# Auction or selection? Two competing (neoclassical) metaphors for "the economy"

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## Introduction

Competitive markets and the private ownership of economic resources can harness the independent, decentralized, and self-interested activities of economic agents and deliver a general, economy-wide, equilibrium that maximizes the social welfare. This is a generic, modern neoclassical version of the famous "invisible hand" theorem. Nevertheless, there is no single version of this theorem: Bernard Mandeville's *Fable of the Bees* mobilizes a different metaphor than the notion of natural order described in Physiocrats' *Tableau Economique*. Similarly, Adam Smith's organicist understanding of the "system of natural liberty" differs from *the system of interdependency* described in the general equilibrium model of Léon Walras. Metaphors economic thinkers and economists use in conceptualizing the economy and its functioning differ, and this difference has material implications for economic and social policy. Even when economic thinkers and economists describe similar sounding ideas, they may be describing them in radically opposed ways, drawing radically opposed conclusions, and formulating radically opposed policy prescriptions.

Based on this premise, this paper aims to highlight a line of fracture that traverses the entire history of neoclassical tradition from its inception onwards and splits the tradition around two different representations of the "invisible hand" theorem—notwithstanding the internal differences on both sides of the fracture. While a Walrasian skein, one that began in Lausanne and continued in postwar North America in and around the Cowles Commission, tended to construct general equilibrium models ground up from the

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individual agents, a Marshallian skein, one that began in England and continued at the University of Chicago after the war, tended to have a partial equilibrium approach that emphasized the use of representative agents and market-level analysis.[1] In the Walrasian tradition, the competitive markets are conceptualized, even though many prominent Walrasian economists have always been very unsatisfied with this metaphor, as an *auction* where the "invisible hand" ends up being the hand of an imaginary auctioneer that guides the actions of producers and consumers through an out-of-time *tâtonnement* process. In contrast to the static equilibrium and price-adjustment approach of Walrasian economics, the post-war Chicago School, following Marshall's performative prediction "the Mecca of economics lies in economic biology" (Marshall 1920: xiv), tended to gesture towards what seems to be a dynamic, evolutionary metaphor: the competition is theorized, with explicit, yet almost always under-theorized, references to biology and Darwinian theory, as an evolutionary *selection* process that would weed out those under-performing inefficient agents. In this case, the "invisible hand" takes the form of a selection mechanism that secures the efficiency of the outcome.[2]

Metaphors matter. They *enframe* the way the problems are posed and the solutions are devised. Metaphors with which the markets are conceptualized have material consequences pertaining to policy prescriptions.[3] In this sense, it is important to emphasize that for the neoclassical tradition, the invisible hand theorem is indeed a *theorem*—i.e., the proponents of neoclassical economics are *not* all advocates of *laissez faire*.

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[1] Throughout the history of neoclassical tradition, the two tendencies had a dialectical relation of sorts: up to the WWII, the Marshallian skein took the lead; after the WWII, up to the 1970s, the Walrasian skein, perhaps due to the impact of its forceful and rapid mathematization, gained prominence; and since the early 1980s, partly due to the efforts of the proponents of the Chicago School, partly due to ascendancy of the Coasean new institutional economics, and partly due to the increasing spread of the use of evolutionary metaphors (a distinctively Marshallian theme, as we will see) the Marshallian influences are giving shape to the character of late neoclassical economics (Madra 2016). It is important to register the differences between what I call Marshallian approach here and Marshall's analyses (see Hirsch and De Marchi, 1990; Aldrich 1996). No doubt, Marshall's own work has influenced and continues to influence the Marshallian neoclassicism. But the latter is shaped by the entire history of neoclassical tradition and not just by Marshall's writings.

[2] There is indeed a debate whether the Adam Smith of the Chicago School is really the Adam Smith of *The Wealth of Nations* (1776) and *The Theory of Moral Sentiments* (1790) (Evensky, 2005; see also Sen, 1987: 15-28).

[3] The role rhetorical tropes play in economic theory have been extensively discussed by D. N. McCloskey (1985; 1994). For valuable discussions of the role of natural metaphors in economic theorising, see (Mirowksi, 1994)

On the contrary, there have always been neoclassical economists who found justification in a version of neoclassical theory for different degrees of government involvement in the economy (e.g., before the ordinalist turn, Henry Sedgwick, Alfred Marshall, A. C. Pigou; after the ordinalist turn, Abba Lerner, Oskar Lange, Jacob Marschak, Tjalling Koopmans, Kenneth Arrow, Frank Hahn). For those who believe that the reconciliation of the individual and the collective rationality *can* be realized through the competitive markets and the rules of property, the policy prescription has always been to institute the requisite market institutions (e.g., the liberalization of trade, the liberalization of factor markets, the privatization of public assets and all kinds of commons); for those who believe that it *cannot* be realized through the competitive markets and the rules of property, the policy prescription has always been to remedy the various market failures (e.g., ranging from the provisioning of public goods to the regulation of externalities) either through direct government intervention or, if necessary, with the help of non-market and non-governmental institutions. Even though both traditions have their share of market advocates and market-skeptics, the line that divides the former type of neoclassical from the latter type tends to overlap, at least in the post-war North American context, with the line that separates the Marshallian and the Walrasian skeins, respectively.

Despite this divergence of opinion in their policy prescriptions, however, both positions, because they share the common (neoclassical) theoretical problematic of how to reconcile individual and collective rationality, ascribe a privileged and constitutive role to the model of perfect competition as their ultimate point of reference: In the case of the *laissez faire* camp, the model of perfect competition (enframed in the Marshallian biological *selection* metaphor) figures in as an "ideal" state that should be approximated in real economies; in the case of the interventionist camp, the model (in this case, enframed the Walrasian *auction* metaphor) serves as the standard of efficiency to be "emulated" with the help of second best alternatives. In both cases, the model of perfect competition retains its

status as the description of the socio-economic order that would best accommodate the postulated essence of the centered, rational, and autonomous human subjects.[4]

Beginning with the 1930s, weakened by its failure to address the worldwide depression, the neoclassical tradition began to go through its, perhaps, first important transition: Partly in response to American institutionalists who criticized neoclassical economists for subscribing to an outdated, non-scientific, utilitarian model of human psyche ("psychologism") and partly due to the discomfort borne out of the non-measurable notion of *utils*, neoclassical economics took an ordinalist turn and abandoned the earlier cardinalist models that took the utility function as their description of the choice process (Lewin, 1996; Mandler, 1999). The ordinalist turn marked a certain change of attitude in the way the economic agents are treated in the standard neoclassical models.[5] It became preferable *to assume as little as possible* about the preferences of the actual economic agents. Lionel Robbins (1932) was one of the first neoclassical economists to publicly criticize the notion of utility as an interpersonal measure of well-being; Samuelson (1938) wanted to read the preferences directly from the revealed choices of the consumers; Arrow (1951; 1963) rendered the concept of preference indifferent to the underlying motivations of the economic agents; Debreu (1959) proved the existence and efficiency of the general equilibrium by imposing as minimal restrictions as possible on the preferences of the consumer; Becker (1962) went so far as to argue that, even if the consumers and the producers do not respond to changes in prices rationally (i.e., by responding impulsively or remaining inert), market forces (i.e., changes in opportunity sets) will tend to produce

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[4] In his now well-known Jevons Memorial Lecture entitled "In Praise of Economic Theory," Frank Hahn specified the following as the essential features of neoclassical economics (Hahn 1985; cf. Lawson 1997: 87):

an individualistic perspective, a requirement that explanations be couched solely in terms of individuals;

an acceptance of some rationality axiom; and

a commitment to the study of equilibrium states.

All these features are captured in the working definition of the neoclassical problematic provided here. However, while the latter two remained intact throughout the history of the neoclassical tradition and continue to remain intact today, the first feature (i.e., individualism), whether it is acknowledged by neoclassical economists or not, has been repeatedly violated by "structuralist moments" throughout the history of the tradition (Madra 2016).

[5] Let us immediately note that Pareto's formulations in his *Manuel di economica politica* already gesture towards an ordinalist understanding (Ingrao and Israel 1990: 132–5).

"rational" results that would systematically satisfy the basic predictions of neoclassical economic theory.[6]

Despite this accentuated and widespread tendency to refrain from assuming too much about the economic agent, let us note that, all of these neoclassical approaches, when it came to making normative claims about the efficiency of the equilibrium, continued to harbor crucial and common assumptions regarding the psyche of the economic agent: even though it became impermissible with the ordinalist turn to compare the states of well-being of each individual with one another, these mid-century neoclassical models continued to assume that (i) the *choices* of the agent reflect her/his *preferences* and (ii) the *preferences* of the agent (even when s/he is not selfish), in turn, reflect the *welfare* of the agent.

In the late 1960s and early 1970s, when the invisible hand theorem was fully formalized in the Arrow-Debreu-McKenzie (ADM) general exchange equilibrium models, many prominent general equilibrium theorists swiftly recognized and acknowledged that there are indeed limitations to this neoclassical model of the market equilibrium and the concept of economic agent associated with this model (Arrow and Hahn, 1971; Hahn, 1984; Arrow, 1987; Kirman, 1992; Katzner, 1998; 2004). With the full-development of the ADM model, a widespread perception has emerged among neoclassical economists: If they wished to develop the idea of general equilibrium (i.e., harmonious and contradiction-free economic order) as a spontaneous and unintended outcome of the rational actions of individual economic agents, they had to give up the idea that each individual is unique, distinct, and autonomous. The Sonnenschein-Mantel-Debreu results, although more recent research proved them to be less general than they were perceived at the time (for a recent survey see, Rizvi, 2006), demonstrated that, unless further restrictions are imposed on the types of preference that the consumers can have in an ADM exchange economy, it is impossible to obtain the proper market excess demand functions that will always guarantee full reconciliation. Imposing further restrictions,

[6] According to Becker (1962), changes in the opportunity sets (budget constraints), induced by the changes in relative prices, will force "the average economic actor" to behave according to neoclassical theorems, even when each actual actor in the market may behave irrationally.

however, while providing the necessary conditions for the *uniqueness* and *global stability* of general equilibrium, meant for many (but not all) the loss of the intended generality of a thoroughly individualist general equilibrium model (Kirman, 1992; 2006; Rizvi, 1994; 2006).

Accompanying the matters that pertain to the uniqueness and global stability of the general equilibrium, there was the problem of how to conceptualize the process of *price adjustment* (price determination). The auction metaphor, invoked in order to motivate the *tâtonnement* process through which the suppliers and the buyers modify their plans (in relation to everyone else's plans) outside of the real time until the equilibrium is finally reached, due to its lack of conformity with the precepts of methodological individualism, was far from convincing.[7] Indeed, the auctioneer and its contradictory position within the intendedly individualist framework of the Walrasian system have already been identified by a number of scholars as a *structuralist moment* of an otherwise theoretical humanist discourse (Amariglio, Resnick and Wolff, 1990; Charusheela 1998; see also, Hahn, 1984). Moreover, historically the auction metaphor was used by the left-leaning Walrasian economists (e.g., Abba Lerner, Oskar Lange) as a euphemism for the Central Planning Board. In other words, the Walrasian skein of neoclassical economics, at the time, did not only fail to provide the promised microfoundations for the general competitive equilibrium with a desired level of generality (and hence, in a manner, defaulted on its promise to formalize the invisible hand theorem), but also promulgated in the minds of some a vision of the market economy that necessitated government intervention to undertake its most basic function—namely, the determination of the equilibrium price vector![8]

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[7] In this paper, given my focus on the period up to Gary Becker's 1962 paper, I will mainly consider *tâtonnement* models of general exchange equilibrium. Nevertheless, even though the Auctioneer-led *tâtonnement* has been a prominent metaphor for conceptualizing the price adjustment process in an ADM exchange economy, non-*tâtonnement* (e.g., search) models of price adjustment were also explored starting with early 1960s (Hahn and Negishi, 1962; Diamond, 1971). For a survey of the literature, see (Hahn, 1982: 788-791; Fisher, 2011).

[8] In addition to being a euphemism for the Central Planning Board, perhaps another problematic implication of the auctioneer metaphor for the pro-market neoclassical economists was that the Walrasian agents were autonomous neither from each other (system of interdependency) nor from a supra-individual agency, such as the auctioneer. I am making this hypothesis with the full knowledge of the fact that Milton Friedman, in a review of William Jaffé's translation of *Elements of Pure Economics*, wrote the following

In this paper, I propose to read a series of influential articles written by prominent post-war Chicago School economists (Alchian, 1950; Friedman, 1953; Becker, 1962), among other things, as attempts to formulate a description of the market adjustment process, based on a biological metaphor, as an alternative to the Walrasian auction metaphor and its undesirable theoretical and policy implications. Even though these essays are written in the context of the Marginalism controversy, they also proved to be foundational texts for a distinct Chicago approach to economic analysis, economic policy, and even social theory. The structure of the paper is as follows. Following a brief recapitulation of the early history of neoclassical economics that carefully delineates its Walrasian and Marshallian skeins, I turn my attention first to the *auction* metaphor in post-war Walrasianism and then to the *selection* metaphor in order to explore the origins of the post-war Chicago School. The paper will end with concluding remarks.

## Early neoclassicism: Walrasian and Marshallian

Even though it is usually argued that Adam Smith's theorem received its early mathematical formulations at the end of the nineteenth century, in the writings of Leon Walras (1954; first published between 1874 and 1877) and Vilfredo Pareto (1971[1906]), Bruna Ingrao and Giorgio Israel (1990) argue that it would be wrong to reduce the Walrasian general equilibrium model to a formalization of Adam Smith's invisible hand theorem. They identify, along with Smith and his notion of *invisible hand*, Montesquieu and his notion of "equilibrium of social forces," Quesnay and his *Tableau économique*, and Condorcet and his *mathematique social* as the antecedents of general equilibrium theory. Therefore, even though Adam Smith and the naturalism of the Scottish Enlightenment was indeed an acknowledged influence, it is more appropriate to consider the Lausanne tradition as a product of the French rationalism, the Cartesian philosophy of science, and a constructivist worldview that considers the society as an object of "engineering."

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appraisal: "It is Walras' great and living achievement to have constructed a mathematical system displaying in considerable detail precisely the interrelationships emphasized by Cournot" (1955: 904). My intention is not to claim that Friedman was disingenuous in his praise. Rather, my emphasis is on the fact that his vision of the market economy, with its emphasis on competitive survival, is quite distinct from and normatively opposed to the Walrasian vision.

In Walras, we find the formulation of the *possibility* of an equilibrium price vector that will clear simultaneously all the markets in a market economy and the concept of *rareté*—a subjective measure of the last need satisfied (Ingrao and Israel, 1990: 92). On the other hand, the concept of efficiency that corresponds to the general equilibrium, even though it gained general currency only in the post-war era after the ordinalist turn, is attributed to Pareto (Screpanti and Zamagni, 1993: 206-7; Backhouse, 2002: 279). A *Pareto efficient* allocation of resources refers to a state of a full employment economy where there is no way in which to reallocate the resources to make one person better off without making someone else worse off. These two concerns (equilibrium and efficiency) would find their precise mathematical formulations elsewhere in North America, in the mid-twentieth century, in a series of papers and monographs written by the likes of Kenneth Arrow, Gérard Debreu, Frank Hahn, and Lionel W. McKenzie. In these high modernist mathematical studies, not only the existence of an equilibrium price vector is mathematically proven, but also the efficiency (in the sense of Pareto optimality) of such an equilibrium was established.[9]

Any genealogy of neoclassical economics, however, would be far from complete if the utilitarian lineage that stretches from Jeremy Bentham to William Stanley Jevons and then to Alfred Marshall is not traced. Bentham's hedonistic calculus of pain and pleasure did not only rely on an introspective, subjective, and substantive theory of human action but also offered a cardinal index, a common denominator to compare and to add and subtract the magnitudes of different individuals. Indeed, the main concern of utilitarianism was to maximize the total utility of community (Sen, 2002: 70). In Jevons (1970[1871]), we find an early formulation of the utility calculus (which predates Walras' notion of *rareté*); in Francis Ysidro Edgeworth (1881), we find the concept of indifference curve; in Marshall (1920[1890]), we find a textbook version of the utility-based theory of demand and a discussion of elasticity. Since it was Marshall who consolidated this tradition and gave shape to its overall philosophical and methodological outlook, it is usually referred to as the Marshallian tradition (de Vroey, 1999). In the 1930s and 1940s, as the center of gravity of the discipline began to shift from Europe to North America, the

[9] For sociologically rich and epistemologically sophisticated histories of Walrasian economics, see (Weintraub, 1985; Ingrao and Israel, 1990).

tradition would establish its headquarters at the Economics Department of University of Chicago (Emmett, 1997).

Even though the invisible hand narrative does not hold an important place in Marshall's formalization of the utility theory of demand and the real-cost theory of supply, the neoclassical problematic still dominates his concerns. The distinguishing characteristics of Marshallian economics are its partiality for the analysis of individual markets or industries (as opposed to general equilibrium analysis), its use of representative agents (as opposed to the idealized agents that populate the general equilibrium analysis), and its incorporation of temporality into the analysis of market equilibrium (as opposed to the synchronic non-temporality of the general equilibrium model).[10] A useful, albeit brutally simplistic, way of distinguishing the two traditions could be the following: In the Walrasian system, a *general* equilibrium is reached through a process of *price*-adjustment where the adjustments are made in the price vector so that all excess demand functions equal to zero; in the Marshallian understanding, a partial equilibrium is reached through a process of *quantity*-adjustment where those who cannot survive in the equilibrium price leave the market. But despite these very important differences, Marshall's (and Jevons') policy prescriptions were guided by "the utilitarian principle [which defines] the ultimate goal of economic activity [as] the maximization of collective welfare" (Screpanti and Zamagni, 1993: 182). In this sense, the Walrasian and the Marshallian traditions are different from, and opposed to each other only in how they define and formulate the neoclassical problematic. Otherwise, this is a struggle internal to the neoclassical tradition. In fact, far from being undermined, the neoclassical tradition thrives on such struggles on how to define and formulate its constitutive problematic.

## The auction metaphor and the post-war Walrasianism

In the late 1960s and the early 1970s, when the invisible hand theorem was fully formalized in the Arrow-Debreu general equilibrium models, most general equilibrium theorists swiftly recognized and acknowledged that there are indeed some limitations of

[10] In fact, for Marshall, "the Mecca of the economist lies in economic biology rather economic dynamics" (Marshall, 1920: xiv). In this sense, if the Walrasian understanding of the markets is based on the field theory borrowed from physics (Mirowski, 1989), the Marshallian understanding of the markets is (loosely) based on the selection theory borrowed from biology (Loasby, 1999).

this neoclassical model of the market equilibrium (Hahn, 1984; Arrow, 1987; Kirman, 1992; Katzner, 1998; 2004; 2006; Lee, 2006). Essentially, the problem was the difficulty in bringing together the two aspects (i.e., a unique and globally stable general equilibrium and the autonomous and rational choices of the individual agents) of the neoclassical theoretical problematic at the desired level of generality. The problem was especially aggravated in the context of the growing tendency to assume as little as possible about the motivations of the individual agents. In this section, I will first overview the general properties of an Arrow-Debreu economy. I will then proceed to discuss the structuralist moments as well as the perceived political and normative implications of the structuralist moments of the Arrow-Debreu model.

*The Arrow-Debreu model: Formalism without apologies*

Let me begin with noting that the Arrow-Debreu model is not the only re-formulation of the Walrasian general equilibrium model. Up to 1950s, there were already a number of different formulations articulated by, among others, Cassel (1918), von Neumann (1928; 1937), and Hicks (1939). Moreover, there are important differences even between Debreu's *Theory of Value* (1959) and Arrow and Hahn's *General Competitive Analysis* (1971). For instance, while the latter text, written a decade later, tried to recast the Arrow-Debreu model so as to accommodate the concerns of the economic discourse of the day, Debreu insisted on not compromising with the formalism of his method (see also, Weintraub, 1974: 106). In his introduction to the *Theory of Value*, Debreu wrote:

> The theory of value is treated here with the standards of rigor of the contemporary formalist school of mathematics. The effort toward rigor substitutes correct reasonings and results for incorrect ones, but it offers other rewards too. […] It may also lead to a radical change of mathematical tools. In the area under discussion it has been essentially a change from the calculus to convexity and topological properties, a transformation which has resulted in *notable gains in the generality and the simplicity of the theory*. Allegiance to rigor dictates the axiomatic form of the analysis where *the theory, in the strict sense, is logically entirely disconnected from its interpretations*. (Debreu, 1959: x; emphasis added)

The contemporary formalist school of mathematics that Debreu refers to is the Nicolas Bourbaki group (Weintraub, 2002). Formalism of this mathematical structuralism entailed "emptying the theory radically and uncompromisingly of all empirical reference" (Ingrao and Israel, 1990: 285) and the creating of an abstract and universal "root" model that can

be applied, with the appropriate modifications, to different theoretical and empirical contexts.[11] An important implication of formalist effort for our purposes was to assume as little as possible about the individual agents.

Given the importance of the book and the compactness of its expository format, I will refer mainly to Debreu's *Theory of Value* in the following discussion of the A-D model. Moreover, in contrast to Arrow and Hahn's (1971) much more reader friendly exposition, the uncompromising formalism of Debreu's book can be viewed as a limit case where the auctioneer metaphor is only a vague "framework of images and intuitive figures" (Ingrao and Israel, 1990: 300). In this manner, we can account for the more explicit objections by Friedman (1955: 904-5; see also Hammond, 1993) with respect to the formalism of the general equilibrium tradition without limiting our argument to the mobilization of the auction metaphor. I will begin the discussion with the definition of the concept of the commodity; then I will proceed on discussing the production and consumption decisions; and I will conclude with a discussion of the concept of general equilibrium and the concept of Pareto efficiency.

Debreu defines the concept of the commodity as "a good or a service completely specified physically, temporally, and spatially" (1959: 32). This notion of commodity is very important for the Arrow-Debreu model to establish its domain, for the concept transforms the heterogeneous mass of "things" into logical "objects" that can be manipulated in the language of mathematics.[12] Through this concept of the commodity, the Arrow-Debreu economy establishes a commodity space. The concept of the

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[11] Ingrao and Israel (1990: 300) note that Debreu's "uncompromisingly formalist" exposition of the A-D model is indeed an aberration in a long line of efforts that concentrate on demonstrating "the *existence*, the *uniqueness*, and the *global stability* of the equilibrium" (1990: 3). They argue that unlike, for instance, Arrow and Hahn (1971) who explored the aspects of the questions of uniqueness and global stability of the equilibrium through introducing a number of "ad hoc" assumptions, Debreu, in his *Theory of Value*, given his commitment to formalism and aversion to "ad hoc" assumptions, did not address these questions. In fact, Ingrao and Israel argue, "[t]he clarity of Debreu's approach to the subject soon leads him to recognize that the other cornerstones of the Walrasian program—uniqueness and stability—present enormous difficulties or, are, in fact, blind alleys" (1990: 303). Let us register, for the moment being, that the very concept of "ad hoc" assumptions is not without its problems: What assumptions qualify as "ad hoc" and what assumptions do not? I will further discuss this point below.

[12] In this sense, an Arrow-Debreu commodity is a "logical object" and not a "thing": "Objects are defined as logical entities as opposed to things, which are empirical...[T]he abolition of the thing, the suppression of all its attributes [gives] rise to a logical object" (Copjec, 1994: 171-2).

commodity abstracts from the concrete properties of the "thing." As long as goods and services are properly specified with respect to their physical properties, location, temporal coordinates, and so on (e.g., a black umbrella, on September 11, 2017, in Harlem) anything can be brought into the purview of the general equilibrium model. Specification of the *temporal dimensions* of a commodity, enables the Arrow-Debreu model to incorporate "saving, or lending of money […] as the purchase today of a particular future dated commodity" (Geanakoplos, 1989: 44). Specification of the *location* provides the opportunity to include the transportation costs into the price of the commodity. In this sense, for the Arrow-Debreu model, the commodity—what is being purchased by a consumer or a producer— as a logical object is free of the ambiguities of the actual "thing" and the commodity space is flexible enough to be infinitely inclusive and temporarily infinite.[13]

In the A-D model, the producers are conceptualized as economic agents that choose a *production plan* (into the future), namely a plan that specifies the quantities of all its inputs and outputs that will maximize profits. As such, in the model, the process of production, as a process of transformation of inputs into outputs, is treated as a "black box". Similarly, the technology is exogenously given and the production functions are assumed to be convex. The assumption of convexity imposes strong restrictions on the model: Neither the indivisibility of outputs nor the increasing returns to scale in production are permitted. In short, for the A-D model, the production is a frictionless, automatic process of optimization. Moreover, the specification of a given number of producers in the model bars the possibility of incorporating free entry as well as bankruptcy (Koopmans, 1957: 64-5).

In a structure parallel to the production, the consumer in the A-D model does not choose a single consumption bundle but chooses a complete *consumption plan* according to her/his

[13] Even "uncertainty" can be incorporated into the model through expanding the definition of the commodity: "A contract for the transfer of a commodity now specifies, in addition to its physical properties, its location and its date, an event on the occurrence of which the transfer is conditional (Debreu 1959: 98)." In this framework, "uncertainty" is explained through the metaphor of an *anthropomorphized* "nature" that makes choices among a finite number of alternatives. Each alternative is an *event*. Therefore, a black umbrella, on a *rainy* September 11, 2017, in Harlem, will be a different commodity than a black umbrella, on a *sunny* September 11, 2017, in Harlem.

preferences. Preferences should be complete, reflexive, transitive, continuous, insatiable, and convex. While assumptions pertaining to completeness, reflexivity, and transitivity are seen to be the basic assumptions of economic rationality,[14] the insatiability and convexity are necessary specifically for proving the *existence* of the equilibrium price vector. Unlike the production side, Debreu's treatment of time through the construct of consumption plans makes it possible for the consumers to form their plan in a manner that "includes a specification of the length of life compatible with his [*sic*] present resources, his ability to do remunerative work or shift for himself, and other aspects of his life plan" (Koopmans, 1957: 63). In this manner, the model "permits a more subtle version" of a "hard-bolied" interpretation that "assumes instantaneous elimination of by starvation of those whose resources insufficient for survival" (62).

Which brings me to the matter of equilibrium and its efficiency. The A-D model does establish the *existence* of an equilibrium price vector that would clear all markets.[15] Moreover, the A-D model offers two theorems (also known as the *Fundamental Theorems of Welfare Economics*) pertaining to the efficiency of the general competitive equilibrium (Debreu, 1959: 90-7). The first theorem shows that under the given assumptions pertaining to the commodity space, production, and consumption, any competitive equilibrium is Pareto optimal. As noted in the previous section, the achievement of Pareto optimality relies on the assumptions that the producers maximize profit and that the consumers choose "a consumption plan to which none is preferred" (Debreu, 1959: 50).

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[14] In particular, if the axioms of reflexivity, completeness, and transitivity hold, then the individual is considered to have a *preference ordering*; if the axiom of continuity also holds, the individual's preference ordering can be represented as a utility function (Hargreaves Heap, 1992: 6).

[15] Without doubt, the existence theory discussed above refers to existence only in the mathematical sense of the term. In fact, the A-D model had very little to say about the functioning of the actual markets. But for a mathematical economist like Debreu, the formalism that underpins the A-D model was not a shortcoming, but rather an asset. Yet despite all the formalist aspirations (i.e., "the generality of the theory" or "the disconnectedness of theory from its interpretations") articulated by Debreu, there is still a privileged type of market that silently structures the A-D model: the auction market. Ingrao and Israel highlight this point when they write: "…Debreu's intention in the *Theory of Value* is to take the Walrasian description of the market as what we are tempted to call an empirical frame of reference but is more correctly defined as a *framework of images and intuitive figures*. Moreover, not content with the most orthodox form, he chooses a hyper-simplified version in order to obtain a simple and compact model description. […] Debreu's point of reference is the theorization of the Lausanne school, *which appears only in the background as a set of intuitive images* since his is a full-blooded axiomatic theory. The Walrasian paradigm is thus revived in a new form: the phoenix rises again from the ashes, even though its wings now glitter with axioms" (1990: 300; latter emphasis added).

The second welfare theorem, on the other hand, shows that there is an equilibrium price vector that corresponds to each Pareto optimum allocation. In other words, because there exists an equilibrium price vector that corresponds to each of them, it is possible to reach any of the possible Pareto optimal allocations for any given initial distribution of wealth (endowments).

*Walrasian structuralism?*

Even though it offered a formal proof of the *existence* (and Pareto *efficiency*) of an equilibrium price vector, the Arrow-Debreu model, perhaps as a result of its clearly delineated axiomatic expository format, revealed to its practitioners that the number and the scope of the assumptions necessary to prove the *uniqueness* and the *global stability* of a general equilibrium in a decentralized economy with rational economic agents were quite extensive (Ingrao and Israel, 1990: 314).[16] Unless further restrictions are imposed on the type of preferences that the consumers can have in an Arrow-Debreu exchange economy with the standard price-adjustment rules, it was impossible to obtain a proof of the global stability and the uniqueness of the general equilibrium.[17] Imposing further restrictions, however, for many commentators (but not all), meant the loss of the intended generality of the general equilibrium model. Reverting to the assumption of identical agents (i.e., to the models with representative agents) was tantamount for many Walrasians, when combined with the auctioneer based price-adjustment rules, to a complete abolition of the microfoundations project for the sake of the uniqueness and the global stability of the general equilibrium, for imposing further restrictions on the agents would make the

[16] The uniqueness of a general equilibrium refers to the situation where an Arrow-Debreu economy has a single possible equilibrium price vector. The question of stability, on the other hand, aims to address whether or not there is a tendency towards equilibrium when the economy is not in an equilibrium state. The Sonnenschein-Mantel-Debreu results showed that desired properties of uniqueness and stability of the general equilibrium cannot be obtained from the [standard] assumptions on the individuals in the economy" (Kirman, 1992: 122). In particular, Debreu (1974) establishes that the unrestricted individual utility functions of the kind found in (Debreu 1959) do not imply anything about the market excess demand functions other than continuity, Walras' Law, and homogeneity of degree zero. This would mean that it would be possible to have a "perverse" situation where the aggregate demand for a commodity goes up as the price of the commodity rises.

[17] For instance, Katzner's more recent model of an exchange economy shows that when all agents are endowed with Cobb-Douglas utility functions, uniqueness and global stability obtain (Katzner, 1998; 2004; 2006). More on this below.

model incapable of accommodating the uniqueness and the individuality of the agents (Kirman, 1992; Rizvi, 1994; 1998; Mirowski, 2002; Davis, 2003).

It is important to distinguish the mathematical question of stability from the process of price adjustment (price determination)—even though both constitute the different facets of the same question: "Are there forces at work capable of ensuring the imposition of a price system that is an equilibrium price vector?" (Ingrao and Israel, 1990: 25). The metaphor of auctioneer is invoked in order to motivate the *tâtonnement* (a French word meaning 'groping' as in 'groping one's way in the dark') process through which the suppliers and the buyers modify their plans (in relation to everyone else's plans) until the equilibrium is finally reached. During the non-temporal process of tâtonnement no transaction takes place. Every time the auctioneer announces a price vector, production and consumption plans are modified accordingly. The process continues until the economy reaches equilibrium.[18] Nevertheless, unless the auctioneer adjusts the price vector according to a set of laws, there is nothing that guarantees the convergence towards the equilibrium. And it's precisely for this reason the conditions for stability must be present.[19] Otherwise, the market excess demand functions may fail to respond to the Auctioneer in an appropriate amount and in the right direction.

I consider these two clusters of problems (pertaining to the conditions for stability and to the conceptualization of the price adjustment process) as the two structuralist "moments" of the A-D model.[20] The auctioneer and its contradictory position within the purportedly

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[18] As Brian Loasby, an eminent post-Marshallian (but not Chicago) economist, eloquently puts it, in the A-D model, "all markets open simultaneously, and once only; when a complete set of equilibrium contracts is in place, they all close—forever" (1999: 108). Since both production and consumption plans are into the future, once they are chosen in a way that permits all markets to clear, there will be no need for markets anymore. The remaining task for each producer and consumer is to routinely carry on his or her already set plans into the future.

[19] With respect to the importance of this last point, MIT economist Franklin M. Fisher is quite unequivocal: "It is important to understand this point [i.e., the question of stability] which is generally ignore by economists. No matter how desirable point of competitive equilibrium may be, that is of no consequence if they cannot be reached fairly quickly or maintained thereafter, or as might happen when a country decides to adopt free markets, there are bad consequences of the way to equilibrium" (2011: 35).

[20] While the development of and the reactions to these "moments" exceed the time-frame of the "selectionist papers" by the Chicago economists (1950-1962), they are important to understand the subsequent differential reception of general equilibrium theory and evolutionary metaphors in the late neoclassical context (Madra, 2016).

individualist framework of Walrasian system have already been identified by a number of scholars as a structuralist "moment" of an otherwise theoretical humanist discourse (Amariglio, Resnick and Wolff, 1990; Charusheela, 1998; see also, Hahn, 1984).[21] Charusheela, for one, insists that Walrasian economics is structuralist only with respect to "the equilibrium requirements of the paradigm" (1998: 43). With respect to "the notion of economic subjectivity," she argues, Walrasian economics is an individualist framework.

The second structuralist moment in the A-D model pertains to the Sonnenschein-Mantel-Debreu results. As the aforementioned Sonnenschein-Mantel-Debreu results suggest, under the standard price adjustment rules outlined above, in order to be able to obtain the desired uniqueness and stability results, it is necessary to impose further restrictions over preferences. In this case, the structuralism can be found on the side of the agents, in the fact that they are "idealized" agents. Consider, for instance, a recent model of an exchange economy with individual agents who are endowed with Cobb-Douglas utility functions (Katzner 1998; 2004; 2006). With this particular assumption (which almost has a canonical status in the tradition) about the shape of the utility functions of the agents in this economy, Katzner is able to obtain the conditions for uniqueness and global stability. Nevertheless, because it imposes a particular structure on the preferences of the individual agents, it compromises on the desired level of generality.[22] In other words, from the formalist perspective of Debreu, to assume that the individuals are endowed

[21] S. Charusheela argues that "the desire for closure in the face of contradictions creates collapses [into structuralism] for [a humanist] theory" (1998: 33). It should be noted, however, that it is not an abstract "desire for closure" that propels the proponents of a discourse to revert to structuralism but rather the theoretical problematic of reconciliation of the individual and the collective rationality itself sets up "closure" as the objective of theoretical practice.

[22] The same argument holds for "the agent-price-adjustment-story" proposed by Katzner (2004: 13-16) as an alternative to the auctioneer story. The agent-price-adjustment story effectively decentralizes the function of the auctioneer to the individual agents. But, in doing so, the agent-price-adjustment story adds one more assumption to the "postulate of rationality." Katzner (2004) openly acknowledges this, when he suggests lumping together price-adjustment rules with agent maximization "in what might be regarded as an expanded 'postulate of rationality'" (13). Oddly enough, in the contemporary context of late neoclassical economic, especially considering the considerably expanded conceptions of rationality used in game-theoretic contexts, this extension of the rationality postulate scarcely stands out.

with Cobb-Douglas utility function would be undesirable for it would entail imposing an "ad hoc" structure[23] on the model.

By many a commentator, these two structuralist "moments" (the conceptualization of the process of price adjustment and the questions of uniqueness and stability) have been deemed the main culprits of "the demise of general equilibrium theory" (Davis, 2003: 82; for similar assessments, see Screpanti and Zamagni, 1993: 344-8; Backhouse, 2002: 261-2). In fact, a significant number of late neoclassical economists identify "the demise of general equilibrium theory" with "the death of neoclassical economics" as such (Colander, 2000; Colander et al., 2004). I couldn't disagree more. For it is neither appropriate to read these developments as evidence of "the demise of general equilibrium" (for there are a number of vital research programs within the neoclassical tradition who continue to operate within this framework, e.g., computable general equilibrium analysis, mechanism design theory, social choice theory, new information theory) nor to equate the loss of the disciplinary hegemony of general equilibrium analysis (if this is, in fact, true) with "the death of neoclassical economics." If one defines the neoclassical tradition as an amalgamation of diverse theoretical positions inhabiting the neoclassical problematic, then it will be possible to interpret the loss of the disciplinary hegemony of the general equilibrium theory and the subsequent changes within the mainstream of the discipline as a set of developments within the neoclassical tradition, as a re-configuration of the neoclassical tradition, rather than its death. In fact, the thesis that I would like to put forward is the following: The reason for the decline in the disciplinary hegemony of the general equilibrium theory was not that it simply failed with respect to some methodological criteria (e.g., logical incoherence, empirical irrelevance). Rather, the problem with the post-war theoretical developments in axiomatic general equilibrium theory was their policy implications and normative consequences. In other words, to be able to understand the decline in the disciplinary hegemony of the general

[23] On the other hand, if there is no such thing as "pure formalism" or "full generality," if there is nothing but "ad hoc" assumptions, what's wrong with "adding extra hypotheses"? In fact, to be able to begin rethinking, and perhaps revitalizing, general equilibrium theory, it is necessary to drop the formalist posture: "However, the issue of how 'close' to full generality it is possible to come is still an open question. And to give up before answering it is to foreclose on the possibility of finding conditions of 'reasonable' generality" (Katzner, 2004: 9). Without doubt, how to define "reasonable" generality is also an open question.

equilibrium theory, it is necessary to situate it in the historical context of the pro-intervention versus pro-market debate within the neoclassical tradition.

*Walrasian socialism?*

Against this backdrop, it will be useful to re-consider the Socialist Calculation debate, not as a historical curiosity but rather an ongoing debate. It is now well known that the Walrasian tradition has always attracted socialist-leaning economists who perceived the general equilibrium model not as a template of a competitive market economy but rather a general model that could also be applied to command economies where the Central Planning Board replaces the imaginary Auctioneer (Koopmans, 1957:63-64). While the broader neoclassical tradition has been celebratory of individual freedom and to a large extent for minimal government control over the economy, the Walrasian tradition has repeatedly attracted the neoclassical economists with a socialist bent. In particular, many of the émigré economists (e.g., Oskar Lange, Jacob Marschak, Tjalling Koopmans) who were convened around the Cowles Commission during its Chicago years (1939-1955) and contributed in one form or another to the development of the Arrow-Debreu model had patent socialist and pro-government leanings.[24] This meant that the Walrasian model of the economy was open to, at least, two different (and radically opposed) interpretations. It could either be treated, on the one end of the spectrum, as an abstract model of a competitive market economy or it could be treated, on the other end of the spectrum, as an abstract model of socialist command economy.[25]

Let us begin investigating the matter by considering the policy implications of the Fundamental Theorems of Welfare. The first theorem shows that under the given assumptions pertaining to commodity space, production, and consumption, any

[24] Mirowski (2002: 232-308) traces the links between Lange's earlier work on market socialism and the subsequent works of a number of other affiliates (e.g., Marschak, Tjalling Koopmans, Klein, Arrow) of the Cowles Commission. These scholars were highly fascinated by the social engineering aspect of market socialism; their motivation was to construct mathematically tractable models that will enable them to specify the appropriate ways in which to intervene to the economy.

[25] Fisher, for instance, interprets the proof of the existence and the efficiency of general equilibrium as well as the two welfare theorems from a pro-market perspective and argues that they "provide the rigorous justification fort he view that free markets are desirable (although they say nothing about fairness or any other desirable attribute other than Pareto-efficiency). It is not an overstatement to say that they are the underpinning of Western capitalism" (2011: 34-5). See also Makowski and Ostroy (1993) for a case against market socialism and for the necessity of private property to obtain efficiency under general equilibrium.

competitive equilibrium is Pareto optimal. The A-D model specifies an idealized model of the economy. Consequently, to the extent that its assumptions cannot be met in real-world economies (e.g., when there are externalities, when certain public goods cannot be provided by the competitive markets), the model sanctions government intervention to remedy these "market failures."[26]

The second welfare theorem, on the other hand, shows that under overlapping but slightly different conditions there is an equilibrium price vector that corresponds to each Pareto optimum allocation. This theorem implies that "any desirable final allocation of resources and commodities requires 'only' a redistribution of private ownership rights in the means of production" (Roemer, 1995:112). That is, in order to be able to establish a particular Pareto optimum allocation, provided there is always an equilibrium price vector that would satisfy it, it is sufficient to re-arrange the distribution of initial endowments and then let the agents to trade towards that final allocation of resources. Once again, to the extent that its assumptions cannot be met in real-world economies, the model sanction government intervention to lead the economy to towards equilibrium.

In addition to these two channels (i.e., the government interventions that would supplement the normal functioning of the markets and the redistribution of assets) theorized by the A-D model for the government involvement in the economy, the two "structuralist moments" discussed above gave another reason. Many scholars found in the Sonnenschein-Mantel-Debreu results, with their implications for the uniqueness and stability of the equilibrium (Kirman, 1992) and the numerous logical difficulties involved with the various specifications of the *tâtonnement* process (Hahn, 1984), a strong case for the necessity of actual non-market institutions to usher the economy towards the equilibrium:

> …the foregoing models are […] incomplete as competitive *tâtonnement* models, and that to make them complete it is necessary to provide them with a central market

[26] Without doubt, what is "failure", and therefore, what needs to be "remedied" is determined retroactively, only after establishing, within theory, what counts as the proper functioning of the economy. Consequently, the remedies are themselves designed to mimic the idealized vision of the economy. This constitutes a perfect example of the way in which the modes of intervention to the economy are overdetermined by the particular conceptualization of the economy.

> authority and the *tâtonnement* rules and procedures that it enforces. (Walker, 1972: 353)

Indeed, the problem of *stability* offers an interesting litmus test for distinguishing pro-market Walrasians from their pro-intervention brethren. For those who wanted to conceptualize the economy along the lines of Adam Smith's "invisible hand," it was necessary "to show that the economy is capable of attaining this state spontaneously, that the system's variables of state—i.e., prices—vary and adjust in such a way as to arrive at a vector of equilibrium prices" (Ingrao and Israel, 1990: 331). Ingrao and Israel further argue that "[t]he distance between those considering it essential to maintain the theories of existence and uniqueness together with that of stability and those who do not regard the last as indispensable is the same as that between those firmly convinced of the self-regulating virtues of a free market and those who believe that the only way to achieve compatibility between contrasting individual interests is to decree the "final coherent state"—i.e., equilibrium—through planning" (1990: 331-2). Precisely for this reason it is necessary to distinguish the Fundamental Theorems of Welfare which provide justification for the government involvement in a market economy from the Sonnenschein-Mantel-Debreu results and the auctioneer controversy which provide justification for the substitution of the command economy with a market economy. To put it differently, the post-war theoretical developments in general equilibrium theory tilted the balance too much in favor of the government involvement in the economy to the dismay of the pro-market camp.

## The selection metaphor and the origins of the Chicago School

In this section, I will turn my attention to the origins of the Chicago School and look at three key theoretical and methodological papers (Alchian, 1950; Friedman, 1953; Becker, 1962) written under the shadow of Walrasian structuralism and the hegemony of Neoclassical-Keynesian synthesis and offer a reading of these "selectionist papers" as variations on an alternative to the Walrasian auction metaphor and its policy implications. After a brief discussion of the pragmatism that informs the positivist methodology of the Chicago School, I will proceed to analyze each of the three different

versions of the selection metaphor articulated in these articles. Finally, I will contrast the liberalism of the Chicago School with the socialism of the Walrasian tradition.

*The Chicago School: Pragmatism without apologies*

In the 1950s and 1960s, Walrasian general equilibrium theory was coming into its own as the mathematically equipped émigrés (Lange, Koopmans, Marschak, von Neumann, Oskar Morgenstern, and even Debreu who came to the US in 1948) began to settle into their careers in the North American academia mostly on the east coast, in the economics departments at Harvard, MIT and Yale and the research institutions such as RAND and Cowles Commission (Mirowksi, 2002).[27] In stark contrast to the operationalist program of Paul Samuelson at the MIT (Hausman, 1992) or the axiomatic formalism of the Cowles economists (Weintraub, 2002), Chicago economists rejected both realism and formalism and distinguished themselves with a peculiar sort of pragmatism (McCloskey, 1988: 288; for a more fine-grained reading, see Hirsch and de Marchi, 1990). In his famous methodological essay, Friedman argued that it does not make sense to ask whether the assumptions of a theory "are descriptively 'realistic,' for they never are" (1953: 15). Instead, he argued, we should judge a theory by the accuracy of its predictions: "Its performance is to be judged by the precision, scope, and conformity with experience of the predictions it yields" (Friedman, 1953: 4).

In order to be able to see the implications of this positivist-pragmatist methodological approach to the neoclassical theory of price, it is sufficient to recall that for the proponents of the Chicago School there is no reason to go behind the demand curve (Mirowski and Hands, 1998: 272). Indeed, the downward sloping demand curve is the

[27] From 1939 to 1955, the Cowles Commission was based at the University of Chicago. In this period, a number of the affiliates of the Cowles Commission were also the members of Economics Department. Debreu describes his experience of the period to Roy Weintraub: "[The conflict between the Chicago economics group itself and the Cowles people] must have been much more obvious in the department meetings which I did not attend. But I am sure when I say that tension occurred between, let us say, Milton Friedman and the Cowles group it must have been substantial from many different grounds. Because at Chicago the non-Cowles people were devotees of Alfred Marshall, and the Cowles group took a more general equilibrium viewpoint, and that was one difference. And I am sure that the non-Cowles group thought that the Cowles group used far too much mathematics. And then there were ideological differences. One of the issues of the day was rent control, and this found its way into our discussions. But occasionally antagonism flared up" (Weintraub, 2002: 151). See also Daniel Hammond's (1993) insightful interview with Milton Friedman for his perspective on the economists (in particular, Koopmans) of the Cowles Commission during its Chicago period.

last instance of the Chicago version of the neoclassical theory of price. For instance, in his 1949 discussion of the Marshallian demand curve Friedman (1953: 47-99) does not refer to the preference orderings of the individual. Whenever he invokes the assumption of utility maximization subject to budget constraint, he bothered neither to reveal it retroactively from the choices nor to reconstruct it axiomatically. The disregard of the proponents of the Chicago School towards the micro-foundational concerns of other neoclassical economists went so deep that, only a decade later, another Nobel Laureate Chicago economist, Becker (1962) argued that, in order to derive the downward sloping aggregate demand curve for a commodity, no assumptions regarding their rationality need be made as long as the budget constraint limited the opportunity set of the individual subjects. And if the Chicago economists continue to rely on the optimization assumption, they would argue that they do so only because of its convenience.[28]

Yet perhaps there is another way in which these methodological essays by Friedman (1953) and Becker (1962) can be read. Together with an earlier essay by Armen Alchian (1950), these essays may initially appear to be nothing more than a pragmatic plea for the usefulness of the *homo economicus* assumption (Loasby, 1999). A careful and historically contextualised reading, however, demonstrates that these essays aim to achieve something more than this: They also articulate a new conceptualization of the market adjustment process, based on the biological selection metaphor, as an alternative to the Walrasian auction metaphor and its undesirable implications.

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[28] Given its pragmatist methodology, it is usually suggested that, for the Chicago School, the utility concept is simply a useful, expository device, a "convenient fiction" (Mirowski, 2002: 204). Nevertheless, to claim that the concept of utility is dispensable for the proponents of the Chicago School would entail neglecting the importance of the notion of utility (or wealth) maximization for the derivation of the welfare implications of the market outcomes. The normative authority derived from the welfare properties of the market outcomes underpins their commitment to markets. As it is suggested above, the Chicago School is committed to the idea that the markets always produce efficient outcomes. But more specifically, the markets can maximize "social" welfare only to the extent that they enable individual subjects to maximize their own welfare. As such, to be able to derive their welfare conclusions and policy recommendations, they must rely on a notion of preferences that reflects a subjective and introspective notion of individual welfare. The fact that the proponents of the Chicago School do not explicitly acknowledge this link is beside the point. The concepts of utility and the assumptions about human psychology remain indispensable for the Chicago-style neoclassicism.

*Chicago structuralism?*

In the 1950s, as the early versions of the Arrow-Debreu model were being published, three high-profile proponents of the Chicago School, well known for their pro-market affinities, developed "Marshallian" models of market adjustment (Alchian, 1950; Friedman, 1953; Becker, 1962; for surveys, see Vromen, 1995; Loasby, 1999). Curiously enough, these Marshallian scenarios of market adjustment were also structuralist models, even though its biological structuralism was different than the structuralism of the Auctioneer. In these models, the intentional and rational human agency was replaced by "impersonal market forces," which function as a central causal engine that generates equilibrium outcomes. These papers claimed that while individual rationality was sufficient, it was not necessary for obtaining rationality at the level of the markets.

It is important to recognize that, while they seem to jettison the assumption of marginal calculus (a core concept of Marshallian neoclassicism), these essays were written in defense of neoclassical marginalism during a period of widespread crisis of legitimacy. In the field of macroeconomic research and policy-making, given its failure to successfully respond to the Great Depression, the legitimacy of the marginalist neoclassicism was seriously undermined by the Keynesian revolution and its policy success during the war effort. In the context of Socialist Calculation controversy, Austrian economists fiercely criticized the static general equilibrium construct of neoclassicism and offered an evolutionary understanding of the market process (Caldwell, 1997). And, since the beginning of the century, the proponents of American institutional economics were persistently questioning the realism of the utility construct (Lewin, 1996) and the shortcomings of the abstract formalism of neoclassical models (Rutherford, 1994).

But the particular set of criticisms that these articles appear to be addressing themselves to were the ones developed in the late 1930s and 1940s, when a number of non-neoclassical economists began to question the realism of the marginal calculus in the context of firm theory. Two British economists, based on the surveys that they conducted with actual entrepreneurs, argued that the pricing and output decisions of firms are not governed by the marginal calculus (Hall and Hitch, 1939). On the other other side of the pond, R. A. Lester (1946) claimed not only that the information that is necessary for the marginality

calculations were not available to the actual entrepreneurs, but also that the immediate reactions of the firms to the increases in labor costs were not to reduce the output and employment levels but to search for ways to increase the production efficiency and to implement labor-saving technological changes. (For surveys of this early debate see, Lavoie 1990; Lee 1984; Lee and Irving-Lessman 1992; Mongin 1992; 1998; Vromen 1995: 14-17.)

The papers by Armen Alchian (1950), Milton Friedman (1953), and Gary Becker (1960), which articulate, with slightly different accents, the same "selectionist argument," should be read as responses to this context. While they are indeed responses to those who question the realism of the marginal calculus both in the sphere of consumption ("psychologism" and related criticisms) as well as the production sphere (the marginalism controversy), it is important to recognize their function as an alternative, dynamic take on the invisible hand theory. Indeed the Marshallian image of the market-adjustment process should be seen as an alternative to the static and timeless general equilibrium models that rely on the auction metaphor to theorize the price-adjustment process.

Alchian's (1950) intervention is usually referred to as the first neoclassical text to introduce a biological analogy. Alchian's contribution is a characteristically Marshallian response, as its argument revolves around the distinction between the individual firm and the representative firm. A "representative firm" of an industry is "a set of statistics summarizing the various 'modal' characteristics of" (1950: 217) that industry. Alchian concedes that, under the conditions of uncertainty and incomplete information, it would be wrong to assume that the individual firms will be able to undertake and follow the marginal calculations. But, even if each individual firm would follow a different (and non-marginalist) decision criterion, the industrial average will still tend towards the pattern of behavior as predicted by the neoclassical theory. And the mechanism that would make sure that the industry average, the non-existent "representative firm" will approximate

the behavior of the profit maximizing neoclassical firm would be *the selection mechanism of the market forces*.[29]

This argument assumed that, in the limit, the hypothetical neoclassical firm represents the essential characteristics of the firms that will survive the selection mechanism of the market forces. In other words, for neoclassical predictions, explanations, and diagnoses to hold at the industry level, it is not necessary for the individual firms to consciously maximize profits by following the marginal calculus. As long as the market forces run their course unhindered, the only firms that will survive in the marketplace would be the ones that "realize positive profits." In other words, by *adopting* the firms that are actually realizing positive profits and eliminating the others, an "economic" selection mechanism will make sure that the neoclassical theorems about the directions of the changes, if not actual amounts of the changes, will hold at the industry level (Alchian, 1950: 220).[30]

The second, and bolder, formulation of the selectionist defense of marginalism was that of Friedman (1953). Friedman argued that since the selection mechanism will make sure that the surviving firms will be the ones that "approximated behavior consistent with the maximization of returns"(1953: 22), regardless of how actual firms behave, it is "not at all unreasonable" to construct models that assumes that individual firms maximize expected returns. Sharing the same Marshallian premises with Alchian, Friedman argued that the predictions of the profit-maximizing model should be tested at the industry level rather than at the level of the individual firm. The difference between the two approaches, however, resides in the notion of maximization-of-expected-returns hypothesis that informs Friedman's understanding of the behaviour of the surviving firm. For Alchian, the actual motivations of the successfully selected individual businesses do not have to

[29] In response to one of Lester's criticism, Alchian writes: "…in attempting to predict the effects of higher real wages, it is discovered that every businessman says he does not adjust his labor force. Nevertheless, firms with a lower labor-capital ratio will have relatively lower cost positions and, to that extent, a higher probability of survival. The force of competitive survival, by eliminating higher-cost firms, reveals a population of remaining firms with a new average labor-capital ratio. The essential point is that individual motivation and foresight, while sufficient, are not necessary" (1950: 217).

[30] Alchian did not discount "the likelihood of observing 'appropriate' decisions" (1950: 216). While his argument does not require ascribing non-random, adaptive behavior to the firms, Alchian did discuss two other mechanisms that provide some breathing space for some minimal intentionality: namely, "imitation" and "trial and error".

approximate a notion of profit maximization. For neoclassical theorems to hold as *tendencies*, it is sufficient to have an "economic" selection mechanism (i.e., competitive markets) that would force the industry average, or the representative firm, to move towards the predicted directions in response to changes in independent variables. For Friedman, in contrast, the selection mechanism will select those firms that behave according to the maximization-of-expected-returns hypothesis. To put it differently, the surviving firms must be the ones that have approximated the neoclassical firm: if they weren't maximizing their expected profits, they wouldn't be able to survive.

The final installment of the selectionist defenses of marginalism was Becker's 1962 essay, "Irrational Behavior and Economic Theory." In this essay, after distinguishing between the behavioral motivations of the individual households (and firms) and the aggregate market outcomes, Becker argued that the markets will tend to produce rational results that would systematically satisfy the basic predictions of neoclassical economic theory, even if the consumers and the producers do not respond to the changes in prices in a rational manner. Becker defines irrational behavior as a spectrum of modes of behavior that range from "impulsive" to "inert": While impulsive behavior would mean random, inertia refers to the resistance to change.[31] According to Becker, changes in the opportunity sets (budget constraints), induced by the changes in relative prices, will force "the *average* economic actor" to behave the way the neoclassical theory predicts her/him to behave, regardless of how the *actual* economic actors behave. In other words, for Becker, the shifts in the opportunity set provide the sufficient "structural" conditions to ensure the law of demand which specifies an inverse relation between price and quantity demanded. That is, the famous law of demand may still be reproduced at the level of the

[31] Perhaps, in response to Tjalling Koopmans who concedes that the axiomatic nature of choice in general equilibrium theory "denies the consumer such privileges as the joy in random variability in consumption, as well as its opposite, the comfort of consumption habits somewhat rigidly maintained under varying circumstances" (1957: 137). One possible reason to suspect this communication is that fact that Koopmans makes this concession just before he launches at a critique of the Alchian (1950) and Friedman (1953) papers discussed above. See footnote 36 below.

population average, without any reference to the well-behaved preferences of the individual actors.[32]

On the production side, the Becker's narrative is quite similar to that of Alchian's: "firms could not continually produce, could not 'survive', outputs yielding negative profits, as eventually all the resources at their disposal would be used up" (1962: 10). Repeating the story he told on the demand side, Becker argues that changes in "relative input prices" will shape the production opportunity set in a manner that dictates "rational behavior": a rise in the relative price of an input will move the input mix of the industry average away from that input.[33] In short, according to Becker, the *structure* is embodied in the *scarcity* imposed on the economic subject by the budget line. The budget line itself, at the level of the market, is enough to derive the basic theorems of the neoclassical economics.

Each of these three models explicitly claim that it is not necessary for individual agents to undertake optimization; the market forces will make sure that the surviving agents would be the ones that meet or beat the average (Alchian, 1950; Becker, 1962), or, in the case of Friedman (1953), the ones who do the optimization. I consider these formulations to be inconsistent with methodological individualism for they privilege an aggregate mechanism as the casual essence that establishes the equilibrium market outcomes. But are these models really structuralist models of the economy? For at least two reasons these models should still be considered variations on the ultimately same neoclassical problematic, i.e. theoretical humanism. I have already discussed the first reason in the section on the pragmatism of the Chicago School: to be able to argue that the markets always produce *efficient* outcomes, it is necessary to assume that the surviving agents

[32] No wonder, then, that in some contemporary introductory textbooks the discussion of preferences and indifference maps is relegated to the appendix of the chapter on consumer choice. For instance in (Stiglitz and Walsh, 2002), the demand curve is first derived without referring to the utility maps of the individual. In other words, the changes in budget constraint are deemed sufficient to demonstrate the negative relation between the price and the change in quantity demanded.

[33] One important criticism of Becker's formulation is precisely the unexplained nature of the changes in relative real prices. Israel Kirzner (1962) asks, if no one in the economy is behaving rationally, if everyone is a price-taker, what causes the shifts in relative prices? Interestingly enough, in the context of Walrasian model, we observe a similar problem and the fiction of Auctioneer is there precisely to fill up the exact same problem: "Each individual participant in the economy is supposed to take prices as given and determine his choices as to purchases and sales accordingly; there is no one left over whose job is to make a decision on price" (Arrow 1959: 43). If every agent in the economy is a price-taker, then who changes the prices?

maximize their own welfare. As such, to be able to derive their welfare conclusions and policy recommendations pertaining to the desirability of (however generated) market outcomes, the proponents of the Chicago school must rely on a notion of preferences that reflects a subjective and introspective notion of individual welfare. In this sense, the "selectionist arguments" of the Chicago School are similar to the false consciousness arguments found in the Marxian tradition: The actual agents within a given economy may not know what is really good for themselves; but through the help of the market forces (and the economists who advocate for the institution of more markets), they are forced to come to terms with what is really good for them. In this sense, the competitive dynamics of the markets do not only make sure that the survivors will be the optimizers, but also teaches the economics agents how to behave "rationally" and hence, "efficiently."

The second reason runs deeper: When Alchian invokes "environmental adoption" (1950: 214), he is, in effect, anthropomorphizing the market forces. Indeed, all the "selectionist arguments" of the Panglossian kind[34] involve the anthropomorphization of evolution as an optimizer. But, if we could go behind this anthropomorphization of the structure, don't we find an essentialist concept of *anthropos* with a given (human) propensity to survive, to reproduce its existence? Indeed, it is this humanist presupposition that underpins this structuralist machine: What silently motivate the "scarcity" assumption used by Becker (1962) are the presupposed unlimited (insatiable) wants and desires of the economics agents. Without this (unarticulated) theoretical humanist presupposition, it is impossible to motivate the idea of scarcity as a reified condition of human existence. In other words, the "selectionist arguments" made by the proponents of the Chicago School are yet another formulation of the neoclassical problematic.

*Chicago liberalism?*

In their subsequent writings, considering the prevalence of evolutionary themes/arguments in these seminal essays, none of these economists systematically

[34] "Panglossian modes of thought often involve the assumption, one that Darwin himself was sometimes keen to avoid, that evolution always means increasing progress, a beneficient journey from the lower to the higher form of organization of life, and from the inferior to superior" (Hodgson, 1993: 224).

explored evolutionary economics.[35] In retrospect, it is quite clear that they articulated these selectionist arguments as rhetorical tools to fend-off criticisms against the optimization assumption.[36] In contrast to their subsequent lack of interest in mobilizing evolutionary models, the late neoclassical reception of these "structuralist" texts has been exceptionally enthusiastic: Some consider them as the foundational texts of the new institutional economics (North, 1990; Vromen, 1995); some consider them as the antecedents of the evolutionary game theory (Samuelson, 2002); some find inspiration for their simulation based experimental economics (Gode and Sunder, 1993; 1997). The enthusiastic adoption of these singular texts into the late neoclassical field is all the more surprising given their explicit privileging of "market forces" at the expense of individual intentionality and rationality (the hallmark presuppositions of neoclassical humanism). Given the presence of "structuralist moments" in both the A-D model and the "selectionist arguments," what accounts for the discrepancy between the late neoclassical reception of the these two post-war developments?

I believe the answer, in part, lies, again, in the opposing normative implications and policy consequences of these two variations on the neoclassical problematic. As I argued above, the Walrasian understanding of the functioning of the markets privileges the price-adjustment path to equilibrium. In this sense, in the Walrasian model there is no entry or exit, but rather a tâtonnement process in which a fixed number of producers and consumers adapt their excess demand function to the declared price vector. In the final analysis, a general equilibrium model is premised on an understanding of the economy as an all-inclusive system without an outside. As Koopmans notes with regards to survival of consumers in a competitive equilibrium, "[a]n alternative more realistic for highly industrialized private enterprise societies would be to recognize the existence of income

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[35] Becker's (1976) evolutionary game-theoretic model which provides a rationale for the existence of altruism in a population inhabited by selfish agents is the only exception. Nevertheless, the evolutionary game theoretic model used in the 1976 paper is different from the Marshallian evolutionary model articulated in Alchian's 1950 and Becker's 1962 papers.

[36] The symptomatic unwillingness of these Chicago economists in further pursuing evolutionary theorising is also highlighted by Tjalling Koopmans (1957: 140): "…if [evolutionary selection] is the basis for our belief in profit maximization, then we should postulate that basis itself and not profit maximization which it implies in certain circumstances." Eminent evolutionary economists Richard R. Nelson and Sidney G. Winter also lament the absence of rigorous and formal engagement in these early elaborations of economic selection mechanisms (1982: 141).

transfers through taxation and social insurance, and to look for conditions, including tax and benefit schedules, ensuring general survival of some consumers" (1957: 62). In this sense, what makes the model attractive to modernist economists with socialist, social democrat, and egalitarian leanings is its all-inclusive understanding of the economy. In an A-D economy, at the end of the *tâtonnement* process, no one need be left out—if necessary, redistributionary politics implied by the second welfare theorem will be implemented (Roemer 1995).

In contrast, the Chicago-style partial equilibrium analyses, in part due to their short-run focus, privilege the competitive dynamics of the markets. In their version of the Marshallian model, equilibrium is arrived through the exit and entry of the firms and consumers; there is an outside to the economy—the equilibrium state is not all-inclusive. The equilibrium is not all-inclusive, because equilibrium can only be arrived at when there is no incentive left to *enter* the market (or equivalently, when the inefficient firms are forced to *exit* the market). This particular difference between the Walrasian and the North American Marshallian models cannot be explained by the difference between multi-market focus of the former and the single-market focus of the latter. It is a difference that arises from their respective understanding of how markets function.

An important policy implication of this difference pertains to the relation between the state and the markets. The mobilization of evolutionary analogies furnishes these Chicago economists with a concept of selection mechanism that ensures that the markets will indeed tend towards equilibrium without any need for a central market authority. If the perceived poverty of the Walrasian model in explaining the process through which equilibrium is attained has rendered the economy susceptible to government interventions, the evolutionary metaphors mobilized by the proponents of the Chicago School have rekindled the liberal neoclassical trust in the efficacy (as well as efficiency) of the competitive markets economics. It is in light of this defining difference between the Walrasian and the Chicago School conceptualizations of the functioning of the markets that I make sense of the stark differences in the late neoclassical receptions of the full-development of axiomatic general equilibrium theory and the "selectionist arguments" of the Chicago approach.

But there is another way in which the full-axiomatization of general equilibrium theory and the "selectionist arguments" differ from one another. While the A-D model was intended to give the general equilibrium theory as much generality as possible (in part, to establish it as a root model for subsequent analysis and, in part, out of commitment to a methodological individualism that wishes to impose as limited assumptions as possible on the individual agents) through formalism, the selectionist arguments articulated by Alchian, Friedman, and Becker, by conflating the biological notion of "natural selection" with the Marshallian understanding of market forces, reified (or "naturalized") the latter into an overarching social ontology that explains *mutatis mutandis* everything (as inaugurated in Becker's aptly titled *An Economic Approach to Human Behavior* (1976)).[37] In this sense, the stark discrepancy between the late neoclassical receptions of these two post-war developments shows that, whereas the former project of making the A-D model the "root" model of the subsequent research has experienced decline in its disciplinary hegemony, the latter project of conceptualizing all social phenomena through the lenses of an ontology of competition (e.g., "the survival of the fittest/er") has gained a new found prominence. Ironically, one can even argue that the "selectionist papers" provided a much more successful "root" model than the Arrow-Debreu formalism.

In the final analysis, the analogy between a Panglossian understanding of "natural selection" and the Marshallian conceptualization of market forces makes a very powerful metaphor. Certainly, the situation cannot be reduced to a pragmatic use of an idea borrowed from biology to better understand an economic phenomenon. Not unlike the way early neoclassical economics gained something extra (e.g., scientific credibility) from borrowing concepts from physics, I believe the post-war and late neoclassical tradition has

[37] In a revealing passage, Becker compares his approach with one of "modern psychology": "Moreover, the economic approach does not assume that decision units are necessarily conscious of their efforts to maximize or can verbalize or otherwise describe in an informative way reasons for the systematic patterns in their behavior. Thus, it is consistent with the emphasis on the subconscious in modern psychology and with the distinction between manifest and latent functions in sociology" (1976: 7). This interpretation is in stark contrast with the concept of unconscious in psychoanalysis. For psychoanalysis, unconscious articulates symptoms in singular ways for each subject. There may be social symptoms (e.g., the "Jew" in Nazi Germany) that many subjects share at any given time, but even then, these social symptoms are conjunctural and not eternal and they function as "social" symptoms only because they serve as blank screens on which the subjects project their own singular fantasies. In contrast, Becker's notion of subconscious is nothing but a particular behavioral pattern (optimizing behavior) unwittingly practiced by every one in the same way. See also (Lewin, 1996: 1318-9).

gained something extra from appropriating biological analogies: the elevation of competition to an ontological status. In a manner, in contrast to the system-neutral vision of the market economy that informs the Walrasian model, the vision of market economy that is proposed by these selectionist papers, with its emphasis on competitive survival, does not allow any room for any other system than what is subsequently named as capitalism in a neoliberal mode (Foucault 2008; Mirowski 2013). But perhaps more importantly, and this may be one of the key attributes that distinguishes neoliberalism from capitalism, once competition is naturalized and ontologized, it can then be applied to all social phenomena, indiscriminately. I believe that these post-war developments and their subsequent differential reception in the late neoclassical period can contribute to our understanding of the theoretical foundations of neoliberalism as the hegemonic ideology of contemporary times (see Madra and Adaman 2010; 2014; 2017f).

## Conclusion

In this paper, I discussed two developments within the neoclassical tradition in the postwar North American context: the complete formalization of the general competitive equilibrium model in the 1950s and 1960s by those mathematical economists associated with the Cowles Commission and the articulation of the "selectionist arguments," again, in the 1950s and 1960s by the proponents of the Chicago tradition. In doing so, I compared their respective structuralist "moments" and contrasted the policy implications of these two developments. Contrary to the standard readings of the "selectionist papers" as pragmatic justifications of the use of *homo economicus* assumption, I proposed to read these papers as efforts to formulate an alternative metaphor for market-adjustment process, one that draws on biological and evolutionary sciences, contra the Walrasian auction metaphor and its undesired theoretical and policy implications. This internally split reading of the neoclassical tradition is also important for making sense of the heterogeneity of *fin de siècle* neoclassicism.

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