharp contrast with what Schumpeter view of the history of equilibrium theory was. He considered necessary to dedicate a few lines to point that "the concept of equilibrium, whether static or dynamic, has nothing to do with any borrowing, legitimate or not, from those physical sciences in which analogous concepts occur. They are logical categories and as such as general as is logic itself. They occur both in the physical and the social sciences because it is the same human mind that works both." (Schumpeter, 1986, 936). As we will see below, modern historiography and the narrative hereby developed is antipodal.

Because even if one does not acknowledge the clear additional connotation the equilibrium started to have when it went beyond a metaphor or a cultural assumption rooted in western idiosyncrasy, it is widely understood the keystone role that metaphors and images play in our conceptualisation of the world. There is no need to go to the extreme of the first Wittgenstein (*Tractatus logico-philosophicus,* 2.1, 2.12, 3.03) — although for an example of this radical approach one can refer to Weintraub's *Stabilizing Dynamics* (1991, 150) — to see that the human apprehension of the world is done via metaphors and images of it, be it linguistic or whatever discipline one positions itself.

The definitive contribution which started the study of conceptual metaphors was the seminal work by Lakoff and Johnson *Metaphors We Live By* (2008 [1980]), but Jackobson, for example, stressed out its importance way before, arguing that metaphors and metonymies are the structural axis of all linguistic communication (Honderich, 1995; in Morey, 2014, 24).

When it comes to economics, there is an abundant body of work emphasising the importance of metaphors and other rhetoric devices. We could cite McCloskey's *The Rhetoric of Economics* (1985) or Mirowski's *More Heat than Light* (1989) as seminal contributions central to the movement which considers that metaphors are a key element of economic theories, which characterises them as narratives, and in some sense consider that "economic theories are nothing but extended metaphors born from the attribution to economic objects of qualities and structures previously pertaining to different contexts." (Lagueux, 1999, 3).

In the end, economists erect imaginary worlds from which they analyse the real world. If sociologists have sometimes gone beyond the metaphor and uttered that society is "an organism" (Spencer 1897, l: pt. 2, §1; in Cohen, 1994, 57), even entitling a piece "Human Society as an Actual Organism" (Lilienfeld, 1873; in Cohen, 1994, 58), which establishes an identity relation, economists have also gone beyond the metaphor with its concepts. *Elasticity*, *human capital, rational agents* or *friction* are not mere metaphors, nor metonymies if that were the case, but concepts to an extent erected by themselves. They have an independent entity of the original counterpart used as substrate for the metaphor.

Weintraub walked a similar path when defending a constructivist view of economics. He asks, relevantly to this piece, "Is the economy in a position of stable or unstable equilibrium? From our understanding that there can be only one answer to this question […] it is clear that the 'representation' represents not what is 'out there' but rather what the economist creates." (Weintraub, 1991, 150). But this is not necessarily acknowledged by practitioners. The constructivist approach —through which we could also defend the narrative of the hypostatisation— is not easily swallowed in science, and one can easily see economists discarding it and preferring the first option Weintraub presents, the representation of what is "out there".

Klamer and Leonard glimpse this when saying that the sentence that the labour market is the graphic representation of the supply-demand diagram "is not literally true— *even if frequent application of this particular metaphor makes the user believe it is*—. Of course, there are no demand and supply curves in a market" (1994, 23. Italics added). Even if one does not explicitly say so, real existence is the effective ontological entity the equilibrium has in economics.

And during this second period of salience and hypostatisation economics had metaphorical images, like Marshall's biological parallelisms (Limoges and Menard, 1994; Ingrao and Israel, 2015, 194), but equilibrium ceased to be a mere metaphor, a mere transposition from other fields, to be present with its scientific right to be real.

Finally, closing the circle, metaphors and representations are also important for the concept of equilibrium, for example in Marshall's cross representation of labour market (Klamer and

Leonard, 1994, p. 23). When turned into an object in itself with a whole structure of concepts to support it, equilibrium stepped forward from the background and is now the main character of the economics play. As a protagonist, its existence, its realness, is not mere waffle. It is obvious that it could be maintained as a methodological tool which allows to analyse in a certain manner, but analysing the tool in itself, making it an object, turns its presence more real.

In here, the relevance is not only in the extent to which economists have *thought* equilibrium to be real, but in the extent to which it has been *conceived* to be so. Even if when directly asked an economist does not say "economic equilibrium exist, its real", the usage of equilibrium, the position and presence taken in the whole theory and its study provides the concept with a certain degree of reality which reaches far beyond other abstractions.

As Wittgenstein says:

> "The grammar of a language isn't recorded and doesn't come into existence until the language has already been spoken by human beings for a long time. Similarly, primitive games are played without their rules being codified, and even without a single rule being formulated." (*Philosophische Grammatik*, 1974 [1969], 26[26 s.])

If during the first period the rule, or the game, over equilibrium was used, the second period its characterised by the constant codification and revision of this codification, making its existence explicit, enlarging its presence and its realness.

The mere importance given to the existence theorem (Arrow and Debreu, 1954; Weintraub, 1985, 104) is in itself a clear point of hypostasis, because "outside of pure mathematics, equilibrium is a metaphor, and cannot be 'proved' in a purely abstract sense; all that can be said is that this is the way we organize our intentionally deterministic descriptions, subject to the proviso that most criticisms can be accommodated through further amendments and elaborations of the metaphor." (Mirowski, 1989, 456).

Posing with the existence proof as the banner of the theory by remarking its relevance *ad nauseam* by economists cannot be seen but as signalling to which extent it is being conceptualised as something with real existence, even if then is not explicitly said so. Ingrao argues that "in the absence of any reference to visible market mechanisms, computational algorithms, or proof of existence for equilibrium solutions are assumed 'as if' doing the trick of clearing the markets." (2004, 117) But this "as if" is maintained if one looks economics from great distance. Looking it closely, the "as if" is simply "to be".

Finally, this argumentation applies not only to the concept of equilibrium in itself, but also to the invisible hand, "possibly the most venerable metaphor associated with an economic theory" (Lageux, 1999, 3). Whether being a real description, a fiction, or a metaphor, and apart from the

debates on the iconoclast modern usage versus its original meaning in Smith's writings (see Dellemotte, 2009 as an example), the invisible hand has been secularized in modern times changing the divine-like intervention for an algorithmic one, but the words have remained.

One can grasp the remaining importance of the invisible hand as a metaphor and its new position as a material concept in that at some level of the public imaginary, Debreu received the Noble Prize for 'having proven the invisible hand of Adam Smith'. (Düppe and Weintraub, 2014, 223), —another salience point in which the economic equilibrium can be clearly seen hypostatized in economics and beyond. Also, the invisible hand was secularised; serves as example the fact that the proofs being provided were axiomatic, to facilitate the detection of logical errors within the model, free of divine intervention. Debreu's —and Arrow's— work "made possible a complete and exhaustive analysis of all the implications of the classical approach. The axiomatic approach has "X-rayed" the state of the theory in a complete and even pitiless way" (Ingrao & Israel, 2015).

b. HYPOSTASIS OF THE THIRD PERIOD

During the second half of the 20th century, economic equilibrium lived two movements regarding its presence in the considered-material world. The first one was its attenuation and diffusion when it stopped being a differentiated object of study in itself and got atomised into an infinite number of cases to be resolved (Mirowski, 1989; Colander, 2000). If it is true that studies of equilibrium have been done ever since, they are concreted in specific problematics, and no general or abstract consideration of the equilibrium — as ever-present in the economic reality-as market — has thrived. One of the directions of this diffusion was empirical or applied studies.

But this is not indecisive. As Ingrao and Israel point out, "[the] optimism that finiteness might guarantee a context in which the traditional problems of comparative statics could be tackled with equal significance has certainly been shared by all those who have worked in recent years to apply theorems of the existence of economic equilibrium to empirical problems." This is in sharp contrast with opinions such as Kehoe's, who points out that "conditions that guarantee the uniqueness of equilibrium in models of economic competition are crucial to applications of these models in exercises of comparative statics." (Kehoe, 1985, 119).

Colander remarked that it was not formal modelling but applied policy that changed (2000). In this field, he identifies two aspects which are important. First, the *art* of economics: "In previous time periods, economists such as Smith or Marshall kept the theory in the back of their minds and thought about the policy problem as an art. Their models were kept in the background, and reasonableness —critical thought— was emphasized in applying the models. Applied policy belonged in what J. N. Keynes (1897) called the 'art' of economics" (Colander, 2000, 138). The

second aspect is that during the 1950's and 60's it was hoped that practical models would be guided by general equilibrium theory, something reaffirmed when Arrow-Debreu proved the existence of a general equilibrium in 1957. But by the 1970s economists recognized that the Arrow-Debreu general equilibrium work was not going to get to the promised land. That recognition freed economists to deal with practical policy models that were inconsistent with general equilibrium theory. (Mirowski, 1989, 450).

Thus, in front of the *cul-de-sac* the theoretical research program found, it did not prompt the change one would have expected and resulted in a lack of theory behind applied modelling.

This led to what Mirowski predicted when the program lost its metaphor, that "all that will happen is that the discourse will fragment into ever-smaller and incommensurable splinters, as Walrasians increasingly tend to mistake technique for economic theory" (1989, 460).

For microeconomics it meant that there is an infinite menu of models facing any specific economic problematic, but which pay no considerations for consistency with general equilibrium theory. For macro, Colander holds the position that in the 1990's most economists recognized the impossibility to apply the general equilibrium directly to the economy, thus, "practical and macro modeling was returned to the real-world practitioners, and applied macroeconomics returned to pragmatic, ad hoc modeling." (Colander, 2000, 139-140).

This atomization or diffusion of the concept when it ceased to have a condense — even *solid* — and clear image encased in a specific delimitation, was exacerbated by the so-called economic imperialism. The economic equilibrium was used again as a sort of equilibrium in a more background/cultural way of approaching and understanding the reality, but this time with a scientific turn which allowed now to hypostatize the whole idea of equilibrium, and not only the idea of the *economic* equilibrium.

But these two diffusions — the first one the atomisation inside of economics and the second one the dissemination outside of its academic boundaries — can be seen also as expansions, spread of the domain of the scientific concept, so it could be considered that a second movement regarding the realness of economic equilibrium could be the emphasis of its reality as long as it became present in more concrete yet diverse senses, and in areas seen as equilibrium-free since then. The more paradigmatic example of this would be the study of criminality in terms of equilibrium of interests, being criminality social disequilibrium at its best, even more relevant if is usually disorganized (Becker, 1973, 1968; Hurtado, 2008; Harnay and Marciano, 2009).

5. BRINGING ALL TOGETHER

We will now bring together the two big themes discussed— scientific ontology and the history of the economic equilibrium— to a conclusion that gravitates around the intuition that "the eyes with which we look at an economy differ depending on the theory that we use, and in the case of economics a theory is never totally self-sufficient and autonomous, but dependent on material conditions" (Morishima, 1991, p. 71).

The first part of the sentence puts words to the obvious fact that each scientific theory allows to see certain things because it deals with it from a specific perspective, which also means that in the best occasion it does not allow, and in the worst that it negates the possibility, to see other phenomena.

As Harold Brown put it:

> "Science consists of a sequence of research projects structured by accepted presuppositions which determine what observations are to be made, how they are to be interpreted, what phenomena are problematic, and how these problems are to be dealt with. When the presuppositions of a scientific discipline change, both the structure of that discipline and the scientist's picture of reality are changed." (Brown, 1979, p.166)

So, having overviewed that scientific objects have a history and that this is in fact the case for economic equilibrium both as object of study and assumption for theory, and acknowledging that this affects what can and can't be known, we could continue by questioning if there are economic theories not based on equilibrium— where one does not find the equilibrium hypostasis—, and to which extent this helps to expand the possibilities of what can be known, expanding the notion of what is the economy and what is economic as the domain of study of economics and thus enlarging the possibilities to know more and better.

This is crucial because we can identify World War II as a tipping point in which the formalisation of economics under a specific approach, neoclassical, defined economics of the second half of the 20th century as a monist discipline (Sent, 2006). As Morgan and Rutherford comment, "[T]he transformation into formal economics involved changes in language, form, and tools. This new style became a set of mores that reduced in itself the possibility of pluralism in economics" (1998b, p.19).

There is proper place to start the quest for alternatives in a set of theories labelled as disequilibrium (Benassy, 1982; Fisher, 1983; Quandt and Rosen, 1988). But as Ingrao notices, "the disequilibrium idea is not apt to the purpose since it is a definition *a contraris* belonging to the same semantic field of equilibrium concepts. It is, so to speak, an attempt to escape the strictures of equilibrium concepts, but still with the heavy burden of a core equilibrium idea at the back of the mind." (Ingrao, 2004, p. 12).

Also, not far from equilibrium, we can find all the literature incorporating deviations from it. This includes imperfections and frictions of various kinds, like price stickiness or externalities. But as the case of before, this is still grounded on the equilibrium rationale[15].

This two first options don't seem to enlarge satisfactorily the possibilities to know about the economic phenomena in the sense of prescinding of the mould given by hypostatising the economic equilibrium.

From here we can continue analysing other thesis and methodologies that depart from equilibrium equations. We can think of other "order" based theories, such as the stochastic yet regular conceptualisation of the market (Mirowski, 1989b, c1989c). Also, with a more style difference, game theory is a relevant example, this is an interesting alternative to the methods employed by Debreu and Arrow to study the equilibrium— based on axiomatic mathematization—, but they are usually embedded in the stability-equilibrium framework. A significantly relevant example here is von Neumann, who constructed a model of equilibrium in terms of game theory (Neumann, 1971 [1937]; in Ingrao and Israel, 2015, 188), so its content is still dependent on the substance in which is applied.

On the contrary, developments in the last decades[16] have presented possible alternatives which clearly point out at what we were discussing earlier: each theory has its potential in reviewing certain parts of reality. This is the case for the behavioural uprising, which by questioning the assumptions on which equilibrium is based has opened new arguments, methods, and ways of approaching and understanding the economic phenomena. Another example could be institutional economics, which introduced new factors to be considered when studying economics.

These two examples have broadened the image of what the economy is, who is an economist, and how and economist is supposed to think[17] and have open new possibilities to what can be known, even if in the case of behavioural economics most of its consequences for economic theory has been inside the equilibrium framework[18]. Behavioural opened the study of economic behaviour rather than assuming it to be simple non-satiable rational maximization, and institutional has

[15] Although it has some years now, a good example where this is clear water is in Quandt and Rosen's *The Conflict between Equilibrium and Disequilibrium Theories* (1988), where it is clear how disequilibrium is simply derivations and deviations from equilibrium conservating the same theoretical and idiosyncratic profile.

[16] Older but far-sighted economic authors had no recourse at all to the metaphor of equilibrium, from James Steuart to Karl Marx to Thorstein Veblen to Josef Steindl (Mirowski, 1989, 448).

[17] For contrast regarding the enclosed idea of how an economist is supposed to think under a monist paradigm, see for example Berman (2022).

[18] For example, the contributions in backward bending labor supply curves or *satisficers* rather than optimizing economic agents in market environments or asymmetric price elasticities.

opened the door to identify a process-centred part of the economic reality linked with culture and society which was in its broad sense closed before it.

In line with Kuhn's idea of proliferation by specialization (Wray, 2011), this two examples point at what was impossible to see with the prior conceptualization of what the economy was[19], and one can assume that even with these incorporations we still have much more space in the economics room to better understand the world.

All these alternatives —sometimes more or less conflicting like Marxist and neoclassical or feminist and Austrian, sometimes more or less confluent like ecological and post-Keynesian— study different dimensions of phenomena by changing their focus, methodologies, assumptions, perspectives and so. Even Islamic economics, by radically changing the order of study from what is supposed to be first to what ought to be done first can shine interesting ways to understand the economic reality, so that this can be better and more richly understood.

Deriving from a Kuhnian perspective— referring to his first works (Kuhn, 1971 [1962])—, the case of theories being in conflict rather than in difference presupposes that they are alternative accounts of the same world, which seems to present a rational choice between the two in terms of their capability to explain phenomena. And in this framework "there is a belief, widespread but implicit, that one theory "supplants" another", even if it can be effortlessly argued that "it is seldom and perhaps never the case that two theories are in exact Rivalry" (Stigler, 1978, 200). But with the view presented in here two incommensurable positions don't need to be understood as conflicting alternatives, but as referring to different phenomena, maybe by simply using different perspectives[20].

Each approach develops its own objects to study a part of reality, hypostatising— finding ideas in reality, the world they analyse— more or less concepts such as the economic agent —in behavioural, neoclassical or Austrian economics—, institutions —in Marxian, institutional or complexity economics—, the context of such objects —or the lack of context in the case of

[19] Take as a paradigmatic example Robbins definition: "Economics is a Science that studies human behavior as a relationship between limited resources and unlimited wants which have alternative uses" (1932 [1932]).
In this case, behavioral economics ends with the "unlimited wants" view by presenting economic agents as satisfiers instead of maximisers.
Also taking Samuelson's definition: "Economics is the study of how men and society choose, with or without the use of money, to employ scarce productive resources which could have alternative uses, to produce various commodities over time and distribute them for consumption now and in the future amongst various people and groups of society".
In this case, institutional economics opens a transcendental path deepening the understanding of the economy when, instead of focusing on the employment of "productive resources" looks at the possibilities under which these productive resources can be found in a context.

[20] Overall, one could summarise this by noticing that "If the twentieth century was the century of monism, the twenty-first has fast held high the banner of pluralism." (Cat, 2012, p. 317)

neoclassical economics—, power relations —in Marxian and feminist economics—, the spontaneous order —in Austrian economics—, systems as complex entities rather than the sum of its parts —ecological or complexity economics as the former's cases, and neoclassical— or, finally, equilibrium: neoclassical economics is its first-level proponent. Another perspective is Austrian economics, which although recognising that equilibrium cannot be reached, still is expressed in the market process and for analytical purposes (Quaas and Quaas, 2013, 142). In contrast, other approaches such as feminist or Marxian develop on the imbalance and turbulence rather than reconciliation and equilibrium; and post-Keynesian, evolutionary, institutional, complexity or ecological economics provide each different focuses with the ideas of evolution, emergence, disruption, innovation, and instability instead of unvarying, inert, inactive equilibrium. And these two diverging approaches do not need to be in fight between each other, even if they are incommensurable— no dialogue can be established between them (in latter's Kuhn terms)— does not mean they are incompatible, but complementary[21]. Pointing to "the enrichment of the scientific reality an object" (Ruphy, 2016, p. 31), since here we have noted one type of complementarity: that they are referring to different objects of reality— or at least different perspectives, which expand the propositions that can be formulated about them—, and thus enable to explain and see different parts of reality.

As Ruphy claims:

> "[W]hen a style of scientific reasoning introduces a new kind of entity, this entity does not simply add further to the bestiary of scientific objects, independently of the objects already studied by scientists. […] [T]he introduction of new kinds of entities gives rise to an ontological enrichment of the objects studied by science to the extent that the use in scientific practice of different styles of reasoning widen and diversify the classes of propositions that can be true or false about them". (2016, p. 30)

As can be appreciated, this pluralist stance goes also against the rhetorical movement that defends that once the significance of metaphors in economics is acknowledged only a rhetorical methodological analysis should be left. In this second level of analysis also pluralism should not be vanished. One can find remarkable similarities with this position and the first Wittgenstein[22] — even with the seventh proposition —, but even Wittgenstein corrected himself after such a definitive way of closing the door.

[21] One could say that this proposal goes in line with what Mitchell said to be "interactionist pluralism" (Mitchell, 2003)

[22] See propositions regarding what philosophy is and what should be, for example 4.003, 4.0031 of the *Tractatus*.

One could say that just as we can differentiate between scientific domains because we can identify its different objects of study, we can also identify different theories and approaches because they study different objects within a common theme, in this case economics, maybe each one hypostatising their own categories, "material" objects, effects and so, in order to be able to operate with them.

Acknowledging this entails expanding the possibilities to what can be known incommensurably— inside each field and in transdisciplinary terms—, surpassing the strict corsets of what economic theory is supposed to be, which in turn limits what the domain is— what economic can be conceptualised to be— and this limits what the human world can be, only something enclosed in this understanding of the phenomena.

Finally, although hereby the focus has been put in academic knowledge, weakening knowledge— bringing Vattimo's "weak thought" into the discussion (Vattimo & Rovatti, 1988)— and knowledge production and institutions allows to relax monism in science[23], but also allows to consider non-academic knowledge at par with academic, thus opening a door for popular knowledge and decolonial focuses, which represent an even deeper opportunity to expand knowledge possibilities (Ludwig, et al. 2022).

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7. BIBLIOGRAPHY

Ahmad, Syed. 1990. 'Adam Smith's Four Invisible Hands'. History of Political Economy 22 (1): 137–137. https://doi.org/10.1215/00182702-22-1-137.

Anderson, Gary M. 1988. 'Mr. Smith and the Preachers: The Economics of Religion in the Wealth of Nations'. Journal of Political Economy 96 (5): 1066–1066. https://doi.org/10.1086/261576.

Angrist, Joshua D., and Jörn Steffen Pischke. 2010. 'The Credibility Revolution in Empirical Economics: How Better Research Design Is Taking the Con out of Econometrics'. Journal of Economic Perspectives 24 (2): 3–30. https://doi.org/10.1257/JEP.24.2.3.

Armstrong, D. M. 2010. Sketch for a Systematic Metaphysics. Oxford: Oxford University Press.

[23] An interesting reference of weakening in science can be the difference between hard and soft system thinking, where "the hard stance sees [the system] as a model of reality, while the soft stance sees it as a model of the inquirer's own thinking about the world", and this distinction becomes even more interesting when realizing that it is "not a metaphysical but meta-methodological one that highlights two *complementary* outlooks" (Nagatsu & Thorén, 2022, italics added)

Arrow, Kenneth J., H. D. Block, and Leonid Hurwicz. 1959. 'On the Stability of the Competitive Equilibrium, II'. Econometrica 27 (1): 109–109. https://doi.org/10.2307/1907779.

Arrow, Kenneth J., and Gerard Debreu. 1954. 'Existence of an Equilibrium for a Competitive Economy'. Econometrica 22 (3): 265–265. https://doi.org/10.2307/1907353.

Arrow, Kenneth J., and Frank. Hahn. 1971. General Competitive Analysis. San Francisco: Holden-Day.

Arrow, Kenneth J., and Leonid Hurwicz. 1958. 'On the Stability of the Competitive Equilibrium, I'. Econometrica 26 (4): 552–552. https://doi.org/10.2307/1907515.

Arthur, Richard. 1994. 'Space and Relativity in Newton and Leibniz'. The British Society for the Philosophy of Science 45 (1): 219–40. https://doi.org/10.1093/BJPS/45.1.219.

Becker, Gary S. 1968. 'Crime and Punishment: An Economic Approach'. In The Economic Dimensions of Crime, edited by N. G. Fielding, A. Clarke, and R. Witt, 13–68. London: Palgrave Macmillan. https://doi.org/10.1007/978-1-349-62853-7_2.

———. 1973. 'A Theory of Marriage: Part I'. Journal of Political Economy 81 (4): 813–813. https://doi.org/10.1086/260084.

Beinhocker, E. 2006. Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics. Boston, MA: Harvard Business School Press.

Benassy, Jean-Pascal. 1982. The Economics of Market Disequilibrium. New York: Academic Press. https://archive.org/details/economicsofmarke1982bena.

Bergmann, Gustav. 1940. 'The Subject Matter of Psychology'. Philosophy of Science 7 (4): 415–33. https://doi.org/10.1086/286652.

Berman, Elizabeth Popp. 2022. Thinking like an Economist: How Efficiency Replaced Equality in U.S. Public Policy. Thinking like an Economist. Princeton University Press.

Bertrand, J. 1883. 'Theorie Mathematique de La Richesse Sociale'. Journal Des Savants, 499–508.

Bierstedt, Robert. 1938. 'The Meanings of Culture'. Philosophy of Science 5 (2): 204–16. https://doi.org/10.1086/286501.

Bréban, Laurie. 2018. 'Aux Frontières de l'économie. Les Fictions, Des Expériences de Pensée Aux Protocoles Expérimentaux'. Revue d'histoire de La Pensée Économique 2018 – 1 (n° 5): 91–98. https://doi.org/10.15122/ISBN.978-2-406-08068-8.P.0091.

Brown, Harold I. 1979. Perception, Theory, and Commitment The New Philosophy of Science. Chicago: University of Chicago Press. https://press.uchicago.edu/ucp/books/book/chicago/P/bo3624628.html.

Brown, Vivienne. 1997. '"Mere Inventions of the Imagination": A Survey of Recent Literature on Adam Smith'. Economics & Philosophy 13 (2): 281–312. https://doi.org/10.1017/S0266267100004521.

Brunet, Pierre. 1931. L'introduction Des Theories de Newton En France Au XVIIIe Siècle. Paris: Avant 1738. https://archive.org/details/lintroductiondes00brun/page/n7/mode/2up.

Bryant, Amanda. 2021. 'A Thousand Flowers on the Road to Epistemic Anarchy: Comments on Chakravartty's Scientific Ontology'. Dialogue: Canadian Philosophical Review / Revue Canadienne de Philosophie 60 (1): 1–13. https://doi.org/10.1017/S0012217320000359.

Canard, N. F. 1801. Principes d'Économie Politique. History of Political Economy. Paris: F. Buisso. https://doi.org/10.1215/00182702-31-1-109.

Casini, Paolo. 1969. 'Le Newtonianisme Au Siècle Des Lumières. Recherches et Perspectives'. Dix-Huitième Siècle 1: 139–59. https://doi.org/10.3406/DHS.1969.885.

Cassirer, Ernst. 1968. Antropología Filosófica. 5th ed. México D.F.: Fondo de Cultura Económica.

Cat, Jordi. 2012. 'Essay Review: Scientific Pluralism'. Philosophy of Science 79 (2): 317–25. https://doi.org/10.1086/664747.

Centurião, Lúcia Regina. 2022. 'An Immediately Post-Walras Generation of Mathematical Economists', June. https://doi.org/10.11606/T.12.2022.TDE-23082022-190119.

Chakravartty, Anjan. 2000. 'Risk, Reward, and Scientific Ontology: Reply to Bryant, Psillos, and Slater'. Dialogue 60: 43–63. https://doi.org/10.1017/S0012217320000311.

Chisholm, Roderick M. 1982. Brentano and Meinong Studies. Brentano and Meinong Studies. Amsterdam: Brill. https://doi.org/10.1163/9789004458345.

Cohen, I. Bernard. 1994. 'Newton and the Social Sciences, with Special Reference to Economics, or, the Case of the Missing Paradigm'. In Natural Images in Economic Thought, edited by Philip Mirowski, 55–90. Cambridge University Press. https://doi.org/10.1017/CBO9780511572128.003.

Colander, David. 2000. 'The Death of Neoclassical Economics'. Journal of the History of Economic Thought 22 (2): 127–43. https://doi.org/10.1080/10427710050025330.

Danks, David. 2015. 'Goal-Dependence in (Scientific) Ontology'. Synthese 192 (11): 3601–16. https://doi.org/10.1007/S11229-014-0649-1.

Danziger, Kurt. 1997. Naming the Mind How Psychology Found Its Language. Naming the Mind. Sage.

Daston, Lorraine, ed. 2000a. Biographies of Scientific Objects. Chicago: University of Chicago Press.

———, ed. 2000b. '"Sentimental Pessimism" and Ethnographic Experience: Or, Why Culture Is Not a Disappearing "Object"'. In Biographies of Scientific Objects. Chicago: University of Chicago Press.

Debreu, Gerard. 1970a. 'Economies with a Finite Set of Equilibria'. Econometrica 38 (3): 392–392. https://doi.org/10.2307/1909545.

———. 1970b. 'Economies with a Finite Set of Equilibria'. Econometrica 38 (3): 392–392. https://doi.org/10.2307/1909545.

Dellemotte, Jean. 2002. 'Gravitation et Sympathie. L'essai Smithien d'application Du Modèle Newtonien à La Sphère Sociale'. Cahiers d'économie Politique / Papers in Political Economy 42: 49–74.

———. 2009. 'La "Main Invisible" d'Adam Smith: Pour En Finir Avec Les Idées Reçues'. L'Économie Politique 44: 41–41. https://doi.org/10.3917/LECO.044.0028.

Duffie, Darrell, and Hugo Sonnenschein. 1989. 'Arrow and General Equilibrium Theory'. Journal of Economic Literature 27 (2): 565–98.

Düppe, Till, and E. Roy Weintraub. 2014. Finding Equilibrium: Arrow, Debreu, McKenzie and the Problem of Scientific Credit. Finding Equilibrium: Arrow, Debreu, McKenzie and the Problem of Scientific Credit. Princeton, New Jersey: Princeton University Press. https://doi.org/10.1080/1350178x.2015.1004953.

Edgeworth, F. Y. 1897. 'La Teoria Pura Del Monopolio'. Giornale Degli Economisti 15 (8): 13–31.

Elmslie, Bruce. 1994. 'The Endogenous Nature of Technological Progress and Transfer in Adam Smith's Thought'. History of Political Economy 26 (4): 649–649. https://doi.org/10.1215/00182702-26-4-649.

Feldhay, Rivka. 2000. 'Mathematical Entities in Scientific Discourse: Paulus Guldin and His Dissertatio de Motu Terrae'. In Biographies of Scientific Objects, edited by Lorraine Daston, 307–307. Chicago: University of Chicago Press.

Fisher, Franklin M. 1983. Disequilibrium Foundations of Equilibrium Economics. Disequilibrium Foundations of Equilibrium Economics. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139052108.

Foucault, Michel. 1971. The Archaeology of Knowledge. New York: Pantheon.

Francovich, Guillermo. 1951. Toynbee, Heidegger y Whitehead. Buenos Aires: Raigal.

Hacking, Ian. 1983. Representing and Intervening: Introductory Topics in the Philosophy of Natural Science. Representing and Intervening. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511814563.

———. 1991. 'The Making and Molding of Child Abuse'. Critical Inquiry 17: 253–78.

———. 1992. 'World-Making by Kind-Making: Child Abuse for Example'. In How Class~fication Works, edited by Mary Douglas and David Hull, 180–238. Edinburgh: Edinburgh U.P.

———. 1998. Rewriting the Soul: Multiple Personality and the Sciences of Memory. Princeton: Princeton University Press.

———. 2002. Historical Ontology. Cambridge, MA: Harvard University Press.

Hands, D. Wade. 1994. 'Restabilizing Dynamics: Construction and Constraint in the History of Walrasian Stability Theory'. Economics & Philosophy 10 (2): 243–83. https://doi.org/10.1017/S0266267100004740.

Harnay, Sophie, and Alain Marciano. 2009. 'Posner, Economics and the Law: From "Law and Economics" to an Economic Analysis of Law'. Journal of the History of Economic Thought 31 (2): 215–32. https://doi.org/10.1017/S1053837209090208.

Hicks, J. R. 1935. 'Annual Survey of Economic Theory: The Theory of Monopoly'. Econometrica 3 (1): 20–20. https://doi.org/10.2307/1907343.

Hicks, John. 1946. Value and Capital: An Inquiry into Some Fundamental Principles of Economic Theory. Oxford: Clarendon Press. https://archive.org/details/valuecapitalinqu00hick.

Hodgson, G. M., and K. Thorbjorn. 2010. Darwin's Conjecture: The Search of General Principles of Social and Economic Evolution. University of Chicago Press.

Hodgson, Geoffrey M. 1991. 'Hayek's Theory of Cultural Evolution: An Evaluation in the Light of Vanberg's Critique'. Economics and Philosophy 7 (1): 67–82. https://doi.org/10.1017/s0266267100000912.

Honderich, Ted, ed. 1995. The Oxford Companion to Philosophy. The Oxford Companion to Philosophy. Oxford: Oxford University Press. https://global.oup.com/academic/product/the-oxford-companion-to-philosophy-9780199264797?cc=es&lang=en&.

Hurtado, Jimena. 2008. 'Jeremy Bentham and Gary Becker: Utilitarianism and Economic Imperialism'. Journal of the History of Economic Thought 30 (3): 335–57. https://doi.org/10.1017/S1053837208000321.

Ingrao, Bruna. 2004. 'The Equilibrium Image of the Market'. Journal Des Économistes et Des Études Humaines 14 (2): 87–114. https://doi.org/10.2202/1145-6396.1129.

Ingrao, Bruna, and Giorgio Israel. 2015. The Invisible Hand. Economic Equilibrium in the History of Science. Online. MIT Press.

Karol, Chrobak. 2013. 'Plurality of Ontologies How to Understand the Diversity of Reality?' In Ontologien Der Moderne, edited by John René, Jana Rückert-John, and Elena Esposito, 85–106. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-531-94128-8_6.

Kehoe, Timothy J. 1985. 'Multiplicity of Equilibria and Comparative Statics'. The Quarterly Journal of Economics 100 (1): 119–47. https://doi.org/10.2307/1885738.

Kellert, Stephen H, Helen E Longino, and C Kenneth Waters. 2006. Scientific Pluralism. Edited by Stephen H Kellert, Helen E Longino, and C Kenneth Waters. Minneapolis: The University of Minnesota Press. https://www.upress.umn.edu/book-division/books/scientific-pluralism.

Keynes, John N. 1897. The Scope and Method of Political Economy. New York: Macmillan.

Klamer, Arjo, and Thomas C. Leonard. 1994. 'So What's an Economic Metaphor?' In Natural Images in Economic Thought, edited by Philip Mirowski, 20–52. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511572128.002.

Koyré, Alexandre. 1965. Newtonian Studies. Cambridge, Massachusetts: Harvard University Press.

Kuhn, Thomas S. 1971. La Estructura de Las Revoluciones Científicas / Por Thomas S. Kuhn. México, D.F. [etc.] : F.C.E.,. https://cataleg.uab.cat/iii/encore/record/C__Rb1041269__Skuhn__Orightresult__U__X4?lang=cat&suite=def.

Lagueux, Maurice. 1999. 'Do Metaphors Affect Economic Theory?' Economics & Philosophy 15 (1): 1–22. https://doi.org/10.1017/S0266267100003564.

Lakoff, George, and Mark Johnson. 2008. Metaphors We Live By. Chicago: University of Chicago press.

Leathers, Charles G., and J. Patrick Raines. 1992. 'Adam Smith on Competitive Religious Markets'. History of Political Economy 24 (2): 499–513. https://doi.org/10.1215/00182702-24-2-499.

Levy, David M. 1997. 'Adam Smith's Rational Choice Linguistics'. Economic Inquiry 35 (3): 672–672. https://doi.org/10.1111/j.1465-7295.1997.tb02041.x.

Leys, Ruth. 2000. A Genealogy of Trauma. Baltimore: Johns Hopkins University Press.

Lilienfeld, Paul von. 1873. Die Menschliche Gesellschaft Als Realer Organismus. Mitau: E. Behre's Verlag.

Limoges, Camille, and Claude Ménard. 1994. 'Organization and the Division of Labor: Biological Metaphors at Work in Alfred Marshall's Principles of Economics'. In Natural Images in Economic

Thought, edited by Philip Mirowski, 336–59. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511572128.013.

Lopez, Diana E., Romain Frelat, and Lone B. Badstue. 2022. 'Towards Gender-Inclusive Innovation: Assessing Local Conditions for Agricultural Targeting'. Plos One 17 (3). https://doi.org/10.1371/JOURNAL.PONE.0263771.

López-Beltrán, Carlos, Abigail Nieves Delgado, Sandra P. González-Santos, and Vivette García-Deister. 2022. 'The Heredity Matrix: Genetics and the Understanding of Mestizaje, Health, and Belonging in Mexico'. Science as Culture 31 (3): 357–81. https://doi.org/10.1080/09505431.2022.2065976.

Lucas, Robert E. 1985. Studies in Business-Cycle Theory. Cambridge, Mass: MIT Press. https://mitpress.mit.edu/9780262620444/studies-in-business-cycle-theory/.

Ludwig, David. 2015. A Pluralist Theory of the Mind. A Pluralist Theory of the Mind. Springer Cham. https://doi.org/10.1007/978-3-319-22738-2/COVER.

———. 2022. 'Introduction: Reimagining Epistemology and Philosophy of Science from a Global Perspective'. In Global Epistemologies and Philosophies of Science, edited by David Ludwig, Inkeri Koskinen, Zinhle Mncube, Luana Poliseli, and Luis Reyes-Galindo. New York: Routledge. http://philsci-archive.pitt.edu/18919/.

Ludwig, David, and Birgit K. Boogaard. 2021. 'Making Transdisciplinarity Work: An Epistemology of Inclusive Development and Innovation'. In The Politics of Knowledge in Inclusive Development and Innovation, edited by David Ludwig, Birgit K. Boogaard, Phil Macnaghten, and Cees Leeuwis. Routledge.

Ludwig, David, and Charbel N. El-Hani. 2020. 'Philosophy of Ethnobiology: Understanding Knowledge Integration and Its Limitations'. Journal of Ethnobiology 40 (1): 3–20. https://doi.org/10.2993/0278-0771-40.1.3.

Ludwig, David, Inkeri Koskinen, Zinhle Mncube, Luana Poliseli, and Luis Reyes-Galindo. 2022. Global Epistemologies and Philosophies of Science. Global Epistemologies and Philosophies of Science. New York: Routledge. https://doi.org/10.4324/9781003027140.

Ludwig, David, and S Ruphy. 2021. 'Scientific Pluralism'. Stanford Encyclopedia of Philosophy.

Marshall, Alfred. 1919. Industry And Trade. London: Macmillan. https://archive.org/details/in.ernet.dli.2015.220380/page/n5/mode/2up.

———. 2013. Principles of Economics. Principles of Economics. New York: Palgrave Macmillan UK. https://doi.org/10.1057/9781137375261.

Mas-Colell, Andreu. 1985. The Theory of General Economic Equilibrium: A Differentiable Approach. The Theory of General Economic Equilibrium. Cambridge University Press. https://doi.org/10.1017/CCOL0521265142.

McCloskey, Deirdre. 1985. The Rhetoric of Economics. Madison: University of Wisconsin Press.

Meinong, Alexius. 1904. Untersuchungen Zur Gegenstandstheorie Und Psychologie. Lepizig: Johann Ambrosius Barth. https://archive.org/details/untersuchungenzu00mein.

———. 1907. Über Die Stellung Der Gegenstandstheorie Im System Der Wissenschaften. Leipzig: Radelli & Hille. https://archive.org/details/berdiestellungd00meingoog/page/n8/mode/2up.

Mirowski, Philip. 1984. 'Physics and the "Marginalist Revolution"'. Cambridge Journal of Economics 8 (4): 361–79. https://doi.org/10.1093/OXFORDJOURNALS.CJE.A035556/2/8-4-361.PDF.GIF.

———. 1989a. 'The Probabilistic Counter-Revolution, or How Stochastic Concepts Came to Neoclassical Economic Theory'. Oxford Economic Papers 41 (1): 217–35.

———. 1989b. 'The Rise and Fall of the Concept of Equilibrium in Economic Analysis'. Recherches Économiques de Louvain / Louvain Economic Review 55 (4): 447–68.

———. 1989c. 'Tis a Pity Econometrics Isn't an Empirical Endeavour'. Ricerche Economici 43 (1–2): 76–99.

———. 1989d. More Heat than Light: Economics as Social Physics, Physics as Nature's Economics. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511559990.

———, ed. 1994. Natural Images in Economic Thought: Markets Read in Tooth and Claw. Natural Images in Economic Thought. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511572128.

Mitchell, Sandra. 2003. Biological Complexity and Integrative Pluralism. Cambridge: Cambridge University Press.

Morey, Miguel. 2014. Escritos Sobre Foucault. Madrid: Sexto Piso.

Morgan, Mary S., and Malcolm Rutherford. 1998. 'American Economics: The Character of the Transformation'. History of Political Economy 30 (Supplement): 1–26. https://doi.org/10.1215/00182702-30-SUPPLEMENT-1.

Morgan, Mary S., Malcolm Rutherford, and eds. 1998. 'From Interwar Pluralism to Postwar Neoclassicism'. History of Political Economy 30 (Supplement). https://hope.econ.duke.edu/node/1828.

Morishima, Michio. 1991. 'General Equilibrium Theory in the Twenty-First Century'. The Economic Journal 101 (404): 69–69. https://doi.org/10.2307/2233840.

Nagatsu, Michiru, and Henrik Thorén. 2022. 'Sustainability Science as a Management Science: Beyond the Natural-Social Divide'. In Global Epistemologies and Philosophies of Science, edited by David Ludwig, Inkeri Koskinen, Zinhle Mncube, Luana Poliseli, and Luis Reyes-Galindo, 92–105. New York: Routledge. https://doi.org/10.4324/9781003027140.

Pareto, Vilfredo. 1897. Cours d'Économie Politique. Lausanne: F. Rouge. https://archive.org/details/fp-0148-2/page/n3/mode/2up.

Pigou, A. C. 1912. Wealth and Welfare. London: Macmillan. https://archive.org/details/cu31924032613386/page/n1/mode/2up.

———. 1920. The Economics of Welfare. London: Macmillan. https://archive.org/details/economicsofwelfa00pigouoft/page/n5/mode/2up.

Quaas, Friedrun, and Georg Quaas. 2013. Die Österreichische Schule Der Nationalökonomie Darstellung, Kritiken Und Alternativen. Marburg: Metropolis. https://www.metropolis-verlag.de/Die-Oesterreichische-Schule-der-Nationaloekonomie/1031/book.do.

Quandt, Richard E., and Harvey S. Rosen. 1988. The Conflict between Equilibrium and Disequilibrium Theories. The Case of the U.S. Labor Market. Michigan: W.E. Upjohn Institute for Employment Research.

Quine, Willard Van. 1980. 'On What There Is'. In From a Logical Point of View, 184–184. Cambridge, Massachusetts: Harvard University Press. https://www.hup.harvard.edu/catalog.php?isbn=9780674323513.

Reicher, Maria. 2019. 'Nonexistent Objects'. Edited by N. Edward Zalta. The Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/archives/win2019/entries/nonexistent-objects/.

Robbins, Lionel. 1937. An Essay on the Nature and Significance of Economic Science. London: Macmillan. https://archive.org/details/essayonnaturesig00robb.

Rose, Nikolas. 1996. 'Power and Subjectivity: Critical History and Psychology'. In Historical Dimensions of Psychological Discourse, edited by Carl Graumann and Kenneth Gergen, 103–24. Cambridge, UK: Cambridge University Press.

Ruphy, Stéphanie. 2016. Scientific Pluralism Reconsidered: A New Approach to the (Dis)Unity of Science. Pittsburgh: University of Pittsburgh Press.

Samuelson, Paul A. 1941. 'The Stability of Equilibrium: Comparative Statics and Dynamics'. Econometrica 9 (2): 120–120. https://doi.org/10.2307/1906872.

Scarf, Herbert. 1960. 'Some Examples of Global Instability of the Competitive Equilibrium'. International Economic Review 1 (3): 172–172. https://doi.org/10.2307/2556215.

Schumpeter, Joseph A. 1986. History of Economic Analysis. 1st ed. Great Britain: Routledge. https://www.routledge.com/History-of-Economic-Analysis/Schumpeter/p/book/9780415108881.

———. 2015. Historia Del Análisis Económico. Barcelona: Ariel.

Sent, Esther-Mirjam. 2006. 'Pluralism in Economics'. In Scientific Pluralism, edited by Stephen H. Kellert, Helen E. Longino, and C. Kenneth Waters, 80–101. Minneapolis: The University of Minnesota Press.

Shapin, Steven, and Simon Schaffer. 1985. Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life. Princeton, N. J.: Princeton University Press.

Sonnenschein, Hugo. 1972. 'Market Excess Demand Functions'. Econometrica 40 (3): 563–563. https://doi.org/10.2307/1913184.

———. 1974. 'An Axiomatic Characterization of the Price Mechanism'. Econometrica 42 (3): 425–425. https://doi.org/10.2307/1911782.

Spencer, Herbert. 1897. Principles of Sociology. 3rd ed. New York: Appleton.

Stigler, George J. 1978. 'The Literature of Economics: The Case of the Kinked Oligopoly Demand Curve'. Economic Inquiry 16 (2): 185–204. https://doi.org/10.1111/J.1465-7295.1978.TB00281.X.

Sugarman, Jeff. 2015. 'Historical Ontology'. In The Wiley Handbook of Theoretical and Philosophical Psychology: Methods, Approaches, and New Directions for Social Sciences, edited by Jack Martin, Jeff Sugarman, and Slaney L. Kathleen, 166–82. John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118748213.CH11.

Sweezy, Paul M. 1937. ‘On the Definition of Monopoly’. Quarterly Journal of Economics 51 (2): 362–63. https://doi.org/10.2307/1882094/2/51-2-362.PDF.GIF.

Timpson, Christopher G. 2006. ‘The Grammar of Teleportation’. The British Journal for the Philosophy of Science 57 (3): 587–621. https://doi.org/10.1093/BJPS/AXL016.

Vanberg, Viktor. 1986. ‘Spontaneous Market Order and Social Rules: A Critical Examination of F. A. von Hayek’s Theory of Cultural Evolution’. Economics and Philosophy 2 (1): 75–100. https://doi.org/10.1017/s0266267100000808.

Vattimo, Gianni, and Pier Aldo Rovatti. 1988. El Pensamiento Débil. Madrid: Cátedra.

Vilks, Arnis. 1992. ‘A Set of Axioms for Neoclassical Economics and the Methodological Status of the Equilibrium Concept’. Economics & Philosophy 8 (1): 51–82. https://doi.org/10.1017/S0266267100000481.

Von Neumann, J. 1971. ‘A Model of General Economic Equilibrium’. In Readings in the Theory of Growth, edited by F.H. Hahn, 1–9. London: Palgrave Macmillan. https://doi.org/10.1007/978-1-349-15430-2_1.

Vroey, Michel De. 2002. ‘Equilibrium and Disequilibrium in Walrasian and Neo-Walrasian Economics’. Journal of the History of Economic Thought 24 (4): 405–26. https://doi.org/10.1080/1042771022000029850.

Wagner, Peter. 2000. ‘“An Entirely New Object of Consciousness, of Volition, of Thought”: The Coming into Being and (Almost) Passing Away of “Society” as a Scientific Object’. In Biographies of Scientific Objects, edited by Lorraine Daston. Chicago: University of Chicago Press.

Walras, Léon. 1874. Éléments d’Économie Politique Pure. Lausanne: L. Corbaz. https://archive.org/details/lmentsdconomiep01walrgoog/page/n4/mode/2up.

Weintraub, E. Roy. 1991. Stabilizing Dynamics: Constructing Economic Knowledge. Stabilizing Dynamics. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511571831.

———. 1993. General Equilibrium Analysis, Studies in Appraisal. Michigan: University of Michigan Press. https://archive.org/details/generalequilibri0000wein/page/n5/mode/2up.

———. 2002. How Economics Became a Mathematical Science. Durham, North Carolina: Duke University Press. https://cissct.duke.edu/books/how-economics-became-mathematical-science.

Whitehead, Alfred North. 1929. ‘Process and Reality. An Essay in Cosmology’. In . New York: Macmillan.

———. 1938. Modes of Thought. New York: Macmillan.

Witt, Ulrich. 2013. ‘Competition as an Ambiguous Discovery Procedure: A Reappraisal of F. A. Hayek’S Epistemic Market Liberalism’. Economics & Philosophy 29 (1): 121–38. https://doi.org/10.1017/S0266267113000102.

Wittgenstein, Ludwig. 1960. Tractatus Logico-Philosophicus. London: Routledge & Kegan Paul. https://archive.org/details/tractatuslogicop1971witt/page/n5/mode/2up.

———. 1974. Philosophical Grammar. Edited by Rush Rhees. Maiden, MA: Blackwell Publishing.

Wong, James. 1995. ‘The Very Idea of Child Development’.

Wray, K. Brad. 2011. Kuhn's Evolutionary Social Epistemology. Kuhn's Evolutionary Social Epistemology. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511997990.

Wright, Philip G. 1928. The Tariff on Animal and Vegetable Oils. New York: Macmillan.

Young, Allan. 1995. The Harmony of Illusions. Princeton, N.J.: Princeton University Press.

Zahar, Elie. 1980. 'Einstein, Meyerson and the Role of Mathematics in Physical Discovery'. The British Journal for the Philosophy of Science 31 (1): 1–43. https://doi.org/10.1093/BJPS/31.1.1.

Žižek, Slavoj. 1996. 'Sex in the Age of Virtual Reality'. Science as Culture 5 (4): 506–25. https://doi.org/10.1080/09505439609526445.https://doi.org/10.1080/09505439609526445.