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Earthquake: an Analysis of the “Economic Risk” in the Perspective of Prevention¹

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Abstract The seismic risk affects most of the Italian territory and is realized, with worrying regularity, in events with very impactful and, unfortunately, often tragic effects; each time they end up reproducing similar schemes, first an emergency phase characterized by a wide participation, both operational and emotional, then a debate on the need for more incisive prevention tools, then a slow and cumbersome reconstruction, finally the need to reinvent territories now deprived of previous balances.

One of the critical passages, which drags the effect of these events over time, is represented by the economic impact on the material heritage and the resources needed to carry out adequate prevention projects or, subsequently, reconstruction; however, in the presence of unfavorable economic trends, the results end up being dramatically amplified.

This paper aims to investigate precisely some economic aspects related to seismic risk, with implications largely extensible to the broader scope of natural disasters:

- in the first part, a detailed analysis of past experiences and related impacts is proposed, both from the point of view of emergency and post-emergency interventions and of prevention policies;
- in the second part, an investigation was developed concerning the macro-economic and political roots from which the structural criticalities emerged, trying to deduce possible actions and ways out;
- finally, in the third and last part, the technical tools and regulatory guidelines available to pursue the identified objectives were examined and assessed.

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1 | FOREWORD: EARTHQUAKE, AN ORDINARY EMERGENCY

Several decades of experience on earthquakes demonstrate how, after every seismic event of a certain intensity, there is a unanimous convergence (citizens, politicians, media) on the need to focus future efforts on prevention, in order to prevent the dramatic tolls – in terms of damage and, above all, of lives – that every event brings with it.

However, after the emotion of the first few months, the topic systematically ends up losing its importance in the ranking of priorities; new ‘ordinary’ emergencies take the place of the previous ones and the topic of prevention returns to being confined within theoretical and scientific disquisition, waiting for a new tragic event to bring it once again to the public opinion’s attention (Petrini, 1993). In short, by choice or necessity, the emergency factor appears to be the only condition able to ‘convince’ decision makers to provide resources.

The paradox lies in the fact that oftentimes it is legislation itself that promote this type of approach. As a result of the earthquake in L’Aquila (2009), for example, just under half a billion euros (Solidarity Fund) was allocated at the European level for reconstruction; however the measure provided specifically that the sum could be used only for ‘temporary’ works, that is to say without any medium-long term perspective. In relation to this specific obligation, among other things, a controversy with the Civil Protection came to be pertaining to the so-called “Case Project”, that is the creation of about 20.000 accommodations to be built in a few months in order to deal with a housing emergency that, considering the difficulty in rebuilding the city and especially the historic centre, had been forecast from the beginning to last several decades (Civil Protection, 2013). With a similar mechanism, the Solidarity Fund had already been activated in Molise in 2002 and was also used in Emilia (2012) and in the most recent seismic event that affected central Italy.

In general, the occurrence of sufficiently serious catastrophic events (the damage must exceed certain thresholds in relation to the GDP of the territory involved; see Gramaglia, 2016) – seems to be the only way to legitimize the request for spending and investment margins that go beyond the rigid ordinary parameters (starting from the well-known Stability Pact). Additionally, the institutional structure – which causes responsibilities to be continuously bounced back and forth between the national level (which is depowered but “exposed”) and the supranational level (which is “far away” but binding) – ends up being yet another anchor that takes responsibility away from political decision makers, in an oppressive vicious circle.

So a question must be asked: is the implementation of a structured plan for seismic prevention and, more in general, for securing the territory destined to remain a mere utopia or does it have some actual perspectives? And if so, what are the conditions?

This paper will essentially develop in two parts: the first one will examine the underlying reasons that prevent the implementation of structured plans for the requalification of the physical heritage in our country; the second one will explore in depth the possible operational approaches, once the “soil” of prevention has been cleared and made fertile.

1.1 The costs of prevention

The frequency, with which seismic events of significant impact occur in succession in our country, at more or less regular intervals, depends on the high degree of seismicity of great part of the national territory. Strictly speaking, in order to talk about seismic “risk” it is actually necessary to define three categories (see Ordine degli Ingegneri della Provincia di Roma, 2016):

- 1) seismic danger, that is the probability that a seismic event will occur in a determined period of time with a certain intensity;
- 2) vulnerability to earthquakes, that is the structures' capacity for resistance;
- 3) seismic exposition, that is the value, in a broad sense, of exposed goods.

Currently, there is a systematic and detailed classification of the Italian territory only regarding the first factor, the danger; in particular, the classification has been done, on a statistical basis, taking into account the maximum expected acceleration on rigid soil (that is to say the rock) with a probability to surpass 10% in 50 years. This way, four segments were defined (high, medium, low and very low), which allowed to classify the entire national territory (Ordinance P.C.M. No 3519 of 28 April 2006).

According to the 2012 ANCE/CRESME Report, the municipalities exposed to a seismic danger particularly worthy of attention are almost 3.000 (706 in the high segment and 2.187 in the medium segment, respectively), over a third of the total; it is more than 130000 km² of territory, more than 40% of the total surface (27.000 in the high segment and 104.000 in the medium segment, respectively) and almost 22 million people (3 million of them are in the high segment), equal to 8.6 million families (1.2 million of them in the high segment).

It is also possible to estimate the value of the housing stock concerned: by crossing, in fact, the data pertaining to the seismic danger of Italian municipalities with those pertaining to the corresponding value of houses and appurtenances (see Dipartimento delle Finanze, Agenzia delle Entrate, 2017), it is clear that more than 60% (equal to almost 4.000 billion euros) of the total is exposed to a high or medium risk (see Table 1).

SEISMIC RISK	VALUE OF THE HOUSING STOCK (in billion of €)	(in %)
1	191.1	3.1%
2	2,154.8	34.6%
3	2,606.3	41.9%
4	1,263.9	20.3%
nd	11.3	0.2%
Not available	6,227.5	100,0%

Table 1 – Value of the housing stock* for seismic risk classes.

**The value is refer to the houses and the appurtenances.
Methodological criteria to calculate the value are available in the publication
"Gli immobili in Italia 2017 – Ricchezza, reddito e fiscalità immobiliare",
curated by the Department of Finance and of the Revenue Agency.*

Although, as mentioned before, we cannot talk about a real seismic risk map without crossing all the abovementioned categories, the numbers just exposed give an idea of the potential impact that earthquakes could produce in the future in our country .

The National Council of Engineers then tried to project the data collected on the damage produced on the building heritage of L'Aquila from the 2009 earthquake on the national scale, by crossing them with the era of construction of buildings and the seismic danger of the territory (elaboration of the

data provided by ISTAT and the Civil Protection): the analysis shows that almost 42% of the national housing stock would need interventions for seismic adjustment/improvement (over 12 million houses) for an overall sum, calculated based on average parameters of the technical specifications for anti-seismic interventions, of little less than 100 billion euros, 36 of which would have to be destined to buildings in the high and medium segment (seismic areas 1 and 2).

A similar analysis was also conducted for non-residential buildings; it was found that 29% of industrial warehouses (95.044 over 325.447), 37% of schools (24.073 over 64.797) and 32% of hospitals (1.822 over a total of 5.621) are in areas with high seismic danger; in total, between the residential and non-residential sectors, it would add up to almost 5.5 million buildings in danger.

The Civil Protection also made a rough estimate of the costs that a program for seismic risk prevention would demand: in this case, it is a sum of 50 billion euros for the whole public segment of real estate (13 billion only for schools), a sum considered very reliable because it derives from specific and circumstantial legal provisions (Frontera, 2016). With respect to the private segment, there are no detailed evaluations, but there is a real possibility that the hypothesis contained in the report of the National Council of Engineers could be all too optimistic (an average cost of 30.000 euros per apartment for seismic adjustment, projected on the 12 million houses at risk that were identified by the report itself, would have the estimate skyrocket from less than 100 billion to over 360 billion euros; see Tripodi, 2013).

A last evaluation in this respect was done within the report titled “Rapporto sulla Promozione della sicurezza dai Rischi naturali del Patrimonio abitativo” drafted by the Struttura Tecnica di Missione (Mission Technical Structure) recently set up within the Casa Italia Program, which will be discussed further on: the estimate varies from 36.8 billion euros of a restricted intervention to only the masonry buildings carrying the highest risk municipalities, to over 850 billion euros in case of a generalised intervention extended also to reinforced concrete buildings built before 1981 (see Table 2).

	Intervention in municipalities with ag(max)>0.25 (billions of €)	Intervention in municipalities with ag(max)>0,15 (billions of €)	Intervention in municipalities with ag(max)>0,05 (billions of €)
Only load-bearing masonry buildings	36.8	269.2	540.5
Masonry and reinforced concrete buildings built before 1971	46.4	360.0	723.1
Load-bearing masonry buildings and buildings made of reinforced concrete before 1981	56.0	430.3	850.7

Table 2 - Extent of investments necessary to improve level 1 seismic vulnerability*

*Source: “Rapporto sulla Promozione della sicurezza dai Rischi naturali del Patrimonio abitativo”, drafted by Struttura di Missione Casa Italia (2017).

1.2 The cost of past earthquakes

At this point it would be useful to compare these estimates with the real costs determined over time by seismic events; this is actually quite a complex task, since these costs would have to take into account not only the damage to public and private buildings as well as to infrastructures, but also the medium and long term social impacts and slowing down, or even the interruption, of production activities in the affected areas.

An estimate is included in the Report on the state of the Italian territory drafted by ANCE and CRESME in 2012, then used again by a dedicated study of the National Council of Engineers (2014) specifically on the topic of the costs of earthquakes in Italy. The main sources at the basis of both works were two previous historical researches on the topic: a study of the geological and geo-environmental instability in Italy from the end of World War II to 1990, carried out by Vincenzo Catenacci, geologist for the Civil Protection, and a study carried out by the Study Service of the Chamber of Deputies focusing on earthquakes that affected Italy from 1968 to 2009 (anti-seismic legislation, funding, tax and contribution benefits).

Therefore, with regard to earthquakes, it has been estimated that the incurred costs amounted overall to 181 billion euros from 1944 to 2012 (over 2.6 billion per year), taking into account the emergency phases, those of medium to long term reconstruction, as well as any direct or indirect forms of support to the economic activity, including tax benefits (all sums are in reference to 2011 prices); however these data don't take into account the last dramatic earthquake that hit central Italy between 2016 and 2017, for which information is inevitably still partial and the intervention prospects are still uncertain.

Over 60% of these 181 billion euros has been focused, through public funding, on the seven main events that occurred in the analysed period, through a substantial and articulated series of regulatory measures that were taken over time and that will end their effects in 2033, according to the current expenditure forecast regarding the earthquake in L'Aquila (2009).

In summary:

- for the earthquake in Valle del Belice in Sicily (1968, 6.4 on the moment magnitude scale, with 370 victims and 70.000 displaced people), a sum equivalent to 8.8 billion euros has been allocated through 27 measures;
- for the earthquake in Friuli Venezia Giulia (1976, 6.4 on the Richter magnitude scale, with 989 victims and over 100.000 displaced people) a sum equivalent to about 17.8 billion euros has been allocated through 9 regulatory measures;
- for the earthquake in Irpinia (1980, 6.9 on the moment magnitude scale, with 2.914 victims and about 280.000 displaced people) a sum equivalent to 49.9 billion euros has been allocated over time through 33 regulatory measures;
- for the earthquake in Marche and Umbria (1997, 6.1 on the moment magnitude scale, with 12 victims and about 32.000 displaced people) a sum equivalent to over 12.9 billion euros has been allocated through 42 decrees;
- for the earthquake in Molise and Puglia (2002, magnitude of 5.8, with 30 victims) a sum equivalent to 1.7 billion euros has been allocated through 24 regulatory measures (1.4 according to the National Council of Engineers, which does not take into account the National Plan for the South – Deliberation of the Inter-ministerial Committee for Economic Planning No 62/2011);
- for the earthquake in L'Aquila (2009, magnitude of 5.9, with 309 victims and about 60.000 displaced people), to this day, a sum equivalent to 11 billion euros has been allocated (total estimated damage equal to 13.7 billion euros);

- for the earthquake in Emilia (2012, magnitude 6, with 27 victims and about 19.000 displaced people) a sum equivalent to about 10 billion euros has been allocated (total estimated damage equal to 13.3 billion euros).

Therefore, over 110 billion euros have been actually allocated to lift up again cities, territories and productive structures.

The numbers seem to demonstrate that a purely accounting evaluation – contrary to what some studies state (Buzzacchi and Turati, 2010; Guarascio, 2016) and to the public opinion’s general perception – is not necessarily deciding with regards to the topic of the convenience of a diffused prevention strategy with respect to the emergency management: in other words, there is no guarantee that prevention will cost less, in the long term. In fact, prevention would require an investment estimated between 40 (though excluding significant segments, both in terms of territory and of buildings) and 850 billion euros (last estimate done within the Casa Italia Program), in comparison with an actual disbursement of about 180 billion euros, distributed over the last 50 years, without considering that any kind of prevention can reduce, but not cancel, the restoration costs. However, the data should not be all that surprising if we take into account the diffused seismicity of the Italian territory – which should be faced with a serious prevention plan – and, conversely, the limited range of the damage caused by destructive seismic events that, on average, occur several years apart from each other.

According to relevant scientific literature, it also appears that in many cases the occurrence of natural disasters acted, over time, as a “positive shock” from an economic point of view; that is, it induced positive dynamics on the main indicators of the affected areas, starting with the Gross Domestic Product (see Albala-Bertrand, 1993), especially where the local economic and productive structure was spared (Stewart *et al.*, 2001) and in the presence of events with a sufficiently long return period (like, indeed, earthquakes, see Benson and Clay, 2003:26). The explanation, in scientific terms, can be of Shumpeterian type (from the supply side), so the traumatic event ends up representing a sort of accelerator of production innovation processes (see Aghion, Howitt, 1998; Loayza, Olaberria, Rigolini, Christiaensen, 2012), or it can be of Keynesian type, so the use of a large and concentrated quantity of financial, economic and human resources ends up determining a consistent expansion of the aggregate demand, with the subsequent stimulation of consumption and production.

In-depth analyses regarding national and international cases confirmed that the propulsive thrust caused in the medium term by natural disasters is more significant in more economically underdeveloped contexts – that is, where there is a more significant economic potential still unexplored (Hallegatte, Ghil, 2008; Guimaraes, Hefner, Woodward, 1992). Obviously, it is necessary to keep in mind the complexity of the factors that influence economic cycles, since what matters here isn’t the comparison between the ‘before’ and ‘after’, but that between the ‘with’ and ‘without’ (Ellson, Milliam, Roberts, 1984).

Additionally, these considerations seem to at least partially disregard the efficiency with which the reconstruction operations are carried out. In this respect, the conclusions drawn by a study conducted at the University of Venice “Ca’ Foscari” are interesting: the econometric comparison between three Italian seismic episodes (Friuli Venezia Giulia, Irpinia and Umbria-Marche, respectively) showed that, despite the now well-known structural inefficiencies, the only case in which there were significant effects on the economic cycle was the one in Campania (Durigon, 2012); with regard to the same case in Abruzzo in 2009, a study published in 2015 revealed significant benefits on the local GDP induced by *post-earthquake* interventions, starting from reduced taxation (Porcelli, Trezzi, 2015).

Therefore, the traumatic event often ends up representing an element that in and of itself “unlocks”

the situation, not just from the point of view of politics and media, but also from a strictly economic one, by managing to activate processes that "ordinary" critical factors - tough they may be structural (like unemployment) – can't seem to activate. This paradoxical evidence is probably influenced by an underlying anti-Keynesian ideological framework that became more and more relevant over the decades (Vernaglione, 2003); however, the reasons are very complex and articulated, and later on we will try to give a more in-depth overview.

2 | PREVENTION: A POSSIBLE CHOICE?

Applying a purely accounting approach to such a delicate matter as the one discussed here evidently seems like an unacceptable stretch for different reasons, above all the fact that, unfortunately, material damage always corresponds to the loss of human lives; however, any attempt at launching prevention plans has systematically failed, as it was demonstrated by the actual funding allocated over the last decades.

In this regard, Franco Gabrielli, the former head of the National Civil Protection, in a relatively recent interview gave a summary of the situation that is quite comprehensive and disheartening.

"Overall, between 1986 and 2003, about 316 billion euros were invested for prevention; of these, 66 million were allocated to the private building stock in Sicily (Act No 433/1991), while between 2003 (after the earthquake in S. Giuliano di Puglia) and 2009 (before the earthquake in Abruzzo) about 750 million euros went to fund interventions, mainly for schools. After the earthquake in Abruzzo, with Act No 77/2009, 965 million euros were allocated and distributed over 7 years (2010-2016) for seismic prevention, through the provision included in article 11" (Gabrielli, 2014).

The distance between actual funding and necessary resources is therefore enormous (at least two orders of magnitude); it seems that no one has ever managed to "find" the necessary resources to implement a plausible prevention plan for securing the territory.

At this point, experience and logic impose two important premises:

- 1) earthquakes, like other forms of natural disasters too, present a very high degree of uncertainty, in relation both to the intensity of the expected phenomenon and, most of all, to its timing (Guarascio, 2016). Therefore, taking financial resources from other items of expenditure and investment – whose impact might be less traumatic, but more direct and immediate – ends up being a generally unfeasible option, both for usefulness and opportunity reasons;
- 2) a second aspect to be taken into consideration is the fact that a plan for securing the territory can only be an operation to be developed on the medium or long term. The problem is that those in charge of promoting such a plan are institutions and subjects whose timelines are inevitably limited by the duration of their political and administrative mandate. This eventually imposes the understandable need to pursue policies of more immediate impact, aimed also at gaining consensus – which is, paradoxically, the essential prerequisite for ensuring the continuity of a mandate and, subsequently, more wide-ranging policies. On the other hand, the alternative – that is, imposing priorities and policy guidelines regardless of electoral support – would inevitably mean leaving democracy behind, generally with unfortunate results, as history can teach us through several examples of totalitarian or technocratic regimes.

Actually, the public opinion is generally induced to identify the main critical point as a persistent and lacking "culture of prevention" – indeed, a quite generic expression – which could be translated as an insufficient structured bottom-up impulse capable of wisely orient the choices and priorities of the bodies charged with devising policies and programs. Ultimately, the responsibility for tragedies connected to natural disasters, and to earthquakes in particular, has widespread roots: everyone

could have “done more” and the blame lies, after all, with everyone, either because of inadequate behaviours or for insufficient or “risky” interventions on real estate, or, in any case, because they voted for the wrong person. Oftentimes there is the impression that the first people responsible for tragedies are, directly or indirectly, the victims themselves.

One can not exclude that these considerations are somewhat true, maybe in relation to specific cases; however, the described approach tends to avoid the structural reasons of the general inefficacy of the policies carried out to face earthquakes and natural disasters, some of which were described previously.

Is it possible to significantly remove such obstacles, or is the traditional rhetoric of prevention destined to remain as the only sterile possible reaction in the face of tragedies with unacceptable costs in terms of the economy and especially of human lives lost?

A first observation – which is based both on previous experiences and on consolidated logical and psychological mechanisms – is that a prevention strategy based on interpreting earthquakes as a risk, although it is constantly invoked by the scientific community itself (Gabrielli, 2014; Petrini, 2014), is inevitably destined to fail.

As a matter of fact, the main obstacle is of the psychological kind and translates into the tendency to perceive the earthquake as a “remote and fatalistic possibility” (Carnelli, Ventura, 2015). It is a removal mechanism which tends to be activated in a relatively short time, so even right after seismic events of significant impact, and which even more so has an effect on the medium and long term, in the presence of return periods of several decades.

This is one of the main reasons why technical knowledge is substantially incapable of being translated into political agendas, despite an appreciable and significant evolution in terms of both scientific knowledge and communication efficacy.

So the most “fertile” moment – that is, the emergency, when the topic acquires a recognised priority – ends up being too brief (in other ways, fortunately) and the affected territory too small (again, fortunately) to allow for fully elaborating structural and general strategies; it is almost physiological that, on the medium and long term, the ordinary priorities go back to being on the top of the ranking.

By now, these mechanisms are well known and can be found in all the seismic episodes that over the last decades affected our country; therefore, thinking that “next time” will be different seems to be quite unrealistic.

Instead, it would be interesting to ask the question in a different way: is it possible to impose the topic of anti-seismic prevention (however, the discourse can be extended to the whole field of land protection) within the ordinary ranking of political priorities?

This is indeed the inescapable critical point, which inevitably requires to understand the underlying reasons that today prevent to reach those goals that apparently everyone seems to reasonably agree on; in order to face this problem, it is useful to start again from the two observations made previously.

From point 1) it is possible to deduce that, in the presence of a lack of resources, it is difficult to think that these can be oriented primarily towards mitigating a risk that is characterized by absolute uncertainty, both in terms of size and time; the reasoning is valid both for the individual citizen, who will have no difficulties in identifying more urgent needs, as well as for the public administration, which is having more and more difficulty in simply guaranteeing ordinary services with a daily impact.

Point 2) only reinforces this type of approach, based on mechanisms that, for the good and the bad, are intrinsically ingrained in an institutional model like the one of representative democracy.

Therefore, the root of the problem seems to be, under any point of view one might want to adopt to

look at it, the scarcity of resources, so as to induce even authoritative experts such as Giuseppe Campos come to consider possible and desirable exclusively scenarios marked by so-called "austerity" (Campos Venuti, 2014).

This might seem like a very prosaic thing to say, almost too obvious: everyone will immediately think about the first concept that is taught in any political economy course – that from ancient times, scarcity has always been economy's main driving force, and political economy itself operates within the structural imbalance between scarce resources and the unlimited needs of human beings.

Moreover, it is possible to base on this concept a couple of considerations that might seem to go with the thoughts developed previously:

- 1) an optimal allocation of resources derives from a priority ranking of needs;
- 2) the scarcity of resources ends up imposing that they'd be concentrated on priority needs, to the detriment of others.

Since the need for anti-seismic prevention is not, as it was mentioned before, perceived to be a priority – for reasons that are partly objective (of political and economic nature) and partly subjective (of mostly psychological nature) – it becomes difficult to realistically think about a significant commitment in this sense. This is why, as confirmed by experience and the previously shown data, only the extraordinary nature of a natural disaster can be capable of activating adequate and substantial financial commitments (Petrini, 2014; Carnelli, Venura, 2015).

However, the concept of resource deserves to be explored further: are we sure that the resources to which we are referring in our case are really scarce or limited? And most importantly, what resources are we referring to?

There are essentially three types of resources that need to be activated to implement a prevention plan: human, material, and financial. Human and material resources correspond to the workers needed for planning and carrying out the works and the raw (or processed) materials needed for their execution, respectively; the financial resources represent the link necessary to activate all the productive factors at play.

So, when we say that resources are scarce or limited, which of these categories are we referring to?

Indeed, human resources are a limited set, because in a given context the number of available workers is inevitably limited; so it is indisputable that employing the work force in a certain field means that it cannot be used in different ones – so this implies that choice of priority mentioned above.

A warning, though: from this type of reasoning it is clear that this statement is true only when the potential work force is used at its full, that is to say only at full employment. As a matter of fact, when part of the work force is unemployed, its employment wouldn't require giving up on producing any other goods or providing alternative services. Thus, human resources can represent a limit only at full employment.

Material resources – the second type of resources mentioned above – represent, in the case being examined, the set of physical goods needed to carry out the works. So defining these resources would mean taking the risk to find oneself in the condition to not have the mortar, stone, steel or wood needed to consolidate buildings and infrastructures or produce new safer objects. Evidently, this is an entirely unlikely scenario; therefore, believing the scarcity of material resources to be a negligible hypothesis seems to be a very reasonable approximation.

As it is unfortunately well known, Italy is not at full employment. The unemployment rate recorded by ISTAT in July 2018 was of 10.4%; however other indicators – which take into account those people

who don't look for jobs despite being of working age because they are demoralized and of people employed part-time – estimate that the actual work force that remains unused is more than double, as the European Central Bank has authoritatively confirmed referring to the whole euro zone (ECB, 2017).

Given this situation, so excluding that the scarcity of resources involves the work force or the materials, it is possible to deduce that when talking about limited resources – particularly with regard to the difficulty in implementing effective anti-seismic prevention plans and, more generally, plans for securing the territory – we refer exclusively to one component: the financial one.

2.1 Limited financial resources: a necessity or a choice?

On 2 March 2005, during a hearing at the Committee on Budgets of the House of Representatives, the then-Chairman of the Federal Reserve of the United States, Mr Alan Greenspan – following on a discussion on the sustainability of the US pension system – stated as follows:

“There is nothing that prevents the Federal Government to create all the money it wants and to give it to somebody. The question is how to set up a system that ensures the production of real assets”.

On the 9th of January 2014, during a press conference in Frankfurt, while answering a question on whether or not there is a limit to creating currency, the President of the European Central Bank, Mr Mario Draghi, stated as follows:

“Technically the ECB cannot run out of money, so we have ample resources to cope with all emergencies”.

These statements, coming from the most authoritative institutional sources, can seem as blunt as they are irrefutable: there is no endogenous limit to creating financial resources (Mosler, 1995). So, the subject to which the institutional structure assigns the task to technically manage the currency (generally, it is the Central Bank) is in the condition to respond to “any” need, without any technical restrictions that may prevent it; the restrictions to creating financial resources are of a purely “political” nature.

This was true back when the so-called “gold standard” (that is, the system anchoring currency to gold) was in use – this was indeed a “political” agreement, therefore a reversible one (in fact, it was abandoned in 1971), which was defined during the Bretton Woods Conference (1944) and was linked to the needs of the post-war context – and it is all the more true today that there is no link between the quantity of currency and available real resources (which are therefore limited), such as gold.

It is fundamental to start from this premise: it means that if there is a “lack” of financial resources for a certain goal, this doesn't depend on unavoidable inherent dynamics (as it can be the case, for instance, for the shortage of an agricultural product), but on discretionary choices made by those in the position to do so.

Therefore, if the political field is where the scarcity of a resource that is “naturally” unlimited originated from, it is in that field that we must investigate the problem's causes and possible solutions.

Investigating in the political field means, in a nutshell, trying to find the players' goals and interests and their relevant power relations.

Securing the territory, and not only for anti-seismic prevention, is a goal of general interest that, in order to be reached, requires the implementation of large scale strategies. This means that the initiative and the management cannot fall on individual technical and economic operators – whose

horizons are legitimately limited – but on those subjects that, by “statute”, are charged with safeguarding the collective interest: that is, public institutions. Therefore, the financial resources discussed here are essentially and especially public ones, whether we choose to follow models that focus on direct interventions, or models that orient private initiatives through appropriate incentives. So the topic is the scarcity of public financial resources.

As it is known, the current restrictions on the public budget – that is, the possibility to acquire the necessary resources to pursue public policies – derive from international agreements, first of all the Maastricht Treaty (1992), and they have even been brought up to the level of the Constitution in 2011. However, the true origin can be traced back to demands that emerged at the end of the Seventies: pivoting on the explosion of a strong exogenous inflation, caused by the double oil shock (1973 and 1979), and on the then most famous economic theories’ difficulties in interpreting the contemporary growth in unemployment (Sapelli, 2008), an ideological approach focused on currency’s “stabilizing” role progressively emerged. The goals and modalities were summarised well by the then-Governor of the Bank of Italy, Mr Carlo Azeglio Ciampi, in a report in May 1981: “the belief is that going back to a stable currency requires a “monetary constitution” based on three pillars: independency of the power to create currency from those who determine the public expenditure; expenditure procedures that respect the budget constraint; wage development that is coherent with price stability” (Ciampi, “Final remarks”, May 1981).

Therefore, in order to fight the “monster” of inflation, it was decided to drastically reduce the economic and financial instruments available to the elected bodies: the Central Bank had to transform (and in Italy, in 1981, it transformed indeed, at least formally; see Della Bona, 2014) from a form of support to a sort of dam with respect to the governments, and the availability of public financial resources had to be anchored to accounting balances and no longer to goals of economic policy. The third and last point mentioned by Ciampi, who more explicitly meant “wage compression”, suggested that there was a pretty clear socio-political origin behind this ideological change: after a phase in which the political (see, rise of the Italian Communist Party) and economic (wage share) weight of the working class and the so-called middle class had grown – to the point that they largely coincided – the crisis, in line with the etymological root of the term, became the occasion to reverse the trend and look for a new balance. It is no coincidence that a symbolic passage of this change can be the tendency to gradually leave the so-called sliding wage scale behind – that is, the wage indexation with respect to inflation, which caused a foreseeable collapse of wage share (with inevitable effects in terms of inequality), on the basis of an alleged causality relation (sliding wage scale-inflation) that facts (Holland, 1995; Belgian National Bank, 2008) and scientific rational thought (Nutti, 2010, Bagnai, 2012) had proved to be very questionable, when not inconsistent.

Society was radically overturning the priorities that had been expressed until then and that had placed at the top of the political agenda “economic development, industrialisation, social and distributional conflict” – to use the words pronounced by the current President of the ECB, Mario Draghi, in 2011 (see Research and Legislation Agency “AREL” Conference, during the 30 year anniversary of the divorce between the Bank of Italy and the Treasury, on 15 February 2011).

In that same report, Mario Draghi also clarified the political perspective in which this process was framed: this overturning of priorities was actually indispensable to avoid that “Italy’s decision to join the European Monetary System, that had come into force in 1979” could risk “revealing itself as an unrealistic action, for the difficulty in making internal economic policies coherent with that constraint”. So the monetary constraint represented the ideal institutional support – the constraint of all

constraints, capable of making the new model that Ciampi had hoped for well rooted and possible.

To recap, we can state that the absolute paradigm of the concept of public budget constraint comes from a convergence between social demands (once they would have been called “class demands”) and economic models (neoclassical and monetarist) that has been developed since the end of the Seventies. Through a wise political and communication action, that model and the interests it represented managed to gradually rise up to the top, by first becoming predominant both at the national and international level, and then by presenting themselves as an obligatory scenario with no alternatives.

Like in every political and economic model determined by history’s dynamics, a critical evaluation cannot disregard the point of view, so it is difficult to make absolute judgments taken out of context. However it is useful and legitimate, with a view to this study, to take a point of view that is functional to the topic being discussed – that is, the topic of public interest; in this sense, we can’t help but point out a strong and aware penalisation, carried out through the gradual downgrading of the political (strength and autonomy of elected institutions) and economic (availability and management of financial resources) tools necessary to its fulfilment.

2.2 Perspectives

From the reasoning followed, it seems evident how an extensive and incisive plan for pre-emptively “consolidating” the territory and the settlement system – since it is, by definition, the expression of a non-emergency public interest – belongs to a residual area on the ranking of priorities induced by the current institutional and economic model.

Without removing the structural obstacles imposed by the current system, whose nature and origin we have tried to understand, it seems utopian to imagine that large scale and ambitious goals can be effectively pursued, starting from a widespread anti-seismic prevention; the unsuccessful experiences of the last decades unfortunately plastically and systemically confirm this.

A first fundamental step would undoubtedly be becoming aware of the real nature of the problem – which is all but an easy thing to do, seeing the opposite ideological and media pressure of opposite sign of several decades.

In this sense, it can be useful to underline at least a couple of macroscopic contradictions, which are partly already evident from the reasoning followed until now:

- in the meanwhile, inflation – the phenomenon against which the current development model historically managed to rise and combat – turned from “monster” to fight into a (unsubstantiated) object of desire;
- the current model turned out to be inefficient in reaching what is maybe the main goal of any development model – that is, managing to combine work demand and supply on the basis of society’s collective wellbeing.

In relation to point 1), which is more technical, it should be remembered that there are actually at least two types of inflation – one due to the restriction of the supply of fast-moving consumer goods, and the other due to the expansion of the economy and, subsequently, of the aggregate demand. The contradiction lies in the fact that in order to combat dynamics of the first type (the energy crises of the Seventies), it was decided to adopt models and tools that, on the long term, ended up structurally compressing the second type (which could be defined as virtuous).

The effects have been paradoxical: it simply wasn’t possible to bring down inflation in the Seventies

and Eighties until its causes weren't removed, that is not until the middle eastern crises that had determined the restriction of the oil supply were resolved (Sapelli, 2008); on the other hand, the persistence of strong restrictions on the expansion of public budgets prevents today from making effective expansive policies, which fail to develop tangible effects outside the financial circuit. Instead, the current economic and institutional model, by strongly limiting the margins for developing redistribution policies, has significantly contributed to grow inequality – which is a condition conducive to deflation dynamics taking root. So, is it possible to imagine some kind of plausible solution if the asset that contributed to causing the problem still remains?

In relation to point 2), we previously already hinted at the untenable paradox that a growing availability of unused work force could coexist with a rich agenda of plans and projects that remain not implemented. The official macroeconomic models – whose validity the scientific community is far from agreeing on – even arrived to foresee minimum unemployment thresholds that, as much as this could sound grotesque, would be needed to keep inflation within certain parameters (see NAIRU). After all, it is particularly revealing in this sense that the only subject capable of actually managing public finance, the European Central Bank, has as its only statutory mission that of safeguarding price stability (see ECB, 2009). There is no reference to real economy parameters, like employment – which by the way happens even in the US with the Federal Reserve; the attention is focused exclusively on a topic (inflation) that by now seems to have been structurally surpassed at the global level, if not actually overturned (Masciandaro, 2017).

As it can be seen, there is no lack of technical arguments to anticipate alternative scenarios and models; however, turning these arguments into politically efficient proposals is all but simple and, as we said before, the political terrain at large is indeed where the critical points need to be brought forth and resolved.

In the opening paragraphs we asked a question, which was only apparently a challenge: is it possible to bring the topic of anti-seismic prevention onto the ordinary ranking of political priorities? In other words: what arguments could transform a perennial wish into an actually viable political argument? The thoughts developed until now brought forth a possible answer: full employment. It would indeed be a perspective both tempting in terms of consensus and strictly connected to implementing long term wide-ranging planning; the goal, enhancing an important and widespread cultural and physical heritage, would additionally be completely in line with the prerequisite for making expansive policies sustainable – a condition that former Chairman of the Fed, Greenspan, referred to in the quote mentioned above, namely producing "real assets".

3 | POSSIBLE OPERATIONAL APPROACHES

Once the underlying structural problems have been made clear – which have to be removed as a prerequisite to open actual perspectives regarding the topic being discussed here – it would be interesting to face the equally crucial problem of assigning and dividing the burdens connected to the possible intervention plans, which can be done by adopting different approaches.

In previous paragraphs we already hinted at the possibility to operate within different orientation models, according to which the role and weight of private initiatives especially would be different.

The premise of the previous reasoning is still valid in this case as well: "choosing to allocate the risks of catastrophes remains an exquisitely political matter" (Buzzacchi and Turati, 2010), that is to say that it is an effect of the composition of the interests at play.

The underlying dilemma is quite simple: on one hand, the goal should be a bottom-up process of accountability of each subject – starting from buildings' owners (on the private front) and local administrations (on the public front), in order to minimize the not only economic impact of any

possible event; on the other hand, central authorities have the duty to guarantee the necessary coverage for remedial measures after any possible catastrophe.

It is clear that the two approaches are difficult to reconcile, since it's almost physiological that the more or less formal guarantee of coverage from the top ends up acting in and of itself as an element that takes away responsibility from the subjects involved, both public and private (it is the so-called 'charity hazard').

3.1 The financial approach: insurance policies

In the debate on the measures to implement in order to improve the way we approach seismic risk, and catastrophes in general, the perspective to develop specific forms of buildings' insurance is rising in an ever more insistent way.

It is useful to start by making an observation that is quite obvious in and of itself but that sometimes gets overlooked when discussing this topic: financing risk management through the insurance market does not reduce the overall system's costs, it actually increases them (Buzzacchi and Turati, 2010).

Since the insurance broker is a private subject, his objective by definition is to have a balance surplus; this means that, in aggregate terms and in the medium and long run, the resources drained by the insurance system have to be more than those allocated to repay for the damage, otherwise the consequence would be economic unsustainability. In other words, a new factor comes into play, with financial intermediation functions, which has to correspond to an extra profit; subsequently, the idea that on the medium and long term the diffusion of policies against catastrophes could alleviate the community's burdens in terms of public expenditure (should the argument have any sense, as we'll see later) is "technically" unfounded.

It should also be taken into account that catastrophes, starting with earthquakes, usually have such characteristics that would make them "non insurable" (Buzzacchi and Turati, 2010): as a matter of fact, they are rare and produce economic damage that is high, circumscribed and distributed in a non-homogeneous way, both in time and in space (on the contrary, an insurable risk should be associated with more numerous and statistically independent events). So there is a clear need for a "re-insuring" subject – that is, a subject capable of sustaining this risk at a higher level, maybe by virtue of a portfolio composed by enough types of catastrophic risks that it would seem sufficiently wide and diversified. Actually, it is not rare that the coverage ends up being granted, at least partially, by a public subject – like for example in the case of Japan, where, due to the frequency and consistency of the seismic phenomenon, the Government takes up almost 80% of risks (see Naoi, Seko, Sumita, 2010). After all, these are mechanisms that conceptually don't differ from those typical of other financial sectors, starting from the banking one, and that are implemented to protect the final users. In any case, it is evident that we can all but taken for granted that an insurance system could completely avoid public intervention.

There is also the possibility that similar mechanisms to those of insurance could be applied directly at the public level, without the filter of a private insurance agent; these are generally mutuality funds, with precise criteria both in the way resources are acquired, and in the way they are allocated in case of a calamity. In this case, the limit can be identified in the risk that, in case of necessity, one could continue to trust in more traditional ways to allocate supplementary funds, and therefore don't succeed in obtaining the expected results in terms of raising the accountability of the affected local subjects (Buzzacchi, Turati, 2009) – let's think, for example, of the American federal fund, the "Disaster Relief Fund", which is technically bound 'a priori', but gets systematically refunded (Goodspeed, Haighwout, 2007).

In any case, as it was hinted at before, a largely spread argument in favour of strengthening insurance

tools is that the alternative – public intervention – would force “lucky citizens to support unlucky citizens, as they’ve been affected by a catastrophe” (Buzzacchi, Turati, 2020; Boschi, Feletig, 2016; Buzzacchi, Pagnini, 2012); furthermore, there would be a persistent asymmetry due to the fact that the two groups tend to often remain the same over time. At this point it would be useful to remember what has been stated before: in a modern State, focusing resources in a determined area in order to face a catastrophe doesn’t impose to take away resources from other areas or regions; on the contrary, additional public investments that create value and activate untapped resources represent a positive factor and a stimulus for the whole economy interested. Obviously, as it was seen, this argument is no longer valid in the presence of institutional limits, like it happens when imposing exogenous constraints on public budgets (which, after certain allocations, impose to subtract similar sums from other sources of expenditure, thus actually penalizing other citizens) or when prohibiting certain forms of support to individual areas of the territory because they are believed to be a potential alteration to the principles of competition (see for example “State aids” prohibited in the EU’s territory).

Analysing case studies where forms of non-mandatory insurance were significantly widespread, quite evident data emerges: generally speaking, those who participate are the richest areas (ANIA – Italian National Association of Insurance Companies, 2011) and the richest subjects. This is not surprising, since they are indeed additional costs linked to owning a property; therefore, this phenomenon suggests another important structural problem of the insurance model – the risk that it would actually act as a way of taxing real estate, with expropriation effects in the absence of a sufficient income. We can’t assume that this effect is totally unwanted; as a matter of fact, there are several ideological movements that believe that the capillary diffusion of real estate property could actually potentially hold back labour mobility. In this sense, it is important to remember that in our country it was indeed a renowned representative of this line of thought, Professor Mario Monti, as head of the Government, the one to more decisively promote ways of insuring real estate from seismic risk (see Law Decree No 59/2012), alongside developing policies that compressed internal demand, and so income. If, on the contrary, this effect were undesirable, it would be necessary to also accompany models based more or less extensively on forms of insurance with expansionary economic policies to support income, so as to generate the necessary savings to allow for a widespread sustainability and to enhance the only true benefit that the insurance model could guarantee: incentivizing behaviours aimed at prevention thanks to an adequate modulation of the policies.

Finally, there are quite extreme forms of insurance models, which in many ways are not all that different from the well-known financial derivatives, which allow to distribute and maybe even enhance the risks linked to insuring catastrophes. These are the so-called “catastrophe-bonds” (or more synthetically, “cat-bonds”) – that is to say, financial assets issued by companies linked to an insurance agent/reinsurer, whose profit is linked to the occurrence of a natural disaster, which is essentially compared to a company going bankrupt (if the event occurs, the issuer does not give back the invested capital, or at least it does so only partially). However, the past experiences of financial engineering based on the diffusion of similar assets, potentially “toxic” ones, suggest considering these forms of financialisation as potentially risky and destabilising (see Froot, 2001; Kunreuther, Erwann, 2009).

3.2 Direct public policies

As it was said before, the public subject is also in the condition to develop policies aimed at improving the level of anti-seismic prevention; in this sense, the main tool is that of incentives, oriented toward promoting virtuous behaviours, giving up a part of tax revenue connected to certain processes, at least in the short and medium term.

An example can certainly be the so-called “earthquake-bonus”, that is the incentive recently introduced by the former Italian Government to support structural interventions on buildings, which are capable to improve the seismic risk segment they belong to (as defined by specific Guidelines), in order to strengthen an approach based on tax exemption on restructuring measures – which seems to have produced, over time, results that cannot be overlooked (according to ministerial sources, in 2016, more than 8 million taxpayers allegedly used tax exemption on building renovations in their tax return). Normally, extraordinary maintenance works too tend to be limited to aesthetics and planning, if we consider that only about 15% of interventions done in the decade 2001-2011 (which involved more than half the national housing stock) had interested structures (see Servizio studi della Camera dei deputati, 2014). Therefore it is important to incentivise real estate owners to proceed with technical diagnoses on their building’s structure’s capacity to respond to seismic events, and on the other hand to proceed with consolidating works to significantly improve the buildings’ performance.

Evidently, such measures also end up having expansionary effects in terms of public balance, and their efficacy cannot disregard the income availability of the involved subjects; this is the way to interpret the introduction, for insolvent estates, of the possibility to cede fiscal benefits to third parties in the form of tax credit, provided for by the 2017 Budget Act.

Furthermore, promoting incentives was part of a more structural initiative, capable of pursuing the goal to consolidate the widespread real estate in a systematic way and with the time continuity that we talked about many times: the Casa Italia Program, born after the earthquakes in August 2016 in the central regions. The task to define the contents of this projects was assigned to a specific Mission Structure at the Prime Minister’s Office, which in June 2017 produced a first report, which summarises the operation’s goals and gives a few lines of actions: the aim is not drafting a “rigid and all-encompassing program”, but rather promoting a “strategic and adaptive” approach, capable of stimulating and coordinating the various subjects that could potentially get involved. The report (Struttura di Missione Casa Italia, 2017) includes an articulated section that summarises the current state of the available knowledge after Technical Roundtables with several interested Institutions (which, curiously, do not include the “Land Area” of the Revenue Agency, with its relevant authority on Land Registry and Housing Market). The analysis allowed to evaluate the technical and coordination difficulties, starting from the seismic classification of the territory itself, and to produce an interactive platform (<http://www.istat.it/it/mappa-rischi>) that publishes available information on the risks (seismic, hydrogeological, etc.) and characteristics of the real estate (consistency, building techniques, time of its construction) – all on municipal basis. The intent would be to extend the database to the scale of every single building, but the technical obstacles (starting with the possibility to make the buildings’ logbook compulsory) and especially the citizens’ right to privacy made this perspective quite uncertain.

The feeling – supported by the first feedback and by the indications provided by the documents that have been drafted so far – is that, despite the initial promises, the only possible goal can be the optimization of the existing cognitive tools (starting with public databases) and the coordination of the already existing initiatives. Nothing has been predicted with regard to the structural conditions, starting with resources, trusting in the now usual model of the “best practices”, which however already proved its obvious limits many times (Lucchese, Santarelli, 2014); the mentioned document

talked about 25 million euros for pilot projects and an allocation of 100 million euros for an assessment of the almost 600.000 buildings believed to be at the highest risk, with the intention of raising the owners’ awareness. After all, we should keep in mind that it couldn’t have been possible to legitimately expect more from a technical structure, since the true problems are, as it has been said many times, mainly of a political nature.

3.3 Entrusting selection to the market.

In addition to the two approaches analysed so far – the first one being essentially of the financial type, and the second one based on incentive policies – a third approach can be identified, and it can be conceptually defined as focused on the market’s role.

It is necessary to start by saying that, in its ordinary dynamics, the housing market is not particularly perceptive to the topic of anti-seismic risk (see *Struttura di Missione Casa Italia*, 2017:99) – which is partially due to the uncertainty linked to both the time and the location of possible events, as it was repeatedly pointed out, and also probably to the radical divergence between the typical dynamics of the sector’s market (property cycles, with a scale of decades) and the dynamics of the seismic events (return periods that often last centuries or millennia). So, even in this case, the earthquake’s effects tend to be traumatic.

Instead, a preventive “market” approach would aim to translate the “risk” into a “price”; in order to accomplish this, regulatory tools could play an important role.

Let’s think, for example, about the proposal recently reiterated by sources in the Ministry of Infrastructures and Transport to bind the buildings’ lease/sale contracts to specific “stability certificates”, that define a sort of anti-seismicity class similar to the energy class introduced in 2012; the idea would be to build, over time, an actual archive, in line with the abovementioned project of a “buildings’ logbook”. Obviously there are some problems that are not easy to face, which range from the technical impossibility to proceed by individual building unit in the frequent case of apartment blocks (structural balance can in fact be evaluated only globally, differently from energy balance), to the perception, widespread among operators, that the systematic formal obligation to pay more ends up being mostly an undesired increase of the costs of lease and sale contracts. However, applying such a mechanism by linking an economic operation to a systematic classification could increase the market’s perception of the aspects connected to the structural quality of the buildings.

Translating this principle into operational terms isn’t easy, nor it is automatic; a parametric formulation has been attempted with the E.A.L. (Expected Annual Loss), an index that estimates the building’s annual loss of value in relation to the risk of an earthquake (Calvi, Sousa, Ruggeri, 2016) through the product of the return time expected for the seismic event (as it is known, this is a purely statistical calculation) and the entity of the expected damage (calculated in relation to the building’s structural characteristics). In addition to trying to orient the sector’s market – by affecting the prices and therefore incentivising the operators to optimise the buildings’ seismic performances – such an index could also help increasing the efficiency of possible large scale public intervention plans, allowing to focus resources mainly where the risk would be reduced the most, not necessarily where the risk is higher (there’s no guarantee that the two things will coincide).

4 | CONCLUSIONS

This paper tried to highlight the two key factors that is necessary to focus on in order to make the goal of prevention into no longer a utopia, but an actual opportunity:

- the indispensable implementation of appropriate economic expansionary policies, capable of providing the potentially interested subjects (both public and private ones) with the necessary resources;
- the definition of technical and regulatory tools capable of efficiently affecting an articulated and complex context and/or conveniently orienting the decisions of the players involved.

As a matter of fact, the capillarity of real estate, especially in our country, makes it so that there is a very tight link between widespread income availability and incentives' efficacy with respect to economically demanding programs to be implemented on the large scale. In the absence of political decisions in this sense, the efficacy of the tools that could be used would easily end up turning into expropriation measures for the less wealthy population, unless there are direct public interventions.

Once the socio-economic terrain has been turned fertile, the approaches can be different (public interventions or incentives, financial intermediation, market mechanisms) and each has its own interesting potential; the context's characteristics and the results gradually seen would help to define, over time, the most efficient and appropriate model in relation to the specific characteristics found.

In any case, defining a priori the appropriate political balance (at large) is a necessary prerequisite; this is a crucial element that explains the failures of the past decades and on which depends the perspective of a radical change of pace in terms of anti-seismic prevention, and more generally, of territory protection.

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