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On the antifragility-based economic sustainability – a crucial lesson from Covid-19 pandemic

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Abstract: The COVID-19 pandemic is a non-economic, external, and unpredictable shock which directly affects the real economy, having the potential to degenerate into an economic and financial crisis. The paper aim is to find an institutional and structural way by which the economies could manage such shocks without covering unspecified risks or handling unknown uncertainties. In fact, the paper proposes a sui generis immune system of the economy which consists in endowing that economy with an anti-fragile potential to oppose against perturbations (either external or internal), no matter what kind, or their intensity, and even to gain from those perturbations. The proposal is analogous, from structural and functional point of view, with the biological immune mechanism, but it is designed on institutional bases (both discretionary and automatic). The anti-fragility property is more relevant and productive than other similar properties, such as: robustness, resilience, homeostasis and so on.

Keywords: anti-fragility, sustainability, immunity, perturbation, shock

JEL Classification: H12, H83, K20

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1. INTRODUCTION

The COVID-19 pandemic shock has taught us at least one crucial lesson: the economic system must be ready to face an unpredictable, non-economic, and external shock, wherever it came from. Such facing could have many ways: robustness (Doumpos et all, 2016), homeostasis (Damasio A. and Damasio H., 2016), or resilience (Buheji, 2018). Any of them has specific ends: a) robustness has the property of resisting to the perturbations (generally external), so the system structure (and, consequently, its functionality and behavior) can be preserved; b) homeostasis (Rodolfo, 2000) has the property of „accepting" some changes caused by perturbations, but inside a margin which allows the system to keep its identity (that is, the perturbations' effects do not go beyond certain established thresholds; c) resilience is a property which allows the system to suffer changes which lead the system beyond its limits, aimed at preserving its structural identity - but has the potential to bring the system back into its initial state. It should be observed that all the three properties, (which could characterize, together or not, a given system), do not make else than counter-act, in different ways, the attacks from the perturbations. So, they have neither the potential to predict those perturbations, nor to gain from suffering their impact. Such a passive reaction of the mentioned properties should be questioned from the point of view regarding the best endowment of the economic systems with a property which completes the positioning of these systems. They can be active (or even, as we shall see, pro-active) properties, or reaction functions.

The paper aims to identify such a property or reaction function of the generic economic system, and to provide some methodological and institutional proposals aimed at conferring its effectiveness.

2. ON THE CONCEPT OF ECONOMIC SUSTAINABILITY

2.1. What Is Sustainability?

Sustainability is a concept which already entered the common language and, to some extent, it was even demonetized by use without too much discernment. However, it should be defined rigorously in order to be part of scientific analyses and assessments. In our opinion, the concept of sustainability has the following characteristics:

- it is a property, either of a system or of a process. In conclusion, we cannot speak about sustainability when addressing a phenomenon or an event;
- this property is of structural type, that is, it is deeply implemented in the system identity, so that all the functions exhibited by the system, or by the process assigned to it, are stable, repeatable, and in the most part, predictable;
- from a logical point of view, a system/process is sustainable if its output has the potential to be entirely „captured" and functionally accepted by other system/process. In other words, the property of sustainability relies on the fact that the system/process concerned has the potential to replicate itself indefinitely, based on the fact that all inputs consumed are recovered through the corresponding outputs (either directly, or by a longer chain of successive or cascaded outputs – inputs concatenations in space and time).

There is a definition of the sustainability, especially applied to the economic sustainability, assigned to the development process, which is provided by Brundtland Commission, namely *development that meets the needs of the present without compromising the ability of future generations to meet their own needs* (Brundtland Report, 2013). But it is easy to observe that the definition addresses the inter-generational morality addressing the economic (and natural) resources which enter the economic process, and says nothing, in fact, about the content (if possible, from a scientific point of view) of the concept of sustainability. For example, if the economic resources consumed in the process are recovered (quantitatively, qualitatively, and structurally) by their own outputs, why should the question of sharing those resources inter-generationally (the criterion about inter-generationally shared consumption of economic and environmental resources belongs to the authors of the paper and is completely new in the literature in this field), in an equitable way, still remain on the table?

For the needs of the given paper, we shall propose a definition of the concept of sustainability, in the framework of the above identified characteristics and based on three sufficiency predicates (the definition will be elaborated for the case of a system):

- (SPS_1): all the components of the system are related in an *internal network*. This means that, inside the system, any output of a sub-system becomes certainly an input into another sub-system. The result is a dynamic self-covering of inputs for all sub-systems, so the system as a whole is replicable, in every cycle, at least at the previous level. In other words, this sufficiency predicate requires that in the system concerned, there are only closed internal functional chains;

- (SPS_2): *dominance of negative feed-backward*. This means that any tendency for climbing the system functioning will be discouraged and the system will be re-stabilized;

- (SPS_3): *integrating the feed-forward into the feed-backward*. The anticipations as well as the expectations (anticipations are logically (i.e. validly) inferred from models of rationality - that is, they are necessary, while the expectations are simply subjective desirabilities - for example, by Bayes' assigning, probabilities to future events, (let us say based on the principle of insufficient reason) must be taken over into the feed-backward adjustment. So, not only the risks of perturbations are taken into account, but also the needs of the future society (generation) are integrated into the current decision. Just now, the unique requirement of the Brundtland definition of sustainability occurs (as a sufficiency predicate). This issue is remarkably interesting because it requires having, at the moment of adjusting the next input, based on the current output, a *feed-backforward*. So, for example, algebraically, the adjusting operator becomes more complicated.

2.2. What About the Economic Systems Sustainability?

It is useful to particularize the sufficiency predicates established above for the case of an economic system/process. We shall do this for the case of national economic system, thus, defining the concept of national economy sustainability (Balisacan and all, 2014). Such an application of the general concept of sustainability is required precisely by current COVID-19 pandemic, which has tested the capacity or potential of the national economy to function almost autonomously in the context in which the international economic transactions have diminished or were even stopped.

(a) regarding SPS_1: there are four economic chains which that must be closed for configuring of the internal network:

- *sectorally* closed chain: primary – secondary – tertiary – quaternary – quinary chain;

- *technologically* closed chain: research – designing – prototyping – production – an implementation chain;

- *commercially* closed chain: mining/cultivating – storing/conservation – industrialization – transportation/distribution – selling/consumption chain;

- *financially* closed chain: banking system – capital market – bonds market – inter-banking market – financing of last resort chain;

(b) regarding SPS_2: in economic free and decentralised systems there are inherent negative feed-backwards which are based on the principle of the „invisible hand". In other words, the economic systems, including the national systems, are, generally, self-testable regarding the most part of the economic variables;

(c) regarding SPS_3: the economic behaviour is governed by two causal (and/or conditional) factors: 1) anticipations (or expectations, after the case); b) perceptions (that is, the idiosyncratic assessments of the economic variable dynamics and levels. Based on the two factors, into the behavioural decision procedures, they are, generally, included the „visions" on the future.

Such concrete hypostases of the three sufficiency predicates in the case of the economic systems give them the potential to evolve in a sustainable way. *Figure* 1 illustrates such a conclusion.

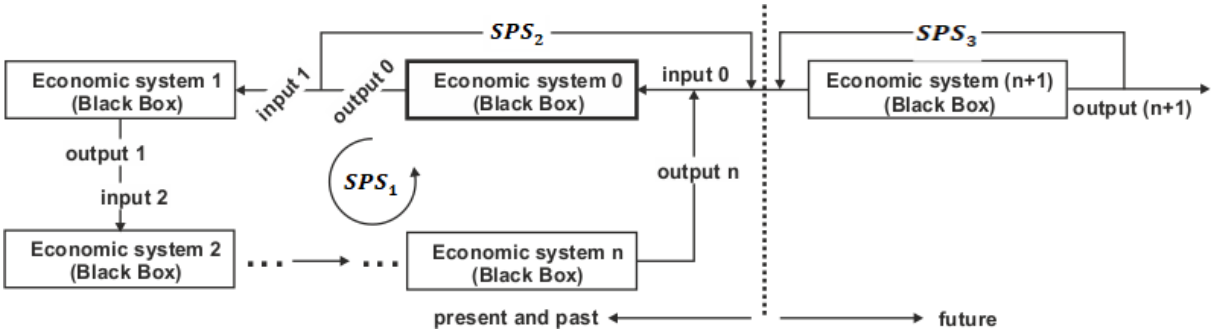

Figure 1: The three sufficiency predicates working to confer economic sustainability.
Source: the authors.

2.3. Could the Economic Sustainability Work Alone?

The majority of analysts (and even of political decision-makers) regard sustainability exclusively from the economic perspective. In fact, the economic system is only one of the social systems (Arrow, 1970) which interact. Moreover, the economic processes or events can only happen through the individuals' actions aimed at obtaining goods and services which satisfy their biological (and social) needs. In fact, the satisfaction of economic needs constitutes the only engine of any economic process. It results in an option that the economic system is the only means, the most efficient, however, to achieve purposes beyond the economic perspective, that is, social purposes. The conclusion comes without any doubt: the economic sustainability is neither possible, nor significant outside the social framework and of social validation (Harsanyi, 1980). We should thus be speaking about economic-social sustainability, not just about economic sustainability. In the next paragraphs, such necessary extension of the meaning of the concept of sustainability will be analytically developed.

3. ON THE ANTI-FRAGILITY PROPERTY OF THE ECONOMIC SYSTEM

3.1. The Concept of Anti-fragility

The concept of anti-fragility was very recently introduced in a quite systematic way. Its meaning addresses, roughly speaking, the property of a system to gain advantages from the perturbations exerted on it, either from inside or from outside (the environment). Consequently, that system (Luhmann, 2012) must have such a structure (that is, such functions) which not only deal with the perturbations but, moreover, obtain advantages of different sorts. Starting from such a general disposition, let us find out the sufficiency predicates which could build the state of anti-fragility in some system (not necessarily of economic type). We believe there are four defining predicates:

- ($SFAF_1$) *list of orthodox impulses*: the system in question must keep its activity regarding the exhaustive list of predictable impulses generated by its own functioning and behaviour (both based on the system general structure). The predictable impulses address both the internal impulses (caused by their functionality) and the external ones (caused by their behaviour) - as it is well-known from the general theory of systems (Bertalanffy, 1969). The functionality is assigned to the relationships among the components/elements of system, while the behaviour is assigned to the relationships between the components of the system, on the one

- part, and its environment (either as outputs or as inputs), on the other part. Since both the functionality and behaviou depend on the system structure, the impulses generated by the functionality and by the principled behaviour are predictable (of course, it is presumed the structure of the environment is also known, so the mutual norms of reaction between the system and its environment are known as well);

- ($SFAF_2$) *discrimination procedure*: the system must have some kind of procedure to discriminate between orthodox and heterodox impulses occurring inside of the system or by crossing the system membrane. The system membrane separates between the system and its environment and can be of three types: a) physical; b) institutional; c) cognitive). All the impulses, no matter their origin and nature, which are not already on the list of orthodox impulses, will be considered as heterodox ones and listed separately on the *list of heterodox impulses*. The members of latter list are considered, in fact, perturbations (it is possible that, because of incompetence, for example, some of the perturbations identified as such are, in fact, predictable (Ariely, 2010), that is, be members of the list of orthodox impulses. This means that, along the time, the list of orthodox impulses has to be actualized as much as some of new perturbations are considered predictable);

- ($SFAF_3$) *structural redundancy*: since the structure of the system concerned is „programmed" to handle the orthodox impulses only, the heterodox impulses must be managed by redundant structural components. So, the anti-fragility requires some redundancy (which, of course, comes under costs) in order to treat the perturbations the system deals with;

- ($SFAF_4$) *fructification device from perturbations*: in fact, this sufficiency predicate is more a specification of the $SFAF_3$ one, which means that the redundant structural components of the system concerned must have the potential to analyse the perturbations from the list of heterodox impulses, and find the most appropriate ways to capture advantages from their occurring (the concept of anti-fragility seems to suggest - and, perhaps, to „recommend" - although rather implicitly, an active behaviour of simply searching the… perturbations, by the anti-fragile systems. Logically, such a suggestion cannot be, however, implemented because of the definition of perturbations – they are unpredictable, so they cannot be searched at all).

Two remarkably interesting consequences could be derived from the concept of anti-fragility: 1) it is not anymore needed to take into account the risks, because the anti-fragility has the ability to manage any risk; 2) the uncertainty is not anymore relevant for the anti-fragile economic systems.

Analogously with the case of economic sustainability, *Figure* 2 illustrates the concept of economic anti-fragility.

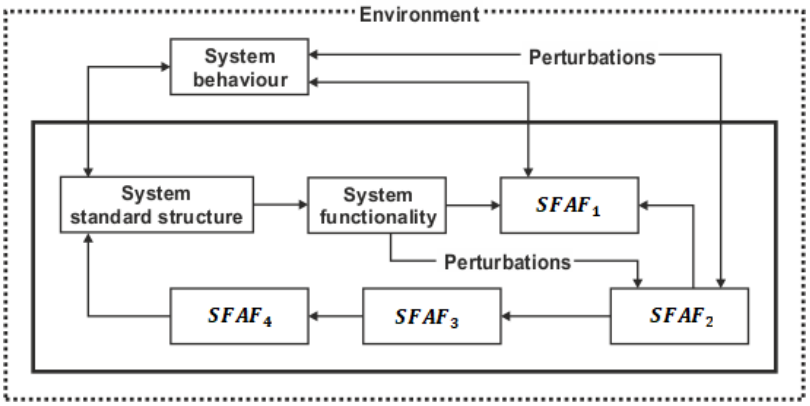

Figure 2: The four sufficiency predicates working to confer the economic anti-fragility.
Source: the authors.

3.2. On the Relationship between Sustainability and Anti-fragility

As the two concepts regarding a generic economic system – sustainability and anti-fragility, respectively – have been defined with respect to their sufficiency predicates, it seems the following relationships subsist between them:

- both address the economic processes (or, more general, the economic systems);
- both are properties of the economic processes/systems;
- both have a similar finality regarding the process/system concerned – that is, its invariance or conservation from the point of view of the identity, either under the impact of own dynamics or under the pressure of perturbations (internal or external);
- both are mechanisms of structural type, that is, with a large temporal permanency and continuity;
- both seem to admit either discretionary or automatic devices for involved mechanisms, or, rather, a mix between the two kinds of devices.

Based on these five structural and functional similarities, we think it could be alleged that the anti-fragility property of economic process/system is a kind of the property of economic process/system sustainability. Consequently, any anti-fragile economic process/system is sustainable one as well (the reciprocal is not true – that is, sustainable economic processes/systems can exist, which are not anti-fragile as well). *Figure* 3 synoptically indicates how the two sets of sufficiency predicates are correlated in order to lead to such a „theorem".

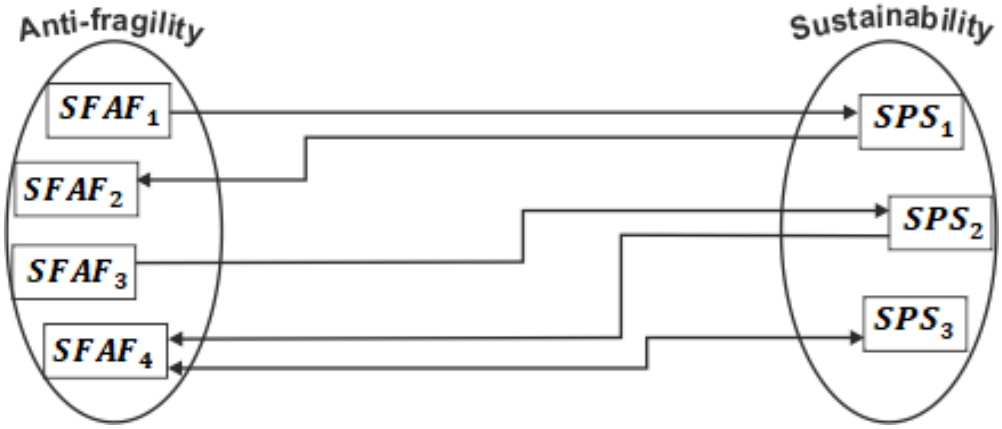

Figure 3: The logical relationships between anti-fragility and sustainability, based on the sufficiency predicates.
Source: the authors.

3.3. What is So Special about Anti-fragility?

The property of anti-fragility is special under at least three features: a) as member of its own conceptual family; b) as fundamental role (function) exerted in the economic process; c) as viral mechanism in a sustainable process/system.

(a) within its own conceptual family, the anti-fragility is distinguished from other concepts aimed at describing properties of systems to face the perturbations by: 1) robustness (Schupbach, 2018) – means a passive resistance to perturbations, so the system identity may be preserved (conserved) due to „gross force"; 2) resilience – means a perturbed state as a result of perturbation, but with the potential of the system to recover the previous state; 3) inertia –

is a kind of robustness with the difference that the resistance is accompanied by accumulation of tensions within changing, so, beyond a threshold of such perturbing accumulation, the system loses its identity (i.e., its structure); 4) homeostasis (Vogel, 2020) – means the system oscillates under the pressure of perturbations, and the new states could differ from the initial one, but it remains in the „tunnel" of oscillations. As shown above, the anti-fragility does not only resist to perturbations by it tries to gain advantages from their exerting. As for the sustainability, we have already proved it is a genus for the anti-fragility;

(b) anti-fragility is, in fact, special, exactly for its role (function) to capture from perturbations any advantages for the process/system concerned. Such potential is, indeed, remarkable, because the system involved uses just the „adversary" force to get to its own purpose (metaphorically speaking, such a procedure is applied in the Chinese martial art called kung-fu);

(c) anti-fragility is endowed with the hubbing effect – by hubbing effect we understand the property of a component of a system to exponentially extend its „map" of connections either inside that system or outside it (obviously, such an exponentiality is supported by positive feed-backwards - do not confuse the fact that anti-fragility acts by the dominance of the negative feed-backwards, with the fact that the hubbing effect which the anti-fragility exhibits is dominated by positive feed-backwards – the former addresses the role of anti-fragility, the latter addresses the „life style" of the anti-fragility. In such a context, using a terminology imposed by the COVID-19 pandemic - the anti-fragility, once instituted inside a system or process, tends to „infect" the entire system or process in question, so it is viral.

4. AN ECONOMIC IMMUNE SYSTEM BASED ON THE ANTI-FRAGILITY

The COVID-19 pandemic shock (Fisk, 2020) is, of course, a perturbation in its nature because it is unpredictable. In addition, this shock is external for the economic system, because it is not assigned to a faultily working of an economic process or variable. Based on all above, such a shock can only be faced by endowing the economic system with the anti-fragile principle, that is, with such a structure capable to fight, including the capturing of advantages from that fight, with the mentioned perturbation. Our proposal is, therefore, to construct an immune system of economic type, based on introducing in the structure of that economic system the property of anti-fragility. We shall provide the following considerations in defence of such a proposal:

(a) *firstly*, we could be inspired by the nature: we can observe that, regarding the biological life, the nature did not invent masks, gloves or anything else to protect us against viruses. It did so because of efficiency reasons: it *should* have invented specific protection equipment for every virus (and, in this context, it should have anticipated all the future possible viruses). In fact, the nature found out a universal solution which can deal with any virus, without the need to know or anticipate it – the immune system of the organism. The anti-fragility property of an economic system is exactly such an immune system of the economic „organism" (the authors have already introduced, several years ago, in other scientific interventions, the concept of *logically living system* (Kahneman, 2011), which is, in fact, the conceptual recipient of the anti-fragility property);

(b) *secondly*, the introducing of the anti-fragility property into an economic structure ensures, as shown before, the sustainability of the economic system concerned, that is, it ensures the fundamental moving of the praxiologic model of the economic process from the optimality paradigm to the sustainability one;

(c) *thirdly*, from a theoretical point of view, to extract advantages from perturbations is equivalent, on the one hand, to extracting neg-entropy from the environment, that is, to augment the dissipativity capacity of the economic system in question and, on the other hand, to overwhelmingly improve the economic efficiency (Nietzsche aphorism according to which

(d) *what does not kill you, makes you stronger* is remarkably adequate here, although it is wrongly associated, in the literature, with the resilience. In fact, it expresses with a great accuracy the nude concept of the anti-fragility - the resilience would not make someone stronger, but only bring him/her at the initial position);

(e) *fourthly*, the risk and uncertainty do not anymore enter the decision making procedure, neither at micro nor macro level in the economic systems – they will be considered simply as perturbations which are, to some extent, „well-come", because they are bearers of advantages for the systems affected by them. This last consideration could lead to radical changes both in the prediction methodology and in formalizing the production functions of economic processes.

Figure 4 suggests the logic way to endow a generic economic system with some anti-fragile property (potential), that is, with an immune device against the perturbations.

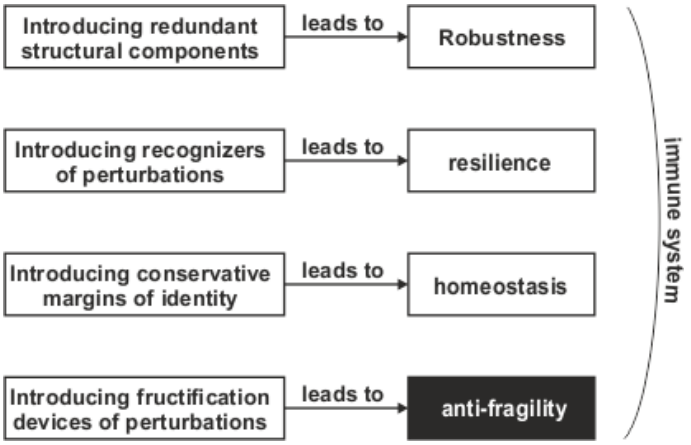

Figure 4: The logical construction of the economic immune system based on anti-fragility.
Source: the authors.

5. CONCLUSIONS

The COVID-19 pandemic is a non-economic, external, and unpredictable shock which directly affects the real economy, having the potential to generate an economic and financial crisis. In this paper we aimed to find an institutional and structural way by which the economies could manage such shocks without covering unspecified risks or handling unknown uncertainties.

The research proposes a *sui generis* immune system of the economy which consists in endowing that economy with an anti-fragile potential to oppose perturbations (either external or internal), no matter what their kind, or their intensity are, and even to gain from those perturbations.

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