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From Addition to Multiplication: The Labour Theory of Value and the Economic Institutions of Capitalism

Part three: Structure, Super-structure and Institutional Change

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Alberto Battistini*

Abstract: this three-parts study propounds an institutional and evolutionary - or a qualitative and inter-subjective- re-interpretation of Marx's version of the labour theory of value.
In this third and final part, the general and dynamic extension of the analyses conducted in the previous parts is concluded. Consequently, the basic issue concerns the Marxian theory of institutional change, i.e. the effect of structural crises on the ideological super-structure and the feedback effect that a possible change of the latter can exert on the former.
More specifically, the point is this: to the extent that the conflict present in reality is transferred to a cognitive level, it is possible to identify a notion of inter-subjectivity that consists in the intersection among different points of view, or, to quote the title of a well-known article by Aumann (1973), in what players 'agree to disagree'.
In its turn, provided that the rather restrictive conditions that ensure its formation are fulfilled, this notion of inter-subjectivity corresponds to a super-structural change which - by changing the perception of the legitimacy and efficacy of the existing property rights' distribution and thereby determining structural changes in decision-making processes- proves able to support the transition from a pair of Pareto-efficient equilibria that do not maximize total value to another pair of equilibria, also Pareto-efficient but which maximizes it. In other words, by resolving what in the previous parts has been called the 'fundamental contradiction of capitalism from the point of view of production', i.e., the problem of the separation between ownership and control of the labour force, such structural changes re-establish the coincidence between players and decision-makers that enables the transition from the tendency to crisis to the one to growth already introduced in the Part Two and respectively associated with the thinking of Marx and Smith.
Moreover, since intersection means that 'the whole is *less* than the sum of the parts', the truth of the statements about this notion of inter-subjectivity does not depend on who makes them and is therefore interpretable in terms of epistemic objectivity. However, since this notion of objectivity does not need unanimity, the philosophy of science which is behind the axiomatic approach - on which in its turn is based standard economic theory, that is, the transformation of normative principle like the Pareto-efficiency one into the universal positive principle for the economic domain- turns out to be likewise questionable.

Key-words: beliefs, expectations, inter-subjectivity; structural interdependence, property rights, self-evidence.

JEL: A10; B00; C70; P10; D02

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1.Introduction.

This third and last part concludes the general and dynamic extensions of the analyses of the division of labour within the firm and the division of labour among firms carried out in the two previous parts.

As already mentioned in the Introduction to Part One, the hypothesis to be verified is whether capital, in Marx's definition of it as money in motion in the M→ C → M' circuit, can be taken as the unit of selection in an evolutionary process driven by the principle of profit maximization, in a relation of partial analogy with the role of the gene and the principle of differential replication in the biological domain.

Of course, the idea of this possible analogy between the apparent self-expansive nature of capital in the economic domain and that of the gene in the biological domain is not new. However, as must have also been realized by Nelson and Winter (1968), who were the first to propose this analogy, in the absence of a non-Schumpeterian notion of profit, one finds oneself in the uncomfortable position of having to state the proposition – at least counter-intuitive - according to which what evolves is what cannot be imitated.

Naturally, the body of literature which goes under the name of the evolutionary theory of the firm has provided remarkable in-depth analysis in regard to the Marxian notion of mode of production and Simon's notion of bounded rationality, on which the approach presented here is also partly based. The very fact, however, that inimitability is the distinguishing feature of artwork, means that it is unlikely to play a central role in the economic domain, as also explicitly ruled out by Schumpeter himself and, particularly, by what he called the theory of imputation –not to speak of the disprortionate role of intellectual property in the recent decades (see Battistini 2019a, b).

In fact, the proposition just cited is in clear contradiction with the notion of differential replication since, as the word itself indicates, not only does imitation not eliminate profits, i.e., reproductive success, but it is even what the latter consists of. And, as repeatedly pointed out, nor this is the case of the notion of profit of the 'Marxian' or 'industrial' type re-dis-covered in the preceding parts.

In its turn, such verification is instrumental to testing the general hypothesis of the whole study, namely, that the principle of the maximization of this kind of profit can play the role of a general positive principle for the economic domain, of which Pareto-efficiency and conflict turn out to be special cases.

However, if the evolutionary approach is the only developed alternative to the axiomatic approaches, which Marx sharply criticized in the form of the theorizations from the state of nature of his times, which were at least explicitly philosophical, it is equally true that it can in turn be called into question, and probably would have been so by Marx too, for its lack of consideration of the typically human characteristic represented by critical thinking.

In effect, such capacity for critical thought, whose existence inevitably tends to be hindered by the dominant ideologies and by the incentives to conformism provided by the power structures of which they are the expression, has been present with real consequences at least since the advent of agriculture and the consequent consolidation of the hierarchical structure of society, not to mention Christianity for obvious reasons (see footnote 13, Part Two). Not surprisingly, therefore, it is also at the centre of the Marxian theory of institutional change: that is to say, the effect of crises in the economic structure on the super-structure and the feedback effect that a change in the latter may exert on the former.

Indeed, in the *incipit* of the Preface to the Critique of Political Economy (1859, pp-8-9, emphasis added), already selectively quoted in the previous parts and now reported in full, Marx points out that: "In the social production of their life, men enter into definite relations that are *indispensable* and *independent* of their will, relations of production which correspond to a definite stage of development of their material productive forces The sum total of these relations of production constitutes the economic structure of society, the real foundation, on which rises a legal and political superstructure and to which correspond definite forms of social consciousness. The mode of production of material life conditions the social, political and intellectual life process in general. *It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness*. At a certain stage of their development, the material productive forces of society come in conflict with the existing relations of production, or –what is but a legal expression for the same thing- with the property relations within which they have been at work hitherto. From form of development of the productive forces these relations turn into their fetters.

Then begins an epoch of social revolution. With the change of the economic foundation the entire immense superstructure is more or less rapidly transformed. In considering such transformation, a distinction should always be made between the material

transformation of the economic conditions of production, which can be determined with the precision of the natural sciences, and the legal, political, religious, aesthetic or philosophic –in short, ideological forms in which men become conscious of this conflict and fight it out. *Just as our opinion of an individual is not based on what he thinks of himself, so can we not judge of such a period of transformation by its own consciousness; on the contrary, this consciousness must be explained rather from the contradictions of material life, from the existing conflict between the productive forces and the relations of production*.".

Formally, the following analysis is conducted in terms of the two complementary games already introduced in the two previous parts of this study: that of asymmetric coordination which represents the division of labour within the firm and that of symmetrical coordination which instead represents the division of labour among firms (Fig. 1, below).

The fundamental feature in this case is the already described one of recursiveness: that is, the circumstance according to which the equilibria of one game determine the rules of the other game, and vice versa.

By 'rules of the game', more specifically, is meant the set of material and cognitive constraints that determine the relationship between strategies and pay-offs and their understanding by players. Compared to the usual definition of the rules of the game - also called 'beliefs systems' in the stream of literature known as epistemic game theory (Aumann and Brandeburg, 1991) - the one just given is at the same time narrower and wider: narrower because it does not explicitly include players, strategies and pay-offs, since it is not from their change that the theory of institutional change under discussion follows; wider because in addition to the constraints of a cognitive nature it also contains their material basis, that is, what determines them and by them is initially justified.

In fact, this definition of rules of the game closely follows the Marxian notions of structure and super-structure just mentioned. The material constraints - that is, the structural elements that respectively represent the degree of wealth concentration and the size of the market, and in particular the one already defined as fundamental, i.e. the former- correspond to the "relations of production" and to the "material forces" in the above-cited sentence from Marx, which in their turn define the notion of mode of production (see also footnote 2, Part One).

These structural elements are those already introduced in the second part, since they measure the intensity of the strategic complementarities in the two games just referred to and, in accordance with the just mentioned notion of recursiveness, are determined by the profile of strategies prevailing in the complementary game.

On the other hand, the cognitive constraints, i.e. beliefs and expectations, which represent the novelty of this third part and whose important difference of meaning in the present approach will be clarified later, correspond instead - most notably as regards the beliefs on the relation of production within the firm- to the "ideological super-structure" of the Marx's sentence just reported.

Theoretically, the fundamental consequence of recursiveness is therefore that a pair of equilibria for such two complementary games, or an equilibrium for the multi-level game comprising such games interpreted as its stages, in addition to the absence of incentives to unilateral changes in strategies, also requires the absence of tendencies to change the rules of the games (**DEFINITION 1**).[1]

However, given that in both the evolutionary approach and the Marxian one, at the beginning cognitive constraints provide the first interpretation of reality so that, before being possibly put under discussion, they are inherited and introjected, the just given definition can be sharpened by requiring only the absence of tendencies to change in material constraints, thus defining a multi-level equilibrium with a given super-structure (**FSM-LE, DEFINITION 1a**), or even the absence of tendencies to change in cognitive constraints, thus defining a multi-level equilibrium with a variable super-structure (**VSM-LE, DEFINITION 2b**).

Consequently, the result is that of the two pairs of equilibria which in Part Two were respectively associated with the Marxian case of the tendency to crisis and to the Smithian one of the tendency to growth, only the latter is a multi-level equilibrium with a variable super-structure while both prove to be multi-level equilibria with a fixed super-structure. Obviously, therefore, the formalization of the type of structural change under discussion consists in proving that the pair of equilibria associated with the tendency to crisis is not robust to a possible change in the cognitive or super-

[1] The intuition, also anticipated in the previous part and hopefully obvious enough, is that in this context, since there is a partial overlap between players in the two games or stages, optimal strategies must be optimal not just in the game or stage where they are played but also in relation to the strategies that are played in the other, and consequently with respect to the decision-makers in both games. The definition given in the text derives from the fact that such relations between strategies in the two games or stages pass through the determination of the rules of game as implied by the notion of recursiveness.

structural rules of the game, and especially in the beliefs concerning the production, or class, relationship within the firm.

The rest of this Part is organized as follows. The next section introduces an evolutionary game theoretic analysis of the "economic structure of society" in the just-recalled Marxian definition, which, in, albeit with the significant caveats highlighted in the Part One, can be considered essentially equivalent to the Coasean one of 'institutional structure of production', which refers instead to the combination of markets, firms and property rights.

The result is the one just referred to with regard to the evolutionary stability of the two pairs of equilibria that respectively correspond to the Marxian maxim according to which "anarchy in the division of labour between firms" and "despotism within the firm" are conditions one of the other, and to the one which can be attributed to Smith's thought, extended to take account of both the collective nature of production and the material living conditions, according to which the same thing is true for 'collaboration within the firm' and 'cooperation between firms'.

Since in both cases there is free-entry and the product can be considered homogeneous, but profits are not just positive but even increasing or decreasing, this situation represents in effect a counter-example to the general equilibrium model. Consequently, the compatibility, or even the necessity, of an evolutionary approach for the re-interpretation of the labour theory of value proposed in this study turns out to be demonstrated *ad absurdum*. A re-interpretation of Marx's approach compatible with the general equilibrium model would indeed be a contradiction in terms.

However, as just mentioned and as will be explained in a more detail below, while an evolutionary approach is necessary for the re-interpretation of Marx's version of the labour theory of value proposed in this study, it is not sufficient.

As is well known, in the evolutionary game theoretic approaches, players always expect that the present is the same as the past. But, independently from the fact that in normal conditions, i.e. not in crisis situations, such assumption is less unrealistic or irrational than usually thought, an observation substantiated also by Schumpeter (1911), as a matter of fact it makes impossible an analysis of institutional change, at least in the terms it is meant here.

Similar considerations, of course, also apply to the axiomatic approach of standard economic theory and classical game theory where, instead, it is the future that is already in the present. Notwithstanding the much debated opposition between forward-

looking and backward-looking thinking, in fact, such position is basically equivalent to the former or even more inflexible as far as an a-critical or fatalistic acceptance of reality is concerned, as follows from the axioms' justification in terms of self-evidence beyond every possible discussion, as well as from the western European debate on the neo-liberal '*pensiero unico*'.

Accordingly, the view that reality is almost always conflictual is not only justified by a proper adherence to reality but also provides interesting theoretical perspectives. Indeed, to the extent that the conflict present in reality is transferred at the cognitive level, it is shown in Section 3 that it is possible to formalize a notion of inter-subjectivity consisting in the intersection between different points of view, or, to quote the title of a famous paper by Aumann (1976), in what players 'agree to disagree'.

In turn, provided that the quite restrictive conditions ensuring its formation are met - that beliefs change as a consequence of the crisis- on again following the sentence just quoted from Marx this notion of inter-subjectivity can be understood as a super-structural change giving rise to a new form of "social consciousness"; to the extent that corresponding to such new form of "social consciousness" is a change in the perception of the legitimacy and efficacy of the existing distribution of property rights that determines a structural change in the decision-making process within the firm, then, in its turn this notion is able to support the type of institutional change under discussion, i.e., the transition from the Pareto-efficient equilibrium which does not maximize total value, or the Marxian case associated with the tendency to crisis, to the equilibrium, also Pareto-efficient, but that maximizes total value which can be associated instead with the Smithian case of the tendency to growth.

Consequently, this result shows that not only firms and markets but also the other main economic institutions such as property rights and the state, or at least economic policy, can be usefully understood as endogenous to the principle of the maximization of the kind of profit under discussion. In its turn, indeed, this principle coincides with the maximization of the profit of capital owners or with the maximization of total value depending on how what has been previously called the 'fundamental contradiction of capitalism from the point of view of production' is treated and perceived. In more modern terms this contradiction can be understood as the problem of the separation between ownership and control of the labour force, and it is through its solution - that is, by re-establishing the coincidence between players and decision-makers- that structural or systemic change can happen.

In addition, since intersection means that 'the whole is *less* than the sum of the parts', the truth of statements about this notion of inter-subjectivity does not depend on who makes them and is therefore interpretable in terms of epistemic objectivity. This notion of objectivity, however, does not need unanimity. Consequently, it calls into question the philosophy of science which is behind the axiomatic approach, on which in its turn is based standard economic theory, that is., the transformation of a normative – and biased- principle like the Pareto-efficiency one into the universal positive principle for the economic domain (see Sections 1 and 3, Part One).[2]

Finally, Section 4 contains some general conclusions.

2. The evolution of the institutional structure of production.

As anticipated, an evolutionary game theoretic treatment of the Marxian notion of economic structure is presented in this section. Differently from the framework of the next section, which refers to the dynamics between generations, the analysis that follows refers to the dynamics within a generation.

For the reader's convenience, the two complementary games respectively representing the division of labour within the firm and the division of labour among firms are depicted again below (Fig. 1).

2 / 1	comp	coop
Comp	$V-\overline{w}, \overline{w}$	0, 0
Coop	0, 0	$\frac{V}{2}, \frac{V}{2}$

Fig. 1a $[\gamma\,(_w)]$

B / A	COMP	COOP
COMP	$\bar{\bar{V}}, \bar{\bar{V}}$	$\bar{\bar{V}}, \tilde{\bar{V}}$
COOP	$\tilde{\bar{V}}, \bar{\bar{V}}$	$\bar{\bar{\bar{V}}}, \bar{\bar{\bar{V}}}$

Fig.1b $[\gamma\,(_b)]$

[2] The distinction between an ontological dimension, referring to the nature of the phenomenon to be studied, and an epistemic one, referring instead to the statements about it, with regard to the notions of objectivity and subjectivity and to the difference between natural sciences (ontologically and epistemically objective) and social sciences (ontologically subjective and epistemically objective) is due to Searle (2005). For the social sciences, however, the problem addressed in Section 3 is that the analysis must include also the (ontologically and epistemically) subjective behaviours and ideologies of the economic agents under discussion, at least as long as conflict is part of the picture. Naturally, although it is a delicate issue, the process of formation of the "social consciousness" referred to in the text is not 'objective' in the same sense as is the one appropriate for social theories, where objectivity should be come from empirical verification and the researcher should adopt an 'external observer perspective'. See also footnote 3, Part One.

However, since the basic characteristics of such games –players, strategies and pay-offs- have already been discussed in detail in the previous parts, now recalled are only their distinguishing features.

The first of these distinguishing features is the fundamental condition ensuring that group production is always attractive compared with individual production:

(**1**) $\widetilde{\boldsymbol{V}} \geq 2\bar{\bar{\boldsymbol{w}}} > 2\bar{\boldsymbol{w}}$, where $\bar{\boldsymbol{w}} < \bar{\bar{\boldsymbol{w}}}$ represents the relationship between the exchange value of subordinate labour and the exchange value of professional labour, respectively.

The second is the sort of 'anomaly' that formalizes the 'fundamental contradiction of capitalism from the point of view of production', also already discussed in some detail in Section 2 of the second part of this study and briefly recalled in the Introduction to this one.

Indeed, a slightly subtle point, so to speak, is that, to the extent that the game within the firm -[$\boldsymbol{\gamma}\ (_{\boldsymbol{w}})$]- is non-cooperative, players are individuals interacting in that domain and taking their decisions independently. However, since from the point of view of the workers the (comp) strategy amounts to accepting the authority of the capitalist within the limits of the contract whereas the (coop) strategy presupposes a consensus-based form of decision-making, those who make decisions concerning the division of labour among firms –capital owners or partners, respectively- are also decision-makers as far the division of labour within the firm is concerned, that is, in [$\boldsymbol{\gamma}\ (_{\boldsymbol{b}})$]. Workers, on the other hand, only have the choice between accepting or not accepting such a decision, reflecting the aforementioned lack of coincidence between players and decision-makers. Because this point is about the difference between optimal choice and satisfying choice, in the sense that the latter is associated with only an improvement, it will be the especially critical in the following evolutionary game theoretic perspective.

The third and related distinguishing feature of these two games is that, because of the interdependence between the theory of value and the theory of distribution, and also because of the partial overlap between players and decision-makers in the two complementary games, the latter can also be understood as two stages of a single multi-level game - as also already mentioned in the Introduction. As discussed in some detail in Part Two, this interpretation formalizes the interdependence –synchronic and diachronic- between the "sphere of production" and the "sphere of circulation". This

in turn implies that the relationship of mutual complementarity characterizing the strategies in the game or stage within the firm extends to the strategies in the game or stage representing the relations among firms and to the complementary strategies in the two games or stages. As already noted in Section 3 of Part Two, the primacy of production over exchange characterizing the classical political economy approach, and especially the ones of Marx and Smith, means that it is not production that adapts to the market, but – to the contrary- the market that adapts to production.

From this third feature - which implies that the condition of non-additive separability characterizing the production function within the firm extends to the aggregate production function- it follows that the issue of how the value of the aggregate product can be determined arises essentially in the same terms in which it arises for the joint product of the firm. Consequently, it can be solved with the same notion exchange value introduced in the first part, further weakening the neo-classical theory of value and distribution, in its turn based on the – methodologically individualist- idea that the value of economic relationships, which obviously include goods, is invariably determined by the sum of individual independent and separate contributions. Secondly, from this dense web of interdependencies it follows that the two pairs of equilibria identified in Part Two and respectively associated with crises and growth are the ones in pure strategies [(comp, comp), (COMP, COMP)] and [(coop, coop), (COOP, COOP)].[3]

To confirm this conclusion in the stricter context of this part of the study, the first step is to embed such games in the typically evolutionary conceptual framework of the replicator dynamics. Basically, assuming there are **n** players and **m=n/2** firms, the idea is that at every period **t=1,…t** in which the three generations, or macro-

[3] For the reader's convenience the three basic features of super-modular functions, a more general notion than that of non-additively separable functions, the difference being that the former do not need the existence of cross derivatives, are repeated as follows: **(i)** the simultaneous increase of the variables yields better results than their separate increase, so that optimal choices are not necessarily marginal; (**ii**) the marginal return from a player's strategies is dependent on the level at which such strategies are employed by the other players, so that pay-offs vary according to a parameter -a feature known as 'increasing differences', which also illustrates the fact that the representation in normal and numerical form is not fully correct, although it is preferable in terms of clarity of presentation; (**iii**) the demonstration of the existence of equilibria in games of this type is not based on Brower's fixed point theorem but on that of Tarski, where the main difference lies in the fact that such fixed points are not the intermediate ones but rather the extreme ones, so that such equilibria are typically also extreme ones with the possibility of jumps from one to another (see Vives, 2005). However, in this study such notions are also considered equivalent between them, as well as equivalent to the one, typical of game theory, of strategic complementarity (see Section 3, Part One, footnote 2, Part Two, and Milgrom and Roberts 1990).

periods, **T=-1,0,1** corresponding to the phases of introduction, development and exhaustion of a given techno-economic paradigm introduced in the second section of Part Two, are subdivided, a fraction of the population is given the chance to update their strategies and that this will be done according to two parameters: the difference in the respective pay-offs and to the degrees of sensitivity to such differences.

The fundamental assumption of this conceptual framework -that players' local knowledge coincides with the effective distribution of strategies adopted by the population under analysis- does not seem to give rise to particular problems given the nature of the game in question and especially given the systemic nature of beliefs and expectations. On the other hand, the fact that the increase or the decrease of firms adopting a given strategy may depend not only on existing players but also on new players participating in the non-capitalist circuit, entering or exiting the capitalist one as discussed in sub-section 3.1. of Part Two, has to be stressed because of its importance in terms of interpretation but it is formally equivalent to the standard formulation. This point will become clearer as soon as the role of mutants with regard to the notion of evolutionary stable strategies has been introduced.

The second step consists of making explicit the learning mechanism which lies behind the strategy updating process on which the replicator dynamic is in its turn based. As already anticipated in the Introduction to Part Two, indeed, unlike the axiomatic models where individuals or, more precisely, their theories represent the beginning and the end of the analysis, so that from this point of view they may also be understood as 'creationists', in an evolutionary model players are in the middle of a process in regard to which they have limited control and knowledge.[4]

More precisely, this feature is formalized by assuming that players are engaged in what is called a 'best response learning process', i.e., a feedback mechanism that goes from precedents to expectations and therefore to the optimal strategies, and thence back again to the precedents, as in the figure below (Young, 1998, p.6).

[4] Clearly, the concept of evolution has problems with the notions of 'beginning' and 'end', so that today it is not considered necessarily in contradiction with views of a religious character, provided that the principle of the division of labor applies in this case too. Precisely this consideration, however, also highlights the risks mentioned above about the inevitable tendency of axiomatic approaches to present themselves as unique and true. Simon himself (1983, p. 34), who called the substantive rationality of the axiomatic approach "Olympian rationality", characterized it as the "rationality of God" (ibid). On the contrary, "The evolutionary model is a *de facto* model of rationality" (ibid, p. 35) even if "(…) an evolutionary model of rationality does not commit us to a particular mechanism for the rational process (ibid, p.72)".

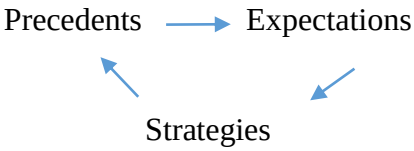

Fig. 2.

In this regard, to be noted is that, in the terms of Marx's statement quoted in the Introduction, this learning process corresponds to the impact of the structure on the super-structure, or to the fact that it is reality that determines knowledge of the former and not the other way around. Also in this case, however, it is necessary to point out that, once again, Marx's uniqueness consists in the fact that in his thought, differently from the evolutionary approach and of course from the axiomatic one, theory and reality are not coincident but interdependent, in the manner already mentioned. This in turn implies that at least in some particular circumstances, for instance during a crisis, reality can disavow theory.[5]

The third step consists in retrieving and re-elaborating the main solution concept of evolutionary game theory: that is, the notion of evolutionary stable strategies (Maynard-Smith, 1982). Basically, the question which this notion of equilibrium answers is this: in what conditions is an asymptotically stable equilibrium in the replicator dynamics protected against an invasion by mutants introducing a new strategy. More formally, the point is to determine what constitutes the barrier against invasion by these strategies, i.e. the fraction $\tilde{\rho}$ such that if mutants appear to a lesser extent than $\tilde{\rho}$ the existing strategy obtains a payoff greater than the entrant one so that the invasion will be rejected - a definition calling for an equally immediate and transparent economic interpretation in terms of free-entry, since the only barriers are those of profitability.

In practice, therefore, indicating with y (Y) the generic strategy in the two games $\gamma\,(_w)$ [$\gamma\,(_b)$], and with p (Q) its frequency distribution in the population, the problem is to determine what happens if a small proportion of players playing x (X) is

[5] To avoid misunderstandings from the very beginning, to be noted is that in the Bayesian approach, which will be discussed in more detail hereafter, the evidence may disavow a hypothesis in favour of the alternative, but not the general theory from which these hypotheses are derived. In the case of balls of different colours inserted in different ballot boxes, for example, the evidence may refute the hypothesis that a ball of a certain colour comes from a certain ballot box but not the general theory concerning the initial allocation of the balls in the ballot boxes. And, to remain with the example, the point is that the general theory that it should be possible to refute concerns precisely 'who put the balls in the ballot boxes in that proportion, and why they did so', a question whose answer also gives indications on the future dynamics of that proportion. See also footnotes 10-13.

introduced. Drawing on the analysis by Bowles (2004, ch.2) and referring to it for a complete derivation starting from the replicator dynamics, the usual conditions follow:

(2a) $\Pi^i(y,y) > \Pi^i(x,y)$,
or, if $\Pi^i(y,y) = \Pi^i(x,y)$, then $\Pi^i(y,x) > \Pi^i$(x,x), and

(2b) $\Pi^g(Y,Y) > \Pi^g(X,Y)$,
or, if $\Pi^g(Y,Y) = \Pi^g(X,Y)$, then $\Pi^g(Y,X) > \Pi^g$(X,X).

In words, the *y* (*Y*) strategy is evolutionarily stable if it is a best response to itself; but, if it is only weakly so, then the alternative strategy *x* (*X*) is not in its turn a best response to itself and therefore does not evolve and does not invade the strategy *y* by inertia (drift).

Firstly, it follows from this definition that the notion of evolutionary strategies is what is called a refinement of the Nash equilibrium, since all evolutionary stable strategies are also Nash equilibria but the opposite is not true. Secondly, as anticipated in the Introduction to Part One, from this definition it also follows that it is a solution concept suited better to the combination between cooperation and division of labour identified by Marx and his contemporaries than to the principle of scarcity and to the view that value derives from given differences. In the general case, in effect, instead of the indifference among alternative strategies, or the same return for an individually-considered production factor among its alternative uses, preference tends to prevail for one or the other, which in the present context amounts to the condition of maximum profit and is in line with the non-marginalist character of the choices in question.

In the vast majority of cases, in other words, the Nash equilibria that are not evolutionarily stable are the 'mixed' ones where the population is indifferent between the two strategies while the Nash equilibria that are also evolutionary stable are the 'pure' ones where the whole population chooses the same strategy. This feature in turn depends on the fact that, apparently, in biology, the negative feedbacks characterizing the notion of scarcity of the production factors individually-considered are relatively rare compared to the positive feedbacks at the core of self-reinforcing mechanisms that

typically characterize the processes in which the frequency with which certain phenomena manifest themselves affects the processes themselves.[6]

As already mentioned in the Introduction, indeed, in biology not only does imitation not eliminate profit, i.e. reproductive success, but it is even what the latter consists of. This feature is in its turn the main element of similarity in the analogy between the principle of maximization of the Marxian or industrial profit and the principle of differential replication which lies at the core of the evolutionary interpretation proposed in this study.

Thirdly, and relatedly, it is worth pointing out again that the lack of use of this solution concept for standard economic problems such as price determination rather than for phenomena of a more institutional kind such the adoption of conventions or social norms, is particularly unfortunate given the immediate relation with the notion of free-entry and the fact that profitability is its only barrier. Consequently, the zero profit condition, countlessly used to 'close the model', becomes much less undisputable in this context.

To summarize, from a simple inspection of pay-offs it follows that both the (*comp*, *comp*) and (*coop*, *coop*) strategies in $\gamma\ (_w)$ and the (*COMP*, *COMP*) and (*COOP*, *COOP*) strategies in γ_b are evolutionarily stable strategies in their respective dynamics while the intermediate equilibria where players are indifferent between the two strategies represent the point (or the range) defining their respective basins of attractions and for this reason, even if they existed - an occurrence that as will be seen shortly is neither particularly intuitive nor easily interpretable- would not be evolutionarily stable.

However, thus far the analysis of the two games $\gamma\ (_w)$ and $\gamma\ (_b)$ has been conducted as if they were played independently while a basic point of analysis of this study is the already-mentioned interdependence between the phase of production and the phase of circulation, or the interdependence between creating or appropriating value within the firm and its realization or appropriation in the goods market.

In other words, the best response learning process must be complicated to take account of the interdependence between the division of labour within the firm and the

[6] An illuminating exception in this respect is the Hawk and Dove game where, if the cost of fight is higher than the value of the contested resource, an increase in number of hawks effectively increases the pay-off of the dovish strategy and vice-versa. If V>C, instead, fighting is the dominant strategy.
.

division of labour among firms formalized by these two games or stages as well as the afore-mentioned interdependence between theory and reality characterizing the Marxian approach ((Fig.3, where $\widehat{\sum}_g^{t=-1,0}$ and $\hat{\sigma}_i^{t=-1,0}$ respectively represent the strategy profiles in the two games while the suffix over beliefs (**β**) and expectations (**ϵ**) indicates that they are univocally determined by the material constraints represented by the degree of wealth concentration (**η**) and by the market size (**δ**); see also Fig. 2, Part Two, and Fig. 4 below).

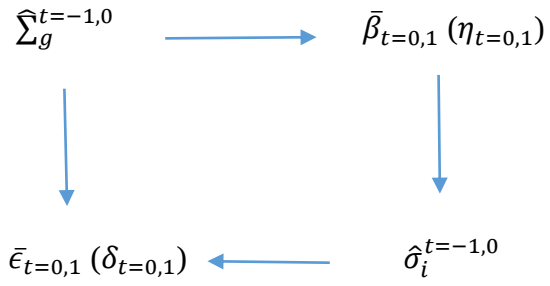

Fig. 3.

Indeed, in this more complex context, where moreover beliefs and expectations still play an implicit role of confirmation of the relation between strategies and pay-offs determined instead by the structural elements, and which therefore only involves the notion of a multi-level equilibrium with a given super-structure (**FSM-LE**), the problem is that behaviours associated with strategies that are not the best response in the two complementary games (or stages) considered separately may nevertheless evolve if profitable from the standpoint of the two games considered jointly, that is, in the 'multi-level' game. Moreover, this possibility is at the center of the recent biological models of group selection, whose intuition can be traced to Darwin and his famous sentence about the better fitness of groups comprising brave and/or altruistic individuals: "a tribe including many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy were always ready to give aid to each other and to sacrifice themselves for the common good, would be victorious over most other tribes; and this would be natural selection." (Darwin, 1871, p. 166; see also footnote 20).

In other words, given that the pay-offs can be assessed differently depending on whether the assessment is conducted individually or from the point of view of the

group due to the asymmetrical and conflictual character of the coordination game within the firm, to rule out the aforesaid possibility it is necessary to add the following conditions. They ensure that the strategies which are not able to invade the equilibrium strategies in the two games considered separately continue not to be able to invade them when the two games are considered simultaneously:

(3a) if $\Pi_g(\hat{\sigma}|\eta) \notin argmax\Pi_g(\hat{\sigma}|\eta)$,
then $\Pi_i(\hat{\Sigma}|\delta) \in argmax\Pi_i(\hat{\Sigma}|\delta)$ for at least one or ϵ individuals.

In words, if an individual deviation in $\gamma\ (_w)$, which is not profitable from the individual standpoint due to the ordinary definition of the evolutionarily stable strategy, is however profitable from the point of view of the group, i.e. the first part of the expression (3a) applies, then the corresponding group deviation in $\gamma\ (b)$, which is not profitable from the group standpoint due to the ordinary definition of evolutionarily stable strategies, is not profitable either from the individual point of view for at least one or ϵ individuals who are decision-makers in such a game, i.e. the second part of the expression (3a) applies. Therefore, the strategy in question cannot evolve even indirectly –because the complementary strategy is a decision-maker's best response in both games.

Likewise,

(3b) if $\Pi_i(\hat{\Sigma}|\delta) \notin argmax\Pi_i(\hat{\Sigma}|\delta)$ for at least one or ϵ individuals,
then $\Pi_g(\hat{\sigma}|\eta) \in argmax\Pi_g(\hat{\sigma}|\eta)$.

In words, if the group deviation $\gamma\ (b)$, which is not profitable from the point of view of the group due to the ordinary definition of evolutionarily stable strategies, is however profitable from the individual standpoint for at least one or ϵ individuals, i.e. the first part of the expression (3b) applies, then the corresponding individual deviation in $\gamma\ (_w)$, which is not profitable from the individual standpoint due to the ordinary definition of evolutionary stable strategies, is not profitable either from the group's point of view, that is, from the point of view of the entrepreneurs-partners who are decision-makers as well players in both games. Consequently, since the second part of the expression (3b) applies, here too the strategy associated with the deviation at the

start of the process cannot evolve even indirectly because the complementary strategy is a decision-makers' best response in both games.[7]

To put it differently, in the case of the 'altruistic' or 'mutant' entrepreneur, who deviates from (comp) to (coop) in $\gamma\,(_w)$ and from (COMP) to (COOP) in $\gamma\,(_b)$ because $\bar{\bar{V}} > \bar{V}$, were it not true that the strategy profile in $\gamma\,(_b)$ maximizes the decision-makers' individual profit, because $\overline{V} - \overline{w} > \bar{\bar{V}}/2$, other entrepreneurs could deviate from (COMP) to (COOP) in $\gamma\,(_b)$. This in turn could determine a change in the strategy profile of this game as well as a change in the rules of the other one, destabilizing the starting equilibrium in $\gamma\,(_w)$.

Analogously, in the case of the standard entrepreneur who, in a world of entrepreneurs-partners deviates from (COOP) to (COMP) in $\gamma\,(_b)$ and from (coop) to (comp) in $\gamma\,(_w)$, because $\overline{V} - \overline{w} > \bar{\bar{V}}/2$, were it not true that the individual strategy profile in $\gamma\,(_w)$ maximizes the profit of the group, and therefore the individual expected profit as well, because $\bar{\bar{V}}/2 > \overline{V}/2$, other entrepreneurs could deviate from (coop) to (comp) so as to determine a change in the strategy profile of this game as well as in the rules of the other one, destabilizing the initial equilibrium in $\gamma\,(_b)$.

Finally, in the present framework these considerations are especially relevant given the three characteristics of super-modular functions already discussed in Section 3 of Part One and recalled in footnote 3. Moreover, since pay-offs are a function of the structural parameters measuring the intensity of strategic complementarities, a feature already central to the argument of Part Two and known as 'increasing differences', and since these parameters in their turn co-evolve with the strategies' profiles, giving rise to the cumulative causation mechanisms implied by Milgrom, Roberts and Quan' (2001) momentum theorem, also already discussed in Part Two, in the neighborhood of the extremal points the – other, already mentioned - parameters which, in the replicator dynamics, regulate the numbers of players who update their strategies and the sensitivity to differences in pay-offs associated with them could also change, similarly to what happens with the notion of punctuated equilibrium introduced by Elredge e Gould (1967; see also Bowles, 2004, Ch. 2). □

[7] To facilitate understanding of this extension, it should be noted that the ordinary definition of evolutionarily stable strategies can also be written as: if $\Pi^i(\sigma_x^i, \sigma_y^j) \in argmax\Pi^i(\sigma^i, \sigma_y^j)$,
then $\Pi^i(\sigma_x^i, \sigma_x^j) \notin argmax\Pi^i(\sigma^i, \sigma_x^j)$.

To sum up, the preceding considerations confirm that, because both pairs of evolutionary stable strategies - [(comp, comp); (COMP, COMP)] and [(coop, coop); (COOP, COOP)]- are optimal for the decision-makers in both games, they do not present tendencies to change the material rules of the games and are therefore multi-level equilibria with a given super-structure (**PROPOSITION 1**).

2.1. Discussion.

This result prompts the following four observations.

The first is that the mutations at the centre of the analysis conducted in the previous section originated from conflict rather than being random as in the standard evolutionary approach. This is therefore probably the most important difference with respect to the proposed analogy between the self-expansive nature of the gene and the one –if only apparent- of capital. Indeed, this is the reason why the analysis remains deterministic rather than stochastic as is typical of the standard evolutionary models just referred to.

The second and related observation about this result is that, albeit only referring to these two games in particular, this extension of the conditions of evolutionary stability to the pairs of strategies has a fairly immediate and transparent economic interpretation because it formalizes the above-mentioned counter-example to the general equilibrium model and to the so-called 'zero-profit condition': although there is free-entry and a homogeneous product, profits are not only positive but also increasing or decreasing.

The first condition (3a), in effect, represents the case of the 'democratic' or 'altruistic' entrepreneur just referred to: namely, the entrepreneur who, seeing that workers are not paid for what they produce, may decide to give up part of his or her profit, obtain the efficiency gains of an increase in the use-value of labour and in this way invade the (comp, comp); (COMP, COMP) pair of equilibria. As just pointed out, however, this does not happen because this 'democratic' or 'altruistic' entrepreneur will in turn be eliminated by another entrepreneur who obtains the same efficiency gains, and therefore a greater profit, by maintaining the same hierarchical organization of work, a condition expressed by the second part of (3a), which ensures that the corresponding (COMP to COOP) group deviation is not profitable for at least one or ϵ individuals who are decision-makers, i.e. the other standard entrepreneurs who, like the first one, are considering a change in their strategy.

The second condition (3b) - a group deviation which is profitable from an individual point of view- instead represents the situation where a standard entrepreneur in a world of entrepreneurs-partners, on seeing positive profits, implements a policy of lowering the use-value of labour and hence the exchange-value of the product, thereby seeking to invade the (coop, coop); (COOP, COOP) pair of equilibria. Again, however, this does not happen because in this ideal world for entrepreneurs-partners, they obtain a higher profit by increasing the use-value of – their- labour and so the exchange-value of the product. This condition is expressed by the second part of (2b), which ensures that the corresponding individual deviation (from coop to comp) is not profitable from the point of view of the group, i.e. the entrepreneurs-partners who, like the original mutant, are considering a change in their strategies –and who, in the absence of wealth effects, could take their decisions unanimously.

It is in this sense, therefore, that the compatibility of the evolutionary framework with the Marxian one is demonstrated *ad absurdum*: an interpretation of Marx's theoretical framework compatible with the general equilibrium model would be a contradiction in terms.

The general idea -which should be reiterated given the importance of the afore-mentioned zero-profit condition, commonly used to 'close the models' and which was indubitably the most relevant difficulty to overcome when developing the approach of this study- is that insofar value arises from the combination between division of labour and cooperation rather than from scarcity, imitation does not eliminate profits and it is instead possible to create value even by doing the same thing, i.e. without necessarily innovating or differentiating the product. As already noted in sub-section 3.1., Part Two, this is indeed the main consequence of passing form the notion of competition as an assumption to the notion of competition as a process (see also footnote 8, Part Two).

In its turn, as also noted in the just-mentioned sub-section, the scarcity of goods and production factors, as endogenously determined by the value creation process, determines the spontaneous adaptation of market- or short-term prices to exchange-values or long-term prices, preventing the cumulative causation mechanisms from 'exploding'. But, being of a derivative nature, since it is not the exchange that determines the magnitude of value but the other way around, it does not reverse the underlying tendency, which is instead determined by the capital accumulation process and is measured by the dynamics of transaction costs (see also footnote 1, Part One).

Consequently, the third observation is that these two games and their relationship may be interpreted as a formal representation of the Marxian notion of economic structure: that is, of production relations – "indispensable and independent of their will"- in which players already find themselves, and which they would not have chosen but whose rejection would lead to economic extinction, and upon which - as said- an ideological super-structure is built.

Indeed, in the general Marxian case, these two games and their relationship represent the way in which power, conflict and exploitation derive from the 'fundamental contradiction of capitalism in the sphere of production' rather than from various forms of market power. Consequently, as happens with profit, they are not eliminated by competition, which instead makes them systemic and to a certain extent independent from the will of the individual capital owners, in the sense that also in this case the awareness or the intentionality of the oppressive behaviour is not necessary to the logic of the argument.

And, as already noted, the re-dis-covery of the original meaning of such notions – which is neither 'economic' nor 'political' in the language and the conceptual framework of standard economic theory, nor in that of the Marxist economic theory which renounced the labour theory of value, is by itself a remarkable result of the perspective introduced in this study.

In this regard, finally, in analogy with the cognitive opportunities and the constraints with which the evolutionary approach explains apparently 'irrational' behaviours such as those associated with the notion of bounded rationality – because only satisfying rather optimal -, or 'more than rational' such as those associated with 'enlightened self-interest', which makes it possible to solve social dilemmas such as the Prisoner's Dilemma thanks to the existence of social norms in their turn evolved by group selection, the fourth observation is that the material opportunities and constraints deriving from belonging to such production relations can be used to explain apparently 'irrational' behaviours such as submitting to exploitation or abuse of power, or 'more than rational' ones such as being the agent of such exploitation or abuse of power (see footnote 4 and sub-section 3.1.).

In the case of workers, as just mentioned, we are dealing with situations which are only accepted, satisfying a participation constraint that even from a terminological point of view confirms its character of improvement or satisfaction rather than of optimality. In the case of the capital owners, instead, we are dealing with situations not

necessarily intentionally chosen in the sense that they could be the ways in which "(..) the laws, immanent in capitalistic production, manifest themselves in the movements of the individual masses of capital, where they assert themselves as coercive laws of competition, and are brought home to the mind and consciousness of the individual capitalist as the directing motives of his operations".[8]

Consequently, this type of rationality, which as already mentioned in Section 3 of Part One is still a form of individual rationality even though it is different from the individual and independent canonical condition because of the differences in the context to which it is applied, and especially because of the greater number of theoretically possible situations presenting themselves in non-additively separable contexts compared to simpler, only additive ones, can be interpreted as involuntary or unintended rationality.

Since this type of rationality is the very essence of both the notion of evolution and of the difference between systemic and physical coercion, in its turn the core of the legacy of Marx as a critical economist, this is also the reason why it is possible to conclude that an evolutionary approach is not only compatible with the re-interpretation of Marx's approach proposed in this study but is also necessary for it.[9]

As repeatedly noted, however, it is not sufficient. While this kind of involuntary rationality certainly captures important aspects of the economic agents' real behavior, it is equally true that, in the case of humans, to be added is the possibility that, especially in a crisis situation, they may display a kind of 'conscious' rationality, even though -to use the Marxian terminology recalled in the Introduction- 'unaware' or 'not educated' in the sense that it does not imply knowledge of the 'true' model. In other words, although this kind of rationality in the intentions is not necessarily fully informed, it seems to be a realistic as well as a theoretically significant development of both the evolutionary and the axiomatic approaches. It is therefore discussed in the next section.

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[8] The whole sentence has been cited in the Introduction to Part One.

[9] That Marx has been one of the most influential thinkers to have reflected on the distinction between formal and real freedom confirms that his work as a critical-economist can be interpreted as showing how capitalism *embodies* this difference between systemic and physical coercion. That thereafter, in the so-called first phase of single- firm socialism, the tendency was inevitably that of re-establishing the *coincidence* between those two types of coercion, as is also the case of all the economic systems before and after capitalism, was a risk that the losing side of the political and economic debate within the workers' movement warned the winning side, which included Marx, about. The irony, in effect, is that when such form of systemic coercion is officially dis-covered, the reaction seems to be that, then, resorting to physical coercion is at least not hypocritical –as if explicit cynicism and full oppression were the solution.

3. From asymmetric information to social knowledge.

In the preceding section, the reason for the stability of the equilibrium points was that the relationship between strategies and pay-offs was determined, so to speak, in an 'iron' way by the structural elements **η** and **δ**, i.e., the parameters measuring the degree of wealth concentration and the market size, and most notably the parameter already defined as fundamental, that is the first one determining the type of players in $\gamma\ (_w)$, and consequently the identity of decision-makers in both games.

In a sort of game of crossed vetoes, indeed, if an equilibrium strategy profile in the game within the firm did not maximize the group's profit, the corresponding equilibrium strategy profile in the game among firms, in addition to obviously being a best response in such a game, also maximized the individual profit of the decision-makers in both games, making it impossible for deviations in the game within the firm to evolve indirectly because they were profitable in the two games considered jointly. Analogously, if an equilibrium strategy profile in the game among firms did not maximize the profit of every possible individual, the corresponding equilibrium strategy profile in the game within the firm, in addition to obviously being a best response in such a game, also maximized the profit of the group, and therefore also the expected individual profit of the decision-makers in both games, making it impossible also in this case for deviations in the game among firms to evolve indirectly because profitable in the two games considered jointly.

Beliefs and expectations, in effect, played only an indirect role in confirming or legitimizing the relationships between strategies and pay-offs determined by material constraints or, put otherwise, the interpretative framework by which the individual strategy choices proved to be individually rational.

In this section, instead, besides to being able to change strategy, players are also given the opportunity to update and then eventually change beliefs or expectations -an addition that in terms of the equilibrium concepts advanced in definitions 1a and 1b in the Introduction consists in the transition from a multi-level equilibrium with a given super-structure (**FSM-LE**) to a multi-level equilibrium with a variable super-structure (**VSM-LE**).

The first step therefore consists in making explicit the role of beliefs and expectations in the conceptual framework of this section (Fig. 4) and comparing it with that of the previous one (Fig. 3).

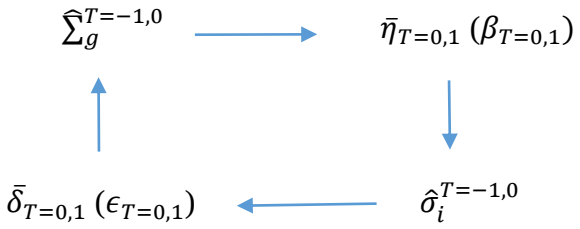

Fig. 4.

In this new figure, $\widehat{\sum}_g^T$ and $\hat{\sigma}_i^T$ represent respectively the strategy profiles in the two games or stages $\gamma\ (_b)$ e $\gamma\ (_w)$, with **T=-1, 0, 1** indicating the three generations that are assumed to correspond to the already-mentioned three stages of introduction, diffusion, and development or exhaustion of a certain techno-economic paradigm (unlike the previous section's model, where players could participate in the two games in every period, in this one every player is assumed to live and work in a single generation, leaving his or her wealth to - only one- offspring).

In addition, while the suffix on beliefs **β** and expectations **ϵ** in Fig. 3, i.e. the super-structural elements, indicated that they were uniquely determined by the structural elements **η** and **δ**, in Figure 4 it is the structural elements, or more precisely their cognitive perception, which are instead determined by beliefs or expectations, that may or may not coincide with those taken as given in the previous period according to whether the updating process confirms them or leads to their change.

In this context, a first remark useful for clarifying the different meaning that is attributed here to the terms 'beliefs' and 'expectations' is the following: in the game among firms the expectations are 'absolute', in the sense that knowledge of one's own type does not give information about the type of the opponent; in the game within the firm, instead, beliefs are 'relative', in the sense that knowledge of one's own type also implies knowledge of the type of the opponent.

In other words, whilst in the case of expectations the problem is the typical one of asymmetric information, because it is assumed that each player knows their type but not that of the opponent, in the case of beliefs the problem is that there may be ambiguity, or disagreement, about what type of players are in relation to each other.

By applying Searle's (2005) terminology, to put it another way, since they refer to an observer independent phenomenon, i.e. there is separation between the observing

subject and the observed object, expectations are epistemically objective by definition; by contrast, in the case of beliefs the phenomenon is observer-dependent, i.e. there is no separation between the observer and the phenomenon to be observed. Consequently, they are epistemically subjective because they refer to a phenomenon internal to the players in question and epistemic objectivity, that is, the sharing of beliefs, is achieved by construction when such beliefs coincide (see footnote 2, this part, and footnote 3, Part One).

And, of course, as already discussed in Part Two, that difference depends on the fact that beliefs refer to the class relationship within the production process - a relationship that results in the joint product of the firm whose production and distribution is internally organised because none of the parties produces anything that can be sold separately. In this sense, therefore, neither of the two parties 'exists without the other', so that, because of conflict, the same relationships can be viewed from two different points of view.

Instead, expectations relate to the size of the market, that is to say, to the supply and demand relationships among firms, so that, fortunately, the production and distribution of the aggregate product are organized externally by the market where, equally fortunately, the two parties produce something that can be sold separately. In this sense, therefore, it can be said that the two parts have a 'separate existence' one from the other, so that there is no reason to think that such relationships are viewed in different, and even less opposite, ways (see footnote 16, Part Two).

Moreover, to be noted is that this sharing of beliefs and expectations is in turn a necessary condition for the game to be played and solved, as demonstrated by the assumption of common knowledge in the epistemic game theory.[10]

[10] Not surprisingly, however, in epistemic game theory such sharing is assumed rather than explained, as noted in the text. Indeed, the starting and the finish point in this regard is the so-called Harsanyi (1968) doctrine, according to which common priors and common knowledge of the posteriors implies that the latter must be identical. Whence derives the idea that differences in beliefs can only be due to differences in information, the repeatedly cited Aumann's theorem (1976) on the impossibility of agreeing to disagree as well as the epistemic conditions for the Nash equilibrium, since common prior and common knowledge of the conjectures imply that players already agree on how the game will be played (Gintis, 2009, p. 158). It is now almost redundant to point out that also in this case such a partial view is justified in terms of self-evidence, so that the objectivity of probability assessments is in turn justified in terms of the coincidence of the subjective ones. And, even in this case, as for methodological individualism and the assumption of wealth effects, conflict is eliminated by decree, so to speak. Consequently, more than an excess of sophistication in the assumptions about the degree of rationality and knowledge attributed to economic agents, the problem seems to be instead an excess of simplification of the assumptions about reality and its perception. See also the next footnote.

Consequently, given the conflictual and asymmetrical nature of the game within the firm, the second remark is this: for beliefs, which formally are a probability distribution with the usual properties on the cognitive perception of the players' types, precisely in relation to each other such as for example [(best/worst) or (both equivalent)], it is possible to distinguish between an equilibrium belief system and a disequilibrium belief system depending on whether or not it induces an equilibrium strategies' profile in $\gamma\ (_w)$.

This possibility is shown in the following figure, where (σ_w^i = comp) and (σ_w^j = comp) respectively indicate the probability that the row and column players adopt the strategy (comp) in $\gamma\ (_w)$ depending on the values assumed by β, while the expressions $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+(\bar{V}-\bar{w})}$ e $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$ indicate the threshold values of β which, respectively, make the row and column players indifferent between the two strategies.

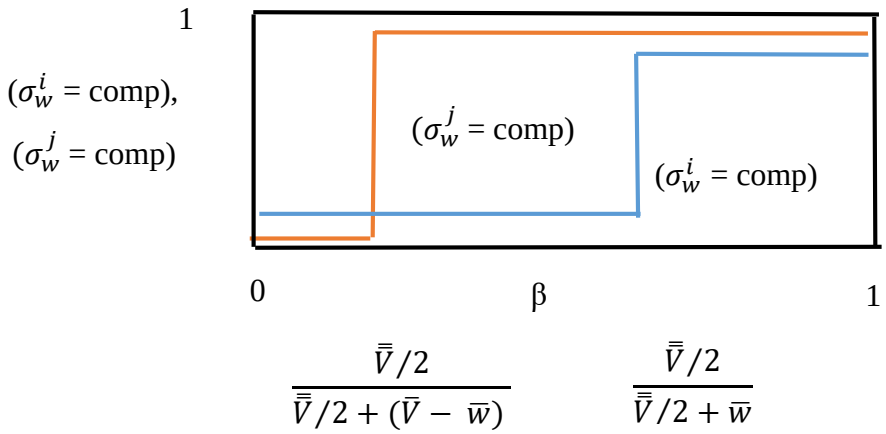

FIG. 5

In words, if players are almost sure they are 'better/worse', i.e. $\beta \geq \frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$ applies, the (comp, comp) equilibrium obtains, while if they are almost sure they are 'both equivalent', i.e. $\beta \leq \frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+(\bar{V}-\bar{w})}$ applies, the (coop, coop) equilibrium obtains. Conversely, if it is not clear who they are in relation to whom, i.e. $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+(\bar{V}-\bar{w})} \leq \beta \leq \frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$ applies, then the (comp) strategy is optimal for the column players, while the (coop) strategy is optimal for row players; consequently, there will be a disequilibrium in $\gamma\ (_w)$.

Moreover, as anticipated, to be noted is that, in this context, the mixed strategies equilibrium, so crucial in demonstrating that games always have a solution, would not only be unstable if it existed but, as mentioned in the previous section, it almost certainly does not exist.

On the one hand, in this context the classic justification for mixed strategies – that they represent the uncertainty of the *other* player about the strategies that will be chosen by the player who considers adopting the mixed strategy, who therefore has an interest in 'not showing his cards' but then adopts a pure strategy - is clearly unsuitable given the just-emphasized relative rather than absolute nature of the relevant knowledge in this context.

On the other hand, the evolutionary justification in terms of the frequency with which a certain strategy is played in a given population – a justification certainly more convincing and apparently appropriate to the present context- also prove to be inappropriate because of the just-discussed nature of the production process within the firm. This implies that the strategies chosen by the players in this game must be in a particular proportion. But, for example, a situation where 1/3 of the row players plays a certain strategy and 2/3 of the column players play the same strategy clearly is not an equilibrium for at least 2/3 of the players in question (see also Hayek's sentence quoted in the conclusions of Part One).

Naturally, however, the situation is very different depending on whether such ambiguity in beliefs is the result of the ambiguity in the parameter measuring wealth concentration or instead is the result of the process of updating beliefs themselves.

In the former case, namely the situation analysed in the previous section, where to be specific the relation $\overline{\boldsymbol{\beta}}_{\boldsymbol{T=0}}\ (\boldsymbol{\eta}_{\boldsymbol{T=0}})$ applies, the issue is less important because, as just pointed out, it only implies that the intermediate equilibrium does not exist instead of only being unstable: a feature which, in turn, implies that the intermediate equilibrium of the game among the firms does not exist, either. Consequently, this consideration confirms what was said just on the basis of the presence of strategic complementarities, that is, that the only equilibria in the replicator dynamics of which it is possible to prove with certainty the existence are the extreme ones with the possibility of 'jumps' from one to the other.

In the latter case, in which to be specific the $\overline{\boldsymbol{\eta}}_{\boldsymbol{T=0}}\ (\boldsymbol{\beta}_{\boldsymbol{T=0}})$ relation applies, this ambiguity in beliefs and thus in the cognitive perception of the legitimacy of property rights instead corresponds to the change in the system of shared beliefs that follows

the updating process and, as will be seen shortly, the consequences may be more significant.

The third remark, in fact, is that, although the game is not a zero sum one in the pay-offs, it is so in the beliefs, since, due to the relative and conflictual character of the class relationship within the firm, the probability that the two players are 'better/ worse' is the complement to the probability that they both are 'equivalent'.

Consequently, assuming an initial multi-level equilibrium with given super-structure [(comp, comp), (COMP, COMP)], or in other words a situation of crisis or stagnation, if the players update their beliefs, they will do so using the minimax-maximin criterion.

On the one hand, also based on this criterion is the concept of solution of zero-sum games introduced by von Neumann and Morgestern (1944). Because this does not require the assumption of common knowledge, was long regarded as more robust from an epistemic point of view than the later developments for which it provided the basis, like, most notably, the Nash equilibrium.

On the other hand, as repeatedly emphasized and also emerges from Marx's famous sentence quoted in the Introduction, this movement from 'unconscious' behaviour to 'conscious' behaviour does not require the knowledge of the 'true' model, that is, it remains somehow 'unaware' or 'uneducated'. Consequently, the use of the minimax-maximin criterion can also be justified in terms of the Wald criterion (1950) in conditions where, compared to the Bayesian world, the common prior assumption cannot be justified (Gilboa, Schmeidler, 1989).[11]

If this is true, the result of this updating process is the displacement of the shared set of beliefs from the one leading to the (comp, comp) equilibrium to the one that is associated with a disequilibrium situation.

In formulas, it is possible to write:

[11] In this regard, to be noted is that both Bayesian rationality and the expected utility theory require the existence of a 'true' theory, unique and known by the subjects under analysis. As Denzau and North (1994, p. 17) point out with regard to the former, it: "implicitly assumes that the dimensions of the internal mental models used to represent the external world are correct, in some sense", so that:" "Bayesian learners are never surprised, or forced within the updating process to completely change the dimensions of the model space.". As emphasised by Gintis (2009, p. 14) with regard to the latter, in Savage's (1954) formulation there is an axiom, the third, which rules out the possibility that probability assessments can be influenced by the outcomes to which they refer, so as to avoid so-called 'wishful thinking'. Accordingly, as also pointed out by Denzau and North (ibid, p .6), the rational choice model may be more appropriate for relatively simple situations such as the one with competitively posted prices for goods in super-markets than for more uncertain and complex decisions.

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(4) $\beta^0 = \beta_k^0 \wedge \beta_L^0$, where

(5a) $\beta_0^K = max_{\beta_K} min_{\beta_L} \Pi^K(\hat{\sigma_\iota}(\beta)) = min_{\beta_L} max_{\beta_K} \Pi^L(\hat{\sigma_\iota}(\beta)) \geq \frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+(\bar{V}-\overline{w})}$

(5b) $\beta_0^L = max_{\beta_L} min_{\beta_K} \Pi^L(\hat{\sigma_\iota}(\beta)) = min_{\beta_K} max_{\beta_L} \Pi^K(\hat{\sigma_\iota}(\beta)) \leq \frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$

In words, column players, i.e. capital owners, think they are 'better/worse' with probability at least higher than $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+(\bar{V}-\overline{w})}$ while row players, i.e workers, think they are 'better/worse' with a probability at least lower than $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$.

As well-known, in the case of zero-sum games the reason for adopting the maximin-minimax criterion derives from the fact that what a player wants to maximize is exactly what the opponent wants to minimize, and vice versa. Indeed, as von Neumann and Morgestern (1944, p.1108) point out: "The desires of the players 1 and 2 are simple enough. 1 wishes to make $X(t_1, t_2)$ = $X(t_1, t_2)$ a maximum, 2 wants to make $X(t_1, t_2)$= - $X(t_1, t_2)$ a maximum; i.e., 1 wants to maximize $X(t_1, t_2)$ and 2 wants to minimize $X(t_1, t_2)$. ".

On the one hand, therefore, the maximin criterion in the present context, where the partial novelty lies in the fact that it is applied to the beliefs on which the strategies depend rather than directly to those strategies, provides an answer to the following questions: which β, chosen by the opponent, makes it more likely that the pay-offs of the player in question are minimized? And which β, chosen by the player in question, makes it such a negative outcome less likely for him or her?

On the other hand, the minimax criterion answers the following questions: which β, chosen by the opponent, makes it more likely that the pay-offs of the player in question are maximized? And which β, chosen by the player in question, makes it such a positive outcome less likely for him or her?

As anticipated, however, unlike what would happen if the game was played independently or in the context of the previous section, where the result would be a disequilibrium situation not reached by the equilibrium path, in this case the disequilibrium situation in $\gamma\ (_w)$, as well as the associated conflict, are due to a super-structural change in the cognitive perception of the types of players in that game or

stage, and therefore of decision-makers in both games or stages. Indeed, to this change corresponds a change in the perception of the legitimacy or appropriateness of property rights **η (β)**, which consequently enter the area characterised by a certain degree of ambiguity that, because of their systemic nature, extends to the cognitive perception of the legitimacy or appropriateness of decision-makers in $\gamma\ (_b)$.

Consequently - postponing to the next section the discussion of the critical issue of who and how many players actually change their beliefs- to the extent that this change in 'social consciousness', or in the shared perception of the legitimacy or appropriateness of property rights, also results in a change in the decision-making process in $\gamma\ (_b)$ which, for example, would involve workers in at least one firm in the game with two firms (and at least (1- $\frac{\bar{\bar{V}}/2}{\bar{\bar{V}}/2+\bar{w}}$) in the game with n firms), the pay-offs in $\gamma\ (_b)$ will be 'evaluated' from the point of view of capitalists and workers as well as from the point of view of their distribution in $\gamma\ (_w)$ – rather than from the point of view of the actual decision-makers.

This in turn implies that the strategy (COOP) becomes dominant for the workers, so that the only evolutionarily stable equilibrium, and therefore also the only Nash equilibrium, turns out to be (COOP, COOP) (Fig. 6).

L / K	COMP	COOP
COMP	$2(\bar{V}-\bar{w}), 2\bar{w}$	$[(\bar{V}-\bar{w})+\tilde{V}/2], \bar{w}+\tilde{V}/2$
COOP	$[(\bar{V}-\bar{w})+\tilde{V}/2], \bar{w}+\tilde{V}/2$	$\bar{\bar{V}}, \bar{\bar{V}}$

FIG. 6

Given the fundamental condition (1), that ensures that group production is always profitable compared to individual production, for workers the following expression applies:

(6a) $\bar{\bar{V}} > \bar{w} + \tilde{V}/2 > 2\bar{w}$.

Instead, the following expression applies for capital owners:

(6b) $\bar{\bar{V}} > 2(\bar{V} - \bar{w}) > [(\bar{V} - \bar{w}) + \tilde{V}/2]$; hence the (COOP) strategy becomes a best response in this modified game or stage whilst remains dominant with respect to independent production.

On the other hand, this sequence of structural and super-structural changes entails that also the expected market size **δ(ϵ)**, where also expectations ϵ are understood as a probability distribution with the usual properties on the cognitive perception of the types of firm in $\gamma\,(_b)$ - for example, a 'value-appropriating' or 'selfish' firm and a 'value-creating' or 'self-interested' firm, to use terms already employed in the previous parts of this study and which will be discussed in more detail in the next sub-section- will not be determined by the previous period's distribution of the strategy profiles in $\gamma\,(_w)$, but by the current period's one, which is changed as a result of the change in shared belief system.

Finally, from this further inversion of the causality relationship between reality and theory ensues the actual transition - or the 'jump'- from the 'low' equilibrium (COMP, COMP) to the 'high' one (COOP, COOP) in $\gamma\,(_b)$, and therefore also the complementary 'jump' – consequent on the actual structural change in the distribution of property rights and therefore of the transformation of the types of players into partners in $\gamma\,(_w)$- from the asymmetrical equilibrium that does not maximize the value of the group (comp, comp) to the symmetrical one that instead maximizes it (coop, coop).

In this sense, a deviation that is not a best response in $\gamma\,(_w)$, the one from (comp) to (coop), and which therefore would not be profitable from the point of view of the two games considered separately or in the fixed super-structure model of the previous section, turns out to be profitable when considering the two games together since the complementary strategy (COMP) proves to be dominated in the modified game. The strategy associated with this deviation is then able to evolve indirectly through the change in the strategies of the complementary game or stage - from (COMP) to (COOP)- which in turn induces the subsequent change in the rules of the initial game or stage.

Conversely, starting from the multi-level equilibrium with given super-structure [(coop, coop); (COOP, COOP)] - i.e the situation of growth determined by the absence of the class divide-, since there is no conflict, the beliefs inherited from the previous period or generation are unanimously confirmed and, unsurprisingly, there is no room for the type of super-structural change just analysed for the other equilibrium situation.

In this context, indeed, the following applies $\bar{\boldsymbol{\beta}}_{\boldsymbol{T=0}}$ **(**$\boldsymbol{\eta}_{\boldsymbol{T=0}}$**) =** $\boldsymbol{\eta}_{\boldsymbol{t=1}}$ **(**$\boldsymbol{\beta}_{\boldsymbol{t=1}}$**),** and $\bar{\boldsymbol{\epsilon}}_{\boldsymbol{T=0}}$ **(**$\boldsymbol{\delta}_{\boldsymbol{T=0}}$**) =** $\boldsymbol{\delta}_{\boldsymbol{T=1}}$ **(**$\boldsymbol{\epsilon}_{\boldsymbol{T=1}}$**)**.

In addition, even if for some reason, there were an analogous change of beliefs so as to bring them into the area of ambiguity with respect to the legitimacy of property rights and, as a consequence, a change in the decision-making processes took place, the strategy (COMP) would not become dominant for any of the new types of decision-makers in $\gamma\ (_b)$, and in particular for the new type of decision-makers represented by capital owners. As a result, the (COOP) strategy would remain a best response with regard to both types of decision-makers and this would therefore cause a return to the pair of equilibria that maximizes the total value (but see the discussion in the next sub-section).

Thus, assuming an initial situation of equilibrium in the multi-level game at **T=-1**, if the strategy profile in $\gamma\ (_w)$ does not maximize the value of the group, so that in $\gamma\ (_b)$ it does not maximize the value of the 'super-group' or total value, the set of shared beliefs after the updating process will be the set of disequilibrium beliefs, to which corresponds the process of institutional or systemic change just described. Conversely, if the strategy profile in $\gamma\ (_w)$ maximizes the value of the group, so that in $\gamma\ (_b)$ it maximizes the value of the super-group or total value, then the belief updating process will confirm the one received from the previous generation; confirmation that will therefore also be extended to the expected market size and the equilibrium strategies in both games.

In formulae, for ease of presentation leaving aside the dependence of the market size at **T=-1** on the strategies in $\gamma\ (_w)$ and their dependence on the strategies in $\gamma\ (_b)$ through the beliefs at **T=-1**, it is then possible to write:

assume that at **T=0** beliefs are critically evaluated and updated, then

(7) $\beta_{T=0} =$

$\beta^{\neq}_{T=0}$ if $\Pi^{sg}_{-1}(\widehat{\sum}^{g}_{-1}(\bar{\epsilon}_{-1}(\delta_{-1}))\ \notin$ argmax $\Pi^{sg}_{-1}\ (\widehat{\sum}^{g}_{-1}(\bar{\epsilon}_{-1}(\delta_{-1}))$

$\beta^{*}_{T=-1}$if $\Pi^{sg}_{-1}(\widehat{\sum}^{g}_{-1}(\bar{\epsilon}_{-1}(\delta_{-1}))) \in$ argmax $\Pi^{sg}_{-1}(\widehat{\sum}^{g}_{-1}(\bar{\epsilon}_{-1}(\delta_{-1}))$, where Π^{sg}_{-1} indicates the profit of the 'super-group' or total value **(PROPOSITION 3).**

But at this point, since according to **PROPOSITION 3** the maximization of the total value is a necessary condition for belief consistency, while according to **DEFINITION 1b** belief consistency is a necessary condition for the existence of a multi-level equilibrium with variable structure (**VSM-LE**), it can be concluded that, at **T=1,** the only equilibrium of this type is the egalitarian and efficient one which maximizes the total value [(coop, coop) in $\gamma\,(_w)$ and (COOP, COOP) in $\gamma\,(_b)$] (**PROPOSITION 4).**

To summarize, whilst the notion of multi-level equilibrium with a fixed super-structure (**FSM-LE**) requires that if a deviation is not a best response in a game considered singularly, then the corresponding deviation in the complementary game or stage is not a best response for the decision-makers in both games or stages, the notion of multi-level equilibrium with a variable super-structure (**VSM-LE**) requires that if a deviation that is not a best response in a game considered singularly is, however, the consequence of a super-structural change in the perception of property rights' legitimacy or appropriateness, which is folllwed by a change in the decision-making process in both games, then the corresponding deviation in the complementary game or stage must not be a best response for *both* types of decision-makers in both games, old and new.

Whence derives the characterization of the second type of equilibrium in terms of robustness in relation to the super-structural changes in the shared beliefs system.

In other words, the reason for the possibility of this type of institutional change, which allows the transition from crisis to growth, is the correction of the anomaly highlighted above: that is, the fact that, in the presence of the class divide or wealth effects, not all players are also decision-makers. This correction, represented first by the changes in decision-making processes in the two games or stages, is then completed with the change, at **T=1**, in the effective property rights' distribution and thus with the transformation of the situation in which workers sell to capital owners the use of their labour power to that in which players and decision-makers exchange property rights on the joint product –the case of partnerships discussed in sub-section 3.3 of Part One.

In addition, as already mentioned in the second part of this study, since this analysis of the two games played simultaneously implies that the pay-offs in one game depend not only on the strategies played by the opponents in that game but also on the strategies played in the other, and that for the notion of recursiveness such second type

of dependency passes through the determination of the rules of the game in both games, it is possible to characterize the resulting strategic situation in terms of a notion of 'structural or systemic interdependence'. This notion is therefore a step forward in terms of complexity, in relation to both the situation of strategic independence of the general equilibrium model and the situation of the strategic interdependence of the standard game theory. Indeed, it makes it possible to do without the latter without ending in the situation associated to the former.[12]

Perhaps more importantly, this notion can be used to represent the difference between the choice *among* the alternatives that emerge from a given economic structure and the choice *of* alternatives that arises instead from the possibility of a change in the structure itself. Whence derives a potentially interesting development of the usual distinction between formal freedom and substantive freedom, where the former refers to the absence of physical coercion and the latter to the material conditions that should make it effective.[13]

Finally, as already anticipated in the Introduction, this result confirms that not just the firm and the market but also property rights and the state, or at least economic policy, can be understood as economic institutions of capitalism in the sense proposed in this study, i.e. as mechanisms with which to appropriate or share the benefits of cooperation. Such institutions, their obvious but critical differences notwithstanding, prove to be usefully understood as endogenous to the capital accumulation process and therefore to the principle of the maximization of the Marxian or industrial profit. The latter, indeed, may or may not coincide with total value maximization depending on how is treated and perceived the 'fundamental contradiction of capitalism from the

[12] Since the doubts about the Harsanyi Doctrine are especially relevant when there are multiple equilibria, it must be noted that even the notion of strategic interdependence itself turns out to be correspondingly weakened. In other words, the not-so-easy-to solve problem lies in identifying the mechanisms that might explain how players come to share the way in which the game will be played. Whence derives the role of social norms in the case of evolutionary analyses and the introduction of the notion of correlated equilibrium in the case of Aumann (1987), whose repeatedly quoted article (Aumann, 1976, p. 1238) in fact: "might be considered evidence against this view [the common priors assumption], as there are in fact people who respect each other's opinions and nevertheless disagree heartily about subjective probabilities.".

[13] From this point of view, the contradiction between the subjectivist tradition of standard economic theory and the objectivity of probability assessments assumed by classic game theory is only apparent. In fact, every individual is free to choose, but among the alternatives provided by the 'Management'. The latter, therefore, represent reality as it 'objectively' is. Whence derives, the relatively poor success of the notion of correlated equilibrium just referred to in the previous footnote, at least compared to the prominence of its proponent: according to its critics, it restricts players' freedom to choose.

point of view of production', which in its turn depends on how the process whereby the role of 'wealth creators' is attributed is treated and perceived.

Indeed, the point is that, since the use-value of a given resource represents its benefits to its owner or its user, the former depends on the property rights' distribution. In the case of labour power, in particular, such use.value may coincide with the whole surplus-value or with a share of profits paying for labour dependeind on the presence or the absence of wealth effects. Consequently, it is precisely to approach the correspondence between indidivual contributions and individual rewards, perturbed by the separation between ownership and control of labour power, that sharing, under certain circumstances, can emerge as an efficient way to distribute the fruits of cooperation.

Assuming that the afore-mentioned correspondence is a gift of nature, as in standard economic theory, corresponds to what Marx meant with the sentence about the "Eden of the Innate Rights of Man", cited in Section 2 of Part One, and at the very least does not represents the reality of multi-national firms employing millions of people around the world, for example. Accordingly, the approach proposed in this study can be characterized as being ontologically and, if necessary, normatively individualistic –but not methodologically.

3.1. Discussion.

Three main considerations to be made about this last proposition.

The first is that, more than a result of existence, it should be interpreted as a result of non-existence. Indeed, given that the situation in which the class distinction is not present from the outset has never been observed in practice - at least since the already-mentioned transition from hunting and gathering economies to agriculture and sedentarism occurred about 10,000 years ago, which in turn established the hierarchical structure of society together with the advent of the state- at T=1 no multi-level equilibrium with a variable super-structure can exist.

Accordingly, in this study the Smithian case extended to take account of both the collective nature of production and the material living conditions, to which the afore-mentioned equilibrium relates, has always been defined as the 'ideal case'. The fact that partnerships and professional labour markets can be interpreted as real examples of this case is important because it illustrates its actual existence. Nevertheless, there

are reasons, already discussed in Part Two, to doubt that it can be extended to the whole of the economy.

However, what, albeit infrequently and temporarily, has been observed is the process of institutional or structural change described by the analysis of the previous section. For example, as already pointed out in the second section of Part Two, Perez (2001) identifies a regular emergence of a period of conflict over the distribution of the benefits of the various techno-economic paradigms since the First Industrial Revolution, which usually occurs between the stages of introduction and development or exhaustion (in 1848, in 1970 and - as expected but did not occur at least on a large scale- at the beginning of the 2000s).

But, since the substitution of the typically Marxian unilinear view of history with the cyclical and evolutionary perspective discussed in the above-mentioned section is intended to eliminate any form of mechanicism or necessity of specific trajectories in development mechanisms, probably the most appropriate example of the type of institutional change discussed in the previous section is the one, unique of its kind, represented by the so-called 'Golden Age' of capitalism in Western countries in the period from approximately after World War II to the late 1980s.

As already mentioned in the third section of Part Two, as well as in Battistini (2019b), this period of structural changes can be considered as involving the most successful institutional changes of the Marxian type, at least from the perspective of this study which, as repeatedly pointed out, is based on the recovery of the figure of Marx as a critical economist and on the related setting aside of his figure as a politician-ideologue.

First, the entire set of policies adopted in that period actually reduced the role of the class divide to a substantial extent, making the adherence of the resulting economic system to Marx's strict definition of capitalism only nominal. That strict definition is, in fact, the one in terms of wage-labour, which as repeatedly noted requires the upstream presence of the class divide between those who do not own the means for independent participation in the production process and those who, even though they own those means, nevertheless prefer to buy on the market the labour power of the former to subsequently sell the joint product. It consequently identifies capitalism with the combined operation of its two most important institutional innovations, the classical firm *and* the subordinate labour market.

Indeed, the welfare policies of those years - the public provision, direct or indirect, of private goods such as healthcare and education, the substantial guarantee, again public and direct or indirect, of employment and welfare, and even decisive support with regard to housing together with substantial steps forward as regards democracy in the workplace –e.g. the forms of workers' participation to the decision-making process discussed in the previous section- can be interpreted as a sort of compromise between those that, again in section 3 of Part Two as well as in Battistini (20119b), have been called the 'decentralized' and the 'centralized' solutions to the 'fundamental contradiction of capitalism in the sphere of production' and to the two derivative contradictions from the point of view of both supply and demand.

In other words, such policies have been far more radical and systemic than might be justified in terms of the so-called 'Keynesian Revolution', which is usually interpreted as a moderate liberal position that provides for the possibility of state intervention in the event of an exogenous and short-term crisis of the market system. It is no coincidence, moreover, that their suggested and largely obtained removal by international economic institutions, at least until recently, was also denoted with the expression 'structural reforms'.

Secondly and relatedly, this interpretation of the Golden Age of capitalism as a form of institutional change of a Marxian type is confirmed by the fact that it is a particular instance of the principle of unintended consequences if the policies to which reference has just been made did actually work despite being at most approximatively justified. Indeed, such policies did not work because they were demand policies -which is like claiming that wages and profits *determine* income, or that the same role was played by the demand for pencils and syringes.

As also already discussed in more detail in Part Two as well as in (Battistini 2019b), to the extent that as a consequence of the role of forward expectations, also the Keynesian approach can be understood in terms of the inversion of the causality direction between contributions an rewards, the principle of effective demand, too, may be seen suffering from the same type of logical flaw already identified in the Alchian and Demsetz' approach: if it is not the contributions that determine the rewards but the other way around, then the latter cannot be determined as a sum of the former – which in this case, to add to the confusion, do not refer to individuals but to social classes (see footnotes 3 and 21, Part One).

In other words, the above principle can be understood as a misunderstanding due to mixing the correct observation that value does not arise from aggregate supply with the questionable attribution of this role to aggregate demand. The latter, as already emphasized by Smith in the terms of the relation between the division of labour and the size of the market, or '*effectual demand'*, remains a consequence of the process of value creation taking place within the production process, which therefore micro-founds aggregate supply as well as aggregate demand, which in their turn macro-found the individual ones because of the interdependence between the phase of production and the phase of realisation (see Section Three, Part Two, for the debatable status of aggregate variables in macroeconomic theory, which will not repeated here).

To give another example of the somewhat 'unconscious' nature of such policies, the food or energy subsidies typically distributed in developing countries, which today the same international institutions are desperately trying to turn into spending on health and education, are in every way much more 'Keynesian' than the policies to which reference has just been made. The latter, if anything, particularly in the case of education, are also attributable to Smith, since it is in his theoretical framework, rather than in the Keynesian one, that the source of value arises from the deepening of the division of labour and therefore the workers' skills play a decisive role, even if it is normally annulled by the needs of capital accumulation, a feature which leaves room for state intervention (see also footnote 8, Part Two).[14]

Third and perhaps most importantly, however, the real merit to be attributed to Keynes, which may go as far as to make the expression 'Keynesian Revolution' acceptable, is that he has contributed decisively to the super-structural change in the legitimacy and effectiveness of the existing property rights' distribution, which has been the decisive factor in the effective implementation of these policies. Indeed, it is from this kind of change that ensues the notion of efficient distribution, which is certainly more appealing than the notion of charitable redistribution prevalent at Keynes' times.

[14] "The man whose life is spent in performing very simple operations, of which the effects are perhaps always the same, or very nearly the same, has no occasion of exerting his understanding or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally become as stupid and ignorant as a human creature can become. But in every improved and civilized society this is the state in which the laboring poor, that is, the great body of the people must necessarily fail, unless governments take some pains to prevent it" (Smith, 1776, p. 616-617).

This element of Keynes' contribution is especially present in the last chapter of General Theory, an appendix entitled "Notes on the Social Philosophy towards which the General Theory might lead". In this appendix Keynes rather unequivocally contests those which can be understood as the pre-theoretical elements of standard economic theory: that is, the fundamental questions concerning who is responsible for value creation, and therefore should keep it in order to re-create it, and those who are responsible for the crisis and therefore should accept the consequent reduction in compensation.

As regards individualism, as also follows from Keynes' methodology in terms of aggregate variables endowed with a logic distinct from that of individual ones, as well as regards capital and savings, which are even characterized as a burden rather than a contribution, the role of 'wealth creators' is overturned into that of 'guilt' or at least responsibility, in a process that the previous section has just been tried to formalize, even if summarily.[15]

Again the reasoning is if you will debatable in the sense that also in this case the correct observation about the fact that abstinence has never created value does not imply this role is played by its opposite, that is impatience, particularly if this means spending money of unknown origin, the point being always the absence of what Schumpeter would call the 'fundamental element', namely the creation of surplus-value.

However, notwithstanding the conceptual doubts that may arise, the attribution to consumption of the role of engine of growth has actually favoured a considerable redistribution of income which, in combination with concrete occurrences such as the great crisis of 1929 and the deterrent effect exerted by the communist regimes that prevailed in the Eastern hemisphere, as well as in combination with theoretical factors such as the existence of critical perspectives, equally questionable and 'unconscious' but surviving thanks to these same practical elements, has then determined the rest of the policies just mentioned.

[15] In this Appendix, Keynes even argued for the 'euthanasia' of the rentier, in its turn achievable with a rate of interest so low as to pay for risk and obsolescence but not for the 'scarcity-value' of capital, a remarkable difference compared to what would become standard economic policy. As already noted in Part Two, this view – that capital does not create value and that the rate of interest is not determined by demand and supply of capital- was also basically shared by Smith and Schumpete, albeit for different and perhaps more convniring reasons,; nor it is much different from the notions of exchange-value and use-value of capital emerging from the framework presented in this study, where the point essentially is that capital, rather than labour, should be treated as raw material since it is the latter, rather than the former, that creates value. See also Battistini (2019b, section 4).

From this point of view, indeed, a more subtle interpretation of the success of Keynesianism could refer to a kind of change of alliances, with workers and borrower capitalists united against lending capitalists or rentiers. And, to confirm that the class relationship is a strictly two-way relationship, once the material conditions that justified this new alliance disappeared, there occurred a recomposition of the old one which, thanks to the resulting return to an economic policy driven by the principle of profit maximisation rather than total value maximisation - as also summed up by Stiglitz's well-chosen statement about 'the privatisation of profits and the socialization of losses'- in fact largely eliminated the distinction between borrowers and lenders and brought together all holders of capital - investors- in the category of rentiers. Besides, to be noted is that, quite disingenuously, Keynes was keen to consider latter as 'speculators as well as being 'ignorant'.

This last consideration, therefore, confirms that the change in beliefs following the updating process is anything but a necessity. In the financial crisis of 2008, for example, this change did not occur; indeed, workers were made to 'pay' for the crisis in the form of an increase in unemployment and a further decrease in wages and social spending. In this regard, it is perhaps worth recalling the analysis conducted in section 3.1. of Part Two, where it was shown that the expulsion of workers as well as that of firms from the capitalist circuit to the non-capitalist one is a kind of 'automatic stabiliser' which, by reducing the market- or short-term price of both labour power and intermediate goods (which may be understood as a form of capital), also makes it possible to reduce the wages of those who remain employed in the capitalist sector in the strict sense. Combined with the further reduction in the cost of production factors provided by standard, anti-cyclical economic policy in situations like these, as well as with the increase in the price of the end product because of increased concentration, these variations are able to conceal the tendency to structural crisis and the associated tendency to a decrease of profits, which depend on the progressive reduction of the opportunities for capital accumulation as its concentration increases, instead giving rise to artificial mini-phases of booms and busts which in their turn make it difficult to distinguish between business cycle and long-term structural trends – in this case 'secular stagnation', as it is sometimes called today.

Precisely this crisis, however, shows that the failure to resolve its ultimate cause, because of the just-discussed tendency of standard economic policy to focus on symptoms rather than on the illness, does not eliminate the problem and directs

attention, as in the Keynesian case just discussed, towards other types of conflict, arising from the fundamental one between capital and labour but, precisely for this reason, essentially misleading and mystifying. A first example is the conflict between nations, were foreigners are blamed for the crisis[16]. A second example is the generational one, which in turn shows how, if it is not resolved, the basic conflict can in fact be 'moved' not only to the outside but also – conveniently, if unfairly- forward. A final example, in some respects the most ironic one, is the conflict between 'insiders' and 'outsiders', in which the tactics of 'divide and rule' and the race to the bottom could not be clearer.

As just pointed out, however, given that this problem is not solved even in this way, it is likely to recur in the form of a new disequilibrium. From this point of view, it is worth emphasizing in this case as well the irony that consists in justifying the different and more 'generous' approach adopted in the current Covid-19 pandemic with the argument that, in this case, it is 'no one's fault'-as if, in general, the crises of human history have been 'paid' by those who caused them.

It is also important to note that, while it is reasonable to assume that workers, by critically updating their beliefs change them in the way described above, it is not necessary for all capitalists to behave in the same way. As already noted, if the capital owners, while critically updating their beliefs, do not change them, there arises a position of disequilibrium more radical than the temporary disequilibrium in $\gamma\ (_w)$ discussed in the previous section. Indeed, if a belief system is not shared, the games cannot even be played, so that the both the theoretical analysis and the practical orderly development of events come to a halt. For this reason, however, also in this case the problem can only recur.

It is therefore more likely that at least some capital owners, those altruists whose theoretical irrelevance in the fixed super-structure model does not call their existence into question and therefore does not extend to the variable super-structure

[16] Most notably, the nationalist rhetoric of individual self-sacrifice in the name of the common good is a mystification completely analogous to the liberal rhetoric of the exchange between free and equal individuals. In both cases, rather than being resolved, conflict is hidden behind a 'wallpaper' of harmony and identity of interests which may be understood as some sort of 'evolutionary universal' in the Parsonian sense of the expression, especially as regards the approaches identifying culture as the determinant of reality and therefore also of the wealth of nations. Cultures may very well differ; but all of them seek to achieve the goal of instilling what Simon (1983, p.140), albeit from a different point of view, called 'docility': that is, the tendency "to learn and believe what we perceive the others want us to learn and believe" or, in other words, "(…) the propensity to behave in socially approved ways and to refrain from behaving in ways that are disapproved" (Simon, 1990, p. 1667). See footnotes 19 and 20, and footnotes 5, Part One, and 9, Part Two,

model; or, more trivially but also more in line with the approach of this study, those who are the losers in the zero-sum competition represented by the (COMP, COMP) strategy profile in $\gamma\ (_b)$, change their beliefs in the way described above, consequently favouring, or at least accepting, the structural change in the decision-making process which is in turn the key to changing the strategy profile from (COMP, COMP) to (COOP, COOP) in $\gamma\ (_b)$ and the complementary one from (comp, comp) to (coop, coop) in $\gamma\ (_w)$.[17]

To be precise, in the simplified context of four players, it is sufficient that a capital owner acts in this manner while in the interpretation with *n* players the minimum number is represented by the threshold values determining the attractiveness of one or the other strategy in $\gamma\ (_w)$ (see Figure 5).

The second consideration, however, is that even if this were to happen, the just-discussed institutional change of structural or systemic nature would not endure.

The first reason, of course, is that even if a techno-economic paradigm is developed rather than prematurely exhausted, it still has a finite life, followed by the disruption typical of the phases of introduction of the next paradigms. And since reality changes, it is reasonable to assume that this too is reflected in the theory.

The second and related reason is what could be called a tendency of economic agents to reason by analogy, extending this new form of 'social consciousness' to areas for which it is not suitable. For example, if egalitarian beliefs are extended to problems of an individualistic character such as dividing the heating costs of an apartment building, which is a typical Prisoner's Dilemma, the result can only be less than efficient, and thus contributing to bring the afore-mentioned phase of exhaustion closer. This, of course, is the most serious risk of ideological thinking, which, as shown in this study, has induced standard economic theory to define team production in terms of not-additively separable production functions, but then to treat them as 'tragedies of common goods', that is, as additively separable functions -without the slightest doubt ever being expressed by the large group of scholars who have dealt with the matter.[18]

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[17] Indeed, the pay-offs $(\bar{V}, \bar{V})$, corresponding to the (COMP,COMP) strategy profile in $\gamma\ (_b)$, are to be interpreted in probabilistic terms in the sense that every firm obtains (2 $\bar{V}$) with probability ½. Accordingly, 'losers' updating' is individually rational because the resulting situation is still better than independent production because of the fundamental condition stated in expression (1).

[18] For instance, in the same article cited in Part Two, Buchanan and Yoon (2010, p. 44) state that: "The advantages of specialization at the within-firm level of team production are, of course, universally acknowledged. Issues arise only beyond these familiar limits. And it is the possible presence of

Finally, the third and related reason is the one already mentioned about the decline of Keynesianism, namely the fact that those disadvantaged by institutional change will endeavour to accelerate this inevitable change of paradigm and, above all, to be its protagonists in order to re-establish the old ideological super-structure that favoured them.

Put otherwise, the doubts about the logical structure of the Keynesian model were not raised for their own sake: they revealed the sort of over-estimation of the political decision-making process –and perhaps even more of the associated economic advice- as well as the corresponding under-estimation of economic agents' reactions that led to demise of the Keynesian approach, especially as regards its original version.

From this point of view, a formalisation more appropriate than that presented in the previous section could have envisaged a cyclical solution, in the sense of representing the considerations just made with a corresponding change in pay-offs, which could then 'pierce' the condition of robustness attributed to the cooperative strategy, and as a consequence provide for an explicit alternation of dominant strategies.

However, since: (i) this would have considerably complicated the analysis, thus blurring the central point of interest; (ii) if pay-offs change, so too do the equilibria; and (iii) in any case, mathematics is not used here to earn a license of truth but only as an -important- aid to rigorous thinking, such more articulated formalization is left as a possible future direction of research.

Finally, as regards the significance of the result -that is, the notion of inter-subjectivity as an intersection of different points of view and the process of social knowledge construction from which it derives- the third consideration is that it does not depend on n, i.e. on the number of players –apart from what follows from the above-mentioned analogy with the notion of punctuated equilibrium.

This is true in both the sense -favourable to that type of change- that the economically disadvantaged are usually the majority, and in the sense -unfavourable to that type of change- that as the number of people involved increases, so too do the problems of collective action.

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increasing returns to the scale of operations for a firm that has generated issues of analytical interest and import.".

Of course, this does not mean that these aspects are not important in the phase of practical implementation of change. However, as in the case of team production the problem of free-riding may arise as a result of the solution of the fundamental problem represented by the coordination of the division of labour within the firm, in this case too, it is important to stress the fundamental element in order to avoid mistaking the solution for the problem as in the case just referred to.

In the case of the positive aspect, the point is that this shift from a Pareto-efficient situation that does not maximize the total value to a situation, also Pareto-efficient, that instead maximizes it does not require political intervention, and therefore in the end a form of physical coercion, as in the analogous case of monopolistic power already discussed in Part One. The acceptance of a 'Paretian worsening' is indeed the cognitive counterpart of the kind of systemic coercion that brings about the acceptance of exploitation by workers discussed in sub-section 2.1., which in effect results in an improvement with respect to independent production due to the fundamental condition that ensures that group production is always preferable to it (see the next footnote).

That the expression 'Paretian worsening' itself does not belong to the lexicon of standard economic theory is then a consequence of the fact that, by definition, only common interest situations are part of its subject matter. But, as the following quotation from Mokyr (2002, p. 128) makes clear, the reason for this limitation is certainly not realism, which in turn makes it appropriate relativize the Pareto principle as this study tries to do: "For the economist, it is a logical puzzle why, in the absence of *coercion*, workers would voluntarily agree to work in factories if doing so reduced their utility. Many workers were paid a factory or a coal-mine premium as a compensating differential, and workers were provided with benefits such as housing, schooling for their children, and even milch cows (…). Insofar as this was inadequate, however, factory owners, especially in the countryside, relied on pauper children and orphans 'borrowed' from workhouses. Beyond that, however, the *economic logic* of the Industrial Revolution implied that workers might end up working in factories even if it made them worse off than they were before (*though not worse off than if they stayed at home*). The reason is that the *opportunity cost* of many of these potential factory employees was set by what they could earn in the cottage industry. This alternative declined rapidly because of factory competition and by 1850 was, in most cases, no longer available. The factories, by relentlessly driving down the price of manufactured goods, reduced the earnings of those working at home and thus *forced*

them (or their offspring) to abandon their cottages and seek work in the mills or to emigrate".[19]

Alas, it was precisely the fear of the majority rule that led first to the introduction and then to the success of the Pareto principle, a fear that in the current political environment seems anything but justified.

Also in the case of the negative aspect, on the other hand, the basic point concerns the re-dis-covery of the original meaning of another fundamental Marxian concept, namely class conflict. As already discussed in detail in Part One, indeed, within the theory of surplus-value, acknowledgement of the class conflict and the consequent behaviour are in the interest of each and every one, so that no form of collusion or collective action is required from workers.

In other words, the transition from crisis and exploitation to growth and sharing does not require any form of altruism but, on the contrary, its elimination. Indeed, being exploited means bearing costs for the benefit of others, which in turn coincides with the definition of altruism. Analogously, being the exploiter means obtaining benefits without bearing the associated costs, which in turn coincides with the definition of selfishness –though, in both cases, they are not necessarily voluntary or conscious kinds of behaviours.

As already mentioned in Part One, in this case too, the basic point concerns the transition from an additive framework, where only the canonical condition of individual optimization applies, to a non-additive one where this 'first best' solution is discarded on passing to capitalist production. In this latter type of framework, other specifications like those just mentioned, as well as a form of reciprocal self-interest which implies bearing costs without obtaining all the associated benefits, but also obtaining benefits without bearing all the associated costs as in the (COOP, COOP) equilibrium in the game between firms, prove to be forms of rationality compatible not only with individual rationality but also with self-interest maximization, which diverge

[19] In this regard, a point which may generate confusion is that such improvement with respect to independent production could also be interpreted in Paretian terms. The misunderstanding in this case depends on the fact that in the axiomatic approaches the set of alternatives is already present in its entirety at time t=0 in the 'state of nature', so that this choice among alternatives does not depend on the time sequence in which they present themselves. This too is a perspective which may be appropriate in some cases; but in others, such as the one analysed here, it seems totally unrealistic and misleading.

from the canonical condition because of the differences of the context to which they apply (see footnote 4).[20]

From the point of view of this study, the issue is important because, in terms of the behavioural assumptions, the approach proposed is more in line with the Smithian perspective than the Marxian one, which makes reference to the rhetoric of the 'new man' or to the quite demanding altruistic principle of communism: that is, contributing according to one's capacities and receiving according to one's needs (see footnote 5, Part One).

More technically, the issue relates to the difference between the endogeneity of beliefs rather than of preferences (see Bowles, 1998).

Finally, as confirmation of the overall coherence of the proposed approach, it is important to highlight that this process of 'social consciousness' formation and the associated notion of inter-subjectivity are not the result of a uniform point of view among the economic agents involved; nor, even worse, are they the result of the intellectual production of particularly charismatic individuals. Rather, they derive from a collective process of social knowledge construction, as anticipated by the area 'to the left' of Marx already mentioned in Part One. The already quoted Hodgskin (1825, p. 83, emphasis added), who was perhaps less pragmatic and self-confident than Marx, at this point almost two centuries ago pointed out that: 'There is no principle or rule, as far as I know, for dividing the produce of joint labour among the different individuals who concur in production, but the judgment of the individuals themselves; *that judgment depending on the value men may set on different species of labour can never be known, nor can any rule be given for its application by any single person*.'.

[20]The notion of reciprocal self-interest referred to in the text is very close to the one of reciprocal altruism introduced by Trivers (1971) and developed by Alexander (1987). According to this notion, bearing costs for the benefit of others in the expectation of being reciprocated, i.e., obtaining benefits without bearing all the associated costs, can be considered evolutionarily viable but, as Bowles (2001, p. 111) correctly points out: it is "not altruistic at all". In this regard, without addressing the difficult issue of the existence of voluntary altruism, to be noted is that the endless debate about altruism and selfishness in additively separable contexts, typical of both biology and economics and involving no less than the discovery of 'human nature', could be fruitfully expanded in light of the present framework. If the context is additively separable, in fact, every apparently altruistic behaviour can always be rationalized as a form of appropriately defined self-interest – as in the case of the kin selection theory in biology (Hamilton, 1963) or in the case of the 'selfish groups and altruistic individuals' of the group selection models. As for beliefs and expectations, in other words, the analysis of non-additively separable contexts may help introduce a conceptual difference in the meaning of the terms 'selfish' and 'self-interested'.

4. Conclusions.

Decades of globalization and neo-liberal restoration, both based on the idea that the value of economic relations is invariably determined by the sum of independent and separate individual contributions and the consequent idea of the economy as 'the province of will' isolated from the rest of society, make clear that Marx's contribution as a critical-economist is both relevant and timely.

From the point of view of praxis, there is little need to go deeply into detail. For example, the growing increase of military spending and the consequent increase in hostility in international relations speak for themselves, and decisively so. Tellingly, the models of authoritarian capitalism do not seem necessarily less productive than the more traditional models of liberal capitalism, unlike what happened for example in Latin America in the 1970s and 1980s, albeit in a much smaller scale and incomparable situations (see footnote 16).

From the theoretical point of view, however, the problem is that the figure of Marx as a critical-economist was completely lost because of the demise of the labour theory of value by Marxist economic theory, which for the most part preferred to sacrifice this figure to the more concrete and (perhaps) materially rewarding one of political-ideologue.

However, the main theoretical problem that led to this demise - the problem of the transformation of values into prices- only made sense in the perspective of the so-called 'first phase' of single-firm socialism, or in other words in the perspective of moving beyond capitalism understood in the general sense of the combination of markets, firms and private property of the means of production.

Since the failure of this perspective appears irreversible, not least because it has already mutated in the ways mentioned above, as argued by the area 'the left of Marx' even before it was implemented, in this study the problem of the transformation of values into prices has been solved by elimination (see Section 2, Part One, and footnote 9, Part Two).

Consequently, an evolutionary and institutional, or qualitative and inter-subjective, re-interpretation of Marx's version of labour theory of value has been proposed. In contrast to the strategy adopted by orthodox Marxism, in other words, the figure of Marx as a political-ideologue has been sacrificed in order to re-dis-cover and re-interpret that of Marx as a critical-economist.

Naturally, since it is a re-interpretation, it has been possible to avoid those elements of Marx's thought that the course of events has confirmed to be erroneous or now irrelevant: (i) the (positivist) philosophy of science on which it was based and the related notion of 'scientific socialism'; (ii) the predictions about workers' progressive impoverishment and the inevitable failure of capitalism, at least in the general sense just referred to; (iii) the consequent economic policy prescriptions relating to the abolition of markets and private property as the first necessary step in implementation of the first phase of single-firm socialism, this too just-mentioned in order to avoid as much misunderstanding as possible.

For the same reason, on the other hand, it has been possible to retrieve and re-interpret some original Marxian notions that had been lost as a result of the demise of the labour theory of value: (i) the notion of Marxian or industrial profit as deriving from the difference between the use-value and the exchange-value of labour-power, both re-interpreted in terms of the institutional opportunity cost represented by the non-capitalist sector of independent or small- and medium-sized firms and consequently measured in terms of transaction costs; since this kind of profit does not depend on price-making like monopoly profit, the fact that it is not eliminated by competition follows; consequently, the significance of the result is directly linked, at least in part, to the somewhat puzzling status of profit in the economic domain: theoretically, it is just an imperfection automatically eliminated by the normal working of the system (see footnote 26, Part One); from the point of view of business practice, instead, it is even what determines the valuation of industrial firms in stock markets, i.e., the value of capital (see footnote 4, Part Two); therefore it is at least one of the main drivers of the system itself; (ii) the principle of capital accumulation and therefore that of the maximization of this kind of profit as a general positive principle for the economic domain, of which Pareto-efficiency and conflict are special cases, re-interpreted in terms of an analogy with the principle of differential replication in the biological domain; thanks to this re-dis-covery, not only markets and firms but also property rights and the state or at least economic policy, i.e. the economic institutions of capitalism in the sense specified in the Introduction to Part One, can be usefully understood as endogenous to the operation of this principle; most notably, these institutions prove to be better understood as mechanisms with which to appropriate or share the benefits of cooperation rather than as mechanisms with which to align individual costs and benefits as in the methodologically individualistic approach of

standard economic theory; (iii) the original Marxian notions of power, conflict and exploitation, which are due neither to market imperfections as in standard economic theory, nor to political power relationships as in the above-mentioned Ricardian-Marxism; quite differently, they prove to be structural or systemic features of the normal operation of the capitalist system in the strict sense, to the point of not even requiring full awareness of it; in this case the point may be considered significant because being independent from politics does not necessarily implies being independent from everything else, and especially from other power structures; (iv) a more realistic and complex view of the economic system, based on a solid network of interdependencies, ranging from that between the capitalist and the non-capitalist sectors to that between the "phase of production" and the "phase of circulation"; from the latter type of interdependence, resulting in its turn from the recovery of the firm's *raison d'être* in the production of a joint product that cannot be sold separately by the participants to the production process, there follows the interdependence between the Marxian theory of value and distribution; from this interdependence, in turn, there ensue the inseparability of distributional issues from efficiency ones, the importance of property rights as a rule rather than as an exception and, indeed, the role of conflict as a positive principle; in this regard, this recovery of the classical political economy perspective is all the more urgent, the more the problems of the neo-classical theory of value and distribution are acknowledged: indeed, in the traditional general equilibrium model, where it is the contribution that determines the reward, the problem is how this contribution is determined: production factors' marginal productivities are in fact quite difficult to find in reality, so that they are sometimes improbably measured by production factors' prices; in any case, in the case of joint production they do not exhaust the product, which in turn may be the reason for the popularity of relatively recent notions such as 'total factor productivity'; in the more modern framework of the general equilibrium plus compatible imperfections, where instead it is the reward that determines the contribution, the problem is how to determine the reward: if it is not the latter that determines the former, that reward cannot be then determined as a sum of individual contributions, separated by an external figure such as the entrepreneur-separator, as in Alchian and Demsetz (1972), or the state-separator, as in Romer (1986); even less, that reward can be determined as a sum of social classes' contributions, as in Keynesian macroeconomics, where the problem also includes the definition and the internal logic of aggregate variables per se, especially in the case of

the critical notion of –forward- expectations; in both cases, the risk is that, once the postulate of methodological individualism has been introjected, the researcher may suffer from a sort of 'optical illusion' whereby the fact the joint or the aggregate product resolves itself in the distributional shares is mistakenly understood as a confirmation of the postulate just referred to: that is, as a confirmation of the idea that the former is determined by the latter, which in turn, again by assumption – price-taking or the absence of wealth effects- coincide with individual contributions; (v) the spirit of the original Marxian theory of institutional change, in the sense of being determined by a super-structural change in the perception of the legitimacy and effectiveness of the existing distribution of property rights, which in turn leads to a structural change that resolves the fundamental contradiction referred to above, restoring the coincidence between economic agents and decision-makers and favouring the solution of the two derived contradictions in terms of aggregate supply and demand; this result is a consequence of the operation of the aforementioned principle of Marxian or industrial profit maximization: indeed, this principle may coincide with the maximization of the capital owners' profit or with total value maximization depending on the property rights distribution, that is, depending on the solution or the lack of it of the problem of separation between ownership and control of labour power; more practically than theoretically, finally, this kind of institutional change also has a distinct Keyensian flavour. More theoretically than practically, instead, it has a distinct Coasean flavour (see footnote 17, Part One).

Moreover, again because it is a re-interpretation, it has also been possible to add some new elements to the original Marxian perspective: (i) the formal addition of a forward-looking component to the backward one typical of the evolutionary analyses, even if this does not mean that the economic agents are attributed with the knowledge of the 'true' model as is instead typical of the axiomatic approaches based on the theory of expected utility and Bayesian rationality; in effect, also in this case there are good reasons to doubt that the 'true' model exists at all; (ii) the formalization of an inter-subjective process of 'social conscience' or 'social knowledge' construction, in the sense that it is not attributable to a particular individual but to the relationship among individuals and in particular to the intersection among different points of view, a feature which also represents an enlargement of perspective with respect to the axiomatic approaches just referred to; (iii) a notion of structural interdependence which, by referring to the choice *of* alternatives rather than the choice between

alternatives, develops the usual distinction between formal freedom and substantive freedom; in addition, such interdependence relationships can consequently be conceptualised even in the presence of a large number of players: that is, without the absence of strategic interdependence leading to the opposite situation of strategic independence, typical of the general equilibrium model (see footnote 12); (iv) a related notion of equilibrium for two games played simultaneously, requiring that equilibrium strategies are not only best responses in the game they are actually used, but also with respect to the strategies that are used in the complementary game; in other words, because of the partial overlapping between players and decision-makers in the two games, the equilibrium condition requires that strategies must be optimal with respect to decision-makers in both gamers when the super-structure is fixed (**FSSMLE**), and to decision-makers in both games, old and new, when the super-structure is variable (**VSSMLE**); accordingly, this notion of equilibrium can be fruitfully related to the game-theoretic literature on institutions and, in particular, to the issue of whether the latter are the equilibria or the rules of the game: in the multi-level equilibrium analysed in this study, the rules of the game are the 'fundamental' institutions, that is, the systemic elements corresponding to the Marxian notions of structure and super-structure (property rights and the size of the market, beliefs and expectations, respectivel); markets, firms and the other economic institutions of capitalism are of a derivative nature and are therefore the equilibria of the games; unsurprisingly, however, even in this case the relationship between these two types of institutions is a relationship of interdependence, more specifically that of previous point whereby, as a consequence of recursiveness, the equilibria of one game determine the rules of the other and viceversa; (v) differently from the original Marxian version, the qualitative interpretation propounded in this study, makes it possible to determine the exchange-value of capital: since the amount that could be earned by independent participation to the production process is zero because the "productive power of capital" is only apparent, a suitable alternative is the amount that would have been the cost of obtaining a given amount of capital in the non-productive sector, which is zero in real terms since it can be both positive or negative; in this regard, however, the problem is again that, since the use-value of a resource represents its utility for its owner, it too depends on the property rights' distribution; indeed, it may coincide with surplus-value or with its exchange value depending on whether it is considered an independent production factor or a raw material; consequently, profit proves to be a tax on labour or its reward,

again depending on the property rights' distribution, i.e. on presence or absence of wealth effects; this point is discussed in more detail in Battistini (2019b, section 4) but it is the twin problem of the separation between ownership and control of labour power analysed in detail in this study; indeed, the general policy implication is that it is precisely to approach the correspondence between individual contriutions and individual rewards that owners and users of a given resource should be the same person: assuming that this correspondence is a gift of nature, as implied by the postulate of methodological individualism, is the sort of mystification whose unmasking was in many ways the main motivation of Marx's theoretical efforts; getting closer to it by sharing the benefits of cooperation is the reason way egalitarian policies, under certain circumstances, can be considered efficiency-enhncing.

Finally, since the first economist to use the labour theory of value and to introduce the notion of natural or long-term price was Smith, the evolutionary and qualitative character of the proposed re-interpretation has made it possible to retrieve also his contribution, understood as the first explanation of the relationship between the value creation process, which depends on the division of labour, and the market mechanisms that can spread it at the level of the economic system creating the bases to trigger the cumulative causation mechanisms at the centre of Smith's explanation of the growth and wealth of nations. From this standpoint, as regards both the behavioural hypotheses and the particular definition of exchange-value in terms of commanded labour, the perspective of this study can be considered more in line with that of Smith than with that of Marx himself (see footnote 14, Part One, and section 3.1., this Part).

Of course, also Smith's contribution has been re-interpreted. In particular, it has been extended to take into account the collective nature of production and the material living conditions. However, thus framed in the perspective of this study and freed from the axioms and therefore the interpretation of the neo-classical approach, this recovery has proved important for three main reasons. The first is that it suggests a decentralized solution to the problem of the separation between ownership and control of the labour force, as opposed to the centralized one that derived from the quantitative version in terms of hours of work. Hence, economic democracy, or democracy in the workplace, can be interpreted as an intermediate step towards a more complete autonomy, since the difference between a decentralised and a centralised solution is that the former resolves rather than eliminates the two derived contradictions in terms of aggregate supply and demand.

The second reason is that this recovery has clarified the role of scarcity as endogenous to the value creation process and thus the relationship between market or short-term prices and natural or long-term prices. More specifically, it follows from this clarification that this role is akin to that of automatic stabilisers that prevent the system from exploding, creating instead phases of mini-booms and mini-busts that give rise to the business cycle and may end up by concealing, or at least making it more difficult to identify, the underlying long-term trends.

The third reason is the possibility to unbind the Smithian theory of growth from the conceptual framework of the general economic equilibrium plus compatible imperfections and interpret it as well, like the Marxian theory of crisis, as a structural feature –albeit essentially ideal or at any rate fragile and transitory- of the normal functioning of the capitalist system.

The basic attempt, to conclude, has been to break the association between Marx and the state. Of course, such association is anything but incomprehensible. However, it does not take account of the thousands of pages comprising the most important writings by Marx himself (see footnote 2, Part One). In these writings, the state rarely appears and, when it does, it is duly understood as a vehicle of profit maximization – for instance, public debt is included among the determinants of primitive accumulation together with enclosures and colonialism and slavery.

Moreover, this association has also served as the basis for the largely misleading antinomy between the state and the market, and therefore for the understanding of the Cold War as a confrontation between free-market societies and centrally planned economies, as well as, within Western societies, for the 'divide' between conservative and progressive economic policies. Consequently, since also those confrontations and debates seemingly belong to the past, it has been considered interesting to explore also the relation of analogy between these basic economic institutions (see footnote 9, Part Two).

Finally, it must be admitted that the formalization presented may be considered insufficient and underdeveloped with respect to the breadth of the issues analysed. However, it is also true that, from the formal point of view, the tentative operation – moving from addition to multiplication- is not necessarily trivial and it is therefore advisable to proceed step by step.

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