Università
Ca'Foscari
Venezia

MASTER'S DEGREE
IN ECONOMICS AND FINANCE

FINAL THESIS

HOLD THE NERVES

AN INQUIRE INTO THE COVID RELATED BEHAVIOURS OF GOVERNMENTS IN ITALY AND NETHERLANDS

Supervisor
Prof. Carlo Romano Santagiustina

Graduand
Sara Vescovi
ID number: 870443

Academic year 2019/2020

In memory of Virginio Vescovi,

a beloved grandfather

and a passionate economist

INDEX

INDEX OF FIGURES

INDEX OF MODELS

Chapter 2

Chapter 3

INDEX OF GRETL OUTCOMES

Chapter 3

CHAPTER 1:
INTRODUCTION

Research question

The aim of this thesis is to inquire whether market agents are rationally behaving as regard the Covid-19 threat and what biases are eventually affecting them in 2020. As a second step, we will look through the role of institutions in tackling systematic market shocks and so we will describe which strategies policy-makers applied to lead people towards better outcomes. At last, we will provide analytical evidence on policy making under uncertainty in Italy and in the Netherlands.

INTRODUCTION

The argument of this thesis is complex and potentially vast. Chapter 1 is meant to outline a simplistic playground in order to make sense of the aim of this thesis and of his main hypothesis. In particular, it offers a general overview of the subject matter, that is, Behavioural Economics, and discusses its approach to Public Health.
In this regard, there are divergent ideological assumptions, which entail a different protection of the collective interests at stake. However, regardless of this condition, health choices are difficult and strategic, so humans make recurring mistakes. Therefore, this chapter frames the Coronavirus Disease 19 systemic shock in economic terms and releases a chronology of the main events at a global level and at the level of some selected countries. Finally, based on the ideological and behavioural premises set out above, the author lists the macro theses on which she will tests the hypothesis of non-rationality towards the Covid-19 issue in the next chapter.

1. THE REASONS BEHIND BEHAVIORAL ECONOMICS

Although it is widely acknowledged that people make mistakes, traditional economics seems to neglect it. Indeed, the behavioural economists Thaler and Sunstein get right to the point: “If you look at economics textbooks, you will learn that Homo Economicus can think as Albert Einstein, store as much memory as IBM’s Big Blue, and exercise the willpower of Mahatma Gandhi”[i]. Whereas the neoclassical economic theory address Homini Economici as just full-reflective and full-cognitive characters, nowadays, most psychologists[ii] address human social behaviour as a combination of two cognitive systems, reflective and impulsive[iii], or System 1 and System 2, which are both complementary and rival at responding to external

stimuli. The former implies people consciously dwelling on decisions, spending long time, and employing a high cognitive effort. On the contrary, the last one trace back to associations of emotional and instinctual ideas, which often fit trivial and routine choices but, as well, could lead to systematic prejudices and suboptimal outcomes. Even thou it is not straightforward why humans keep on making the same mistakes, many scholars attempted to get through it.

Among all these, it is noteworthy that T.K. Das and Bing-Sheng Teng[iv] include a "contingent framework" between modes of strategic decision processes and kinds of cognitive biases. On one side, they support Frederick's[v] breakdown of choice making, for which humans come across thinking distortions from the very beginning (situation diagnosis), through the making up and the assessment of alternatives, until the end (decision integration). Therefore, each stage invoke a limited set of cognitive biases, which, Kahneman and Tversky's[vi] words, relate to three practical methods or heuristics: representativeness, availability and adjustment from an anchor. On the other side, they ground decision-making styles on Lyles and Thomas' theory[vii], such that each one has different biases to each process stage.

However, they do not question the benchmark role of the rational mode, in order to compare the Avoidance or status quo mode, the Logical Incrementalist or step-by-step mode, the Political or coalitional interests model and the Garbage Can or chaos mode. Behavioural Economics goes a step further and centralises the analysis and the fruition of cognitive biases in the decision-making process. That is a revolution in perspective as since economists definitely address human errors as opportunities to pursue better upshots into complex, ambiguous and uncertain contexts.

The early behavioural theory emerged within economists thank to Nobel Prize winner Herbert Simon (1916-2001)[viiiix]. He split rationality into two fields, arguing that the substantive part perfectly and quickly replied to external stimuli, while the procedural part was affected by inner boundaries of pre-existent expertise and cognitive skills. Hence, "bounded rationality" turned away from the Von Neumann-Morgenstein Expected Utility Theory (EUT)[x] and from many of its salient aspects, particularly utility maximization and fixed equilibrium in supply and demand. Thereafter, economists and behavioural researchers carried on proving systematic violations of EUT's premises, such as the static order of preferences.

Among them, Sarah Lichtenstein and Paul Slovic theorized[xi] and proved[xii] that the transitivity axiom is violated in risky games when the same questions are elicited differently (preference reversal), or, instead, when participants account outcomes with different unit measures

(procedural variance). Then, Amos Tversky and Daniel Kahneman, as already cited above, challenged the EUT such that decision makers not only adjust their propensity to risk according to their faith on future outcomes[xiii] (optimism and pessimism), but also they show more sensitivity to losses than to gains (loss aversion). In this regard, preference reversal occurs when people avoid good choices whenever the reference points are losses (prospect theory).

Finally, inside "Nudge. Improving decisions about health, wealth and happiness" , Richard H. Thaler and Cass R. Sunstein address Behavioural Economics as a branch of Choice Architecture, and policy makers as a set of Choice Architects. In such extent, researchers and counsellors play the role of counsellors to "those who are more knowledgeable". These behave as libertarian paternalists who arrange the context such that citizens and customers preserve the maximum legitimate freedom of choice, but, as well, they are willing to improve their choices under an aggregate perspective. However, this nudge is a breakthrough novelty in the mainstream economics, as since as, it makes possible to obtain a social welfare order of preferences, on the contrary of the Arrow's Impossibility Theorem [xiv]. Indeed Arrow's conditions of universality, non-dictatorship, Pareto-efficiency and independence of irrelevant strictly relate to ordinal, complete and transitive preferences, which are no longer feasible when dealing with bounded rationality and cognitive biases.

This suggests that nowadays the objective of the proper policy makers is no longer maximizing the function of social welfare based on the Principle of Individuality, but it is to protect the collective interests of society, based instead on the Principle of Solidarity.

2. BEHAVIOURAL ECONOMICS IN HEALTHCARE

Before going on, it is worth defining what the meaning of collective interests is. Concerning Bentham's welfarism, Felicifit Calculus summed individual interests into an aggregate measure, which would had embodied the community interests[xv]. On the other hand, though, solidarity among people implies the imperfect separation of individual preferences. In any case the welfare issues concerns most times the internalisation of negative externalities, which, of course, affects other people welfare.

This thesis concerns first the role of Behavioural Economics in the improvement of the health levels, in a broader sense[1]. In this regard, the next paragraph will overview the reasons why the acknowledged people shall pursue collective interests as those of group members in the long period. Then, a new paragraph will focus on two way to conceive Public Health, which gave rise to different health care systems worldwide. Therefore, it will follow a dissertation around the placement of cognitive biases in the decision processes of policy makers and their community members, in relation to health-related issues.

2.A Pursuing collective interests

It is widely known the majority of western societies adopt representative democracies, in which citizens delegate their decision power to governments and politicians, who ought to tie administrative and legislative actions to the safeguard of the collective interests. In turn, constitutions and other boundaries to representatives, provide the full recognition of the community into the set of one nation's citizens or inhabitants, regardless of age, gender, race, religions, political believes and professional status. Hence, those in power of private organisations must get stick to laws and regulations, as well to higher principles, such that they cannot achieve private interests indefinitely.

In particular, that is the "field of social dilemma"[xvi]. Broadly speaking, common people know which issues concerns collective interests and excludable interests as well the negative consequences on communities. As instance, they understand pollution and children obesity will imply higher costs in terms of services and human lives. However, similarly to Prisoner Dilemma's context, many times they still do not cooperate.

Game Theory links to that behaviour the struggle between the short-term and self-oriented interests of individuals and their long-term and collective-oriented ones.

On one side, in Behavioural Economics' jargon, preferences are time inconsistent[xvii]. That is people discount the worth of alternatives progressively in time, but, as since as preferences are present-biased, they might end up reverting their tastes when they definitely perceive the outcomes[xviii]. Likewise, hereafter underage students will be probably regret their unhealthy preferences and they will look for low-fat foods. Again, the preference

[1] https://www.who.int/about/who-we-are/constitution#:~:text=Health%20is%20a%20state%20of,belief%2C%20economic%20or%20social%20condition. Last visit 6 05 21 h.16.10

reversal will affect also those canteen managers who take as granted the current tastes, as they will more likely go into crisis or fail.

Of course, certain policy makers cannot fall through, even thou they cause severe shortcomings. These are –just some among all- central governments, local governments and ministries. Indeed, despite of any possible contrast within collective interests, the democratic systems involves, inevitably, contrasts between the kept of short-term electoral promises and the long-lasting structural reforms. Therefore, very often, the fulfilments of collective interests take long time and they call for long years of public debates as well as legislatives and constitutional changes.

On the other side, selfish-interests tend to overshadow the collective interest for many collateral reasons. First, organisations might embody stricter communities mostly because of historical and cultural reasons, such as a nation usually stands for just its citizens. Then, there is a Free Riding problem when trust among community members and with their representative lacks so that the need for sanctions raises to force cooperation towards communitarian goals[xix]. Finally, individuals act, wrongly, on their own because of many cognitive biases, of which I will display those related to health afterwards.

2.B The definition of Public Health

Public Health is the backbone topic of this thesis. This concept implies sharing a decent health level in a community, such that all members have full enjoyment of their human rights, at least as enlisted by the UN Human Declaration of Human Rights (UDHR)[xx].

As already depicted before, nowadays the maximisation of a Bentham's Social Welfare Function is no longer feasible. On the other hand, policy makers still disagree around the nature of Solidarity and that particularly mark health care strategies.

Indeed, according to American philosopher Thomas Samuel Kuhn[xxi], political and economic leaders take decisions, which push the majority within the scientific communities to model certain assumptions about the random connections of phenomena and, therefore, about future concomitances of events[xxii].

These tendencies are called Paradigms. Much often, they ground on the leaders' choice to look up to unconventional scholars, not unlike how nature favours mutations to adapt a species to new needs and circumstances (as instance: Ford H. and Taylor F.)[xxiii].

The same process works as well regarding the Principle of Solidarity in Public Health.

It is also worth looking through the distinction between Public Health and healthcare: the first is a state of fact or an unfulfilled condition, while the second is a set of facilities, goods and services, which involve some kind of organisation[xxiv].
The clash within diverse paradigms on solidarity occurs precisely around the ultimate purpose of healthcare, its raison d'ětre, whether it is public or private.

The neoliberal perspective: Netherlands

The philosopher John Rawls[xxv] is a main master of the liberal current of thought and rejects the utilitarian maximisation of Jeremy Bentham as since as the lack of solidarity leads to unavoidable violations to personal liberty. That is clear in his First Principle of Justice as Fairness, where he writes people benefit from their own liberties unless they respect others' ones. In addition, the Second Principle of Justice specifies that several levels of wealth may still exist providing the "least-advantaged members of society benefit most from redistributions of resources (Difference Principle). Regarding Public Health, the neo-liberals infer from the Theory of Justice that all citizens are indeed customers, so they all will get full satisfaction of their needs through an efficient market functioning of supply and demand. Therefore, that complies with the Principle of Solidarity, in a broad sense, as since as individuals are enough rational to pick up the best alternative within the limits of others' right of choice.
Netherlands requires all over-aged citizens to enrol in private health insurance programs, for short-term medical treatments. That is actually a default option so that the Dutch people should benefit from a decent state of Public Health. Indeed, the Health Insurance Act of 2006 regulates the market such that companies must attend strict regulation while providing elementary coverage, such as non-excludability, but they are still entitled to rise premiums for supplementary coverage, which are supposed to cover risk costs of Universal Coverage. Therefore, it arranges "equalisation payments" to companies[xxvi], which anyhow bare

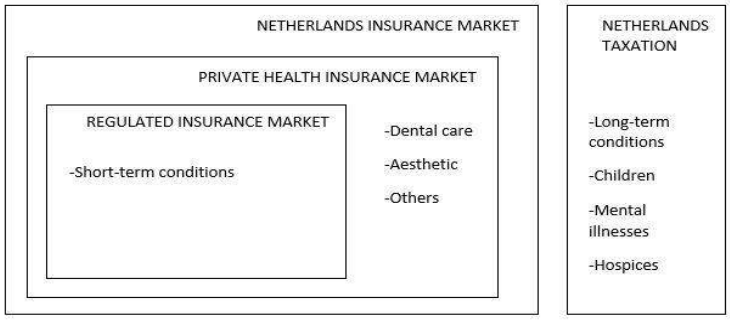

Figure 1.1-Scheme of Dutch healthcare system

excessive risk costs, through the public Health Care Insurance Fund (*Zorgverzekeringsfonds*)[xxvii]. In addition, social insurance schemes finance the healthcare for the chronic-ill, children, disables, mentally impaired and dying patients. These are what remains of the previous healthcare system, which, instead, was largely public-founded.

The welfarist perspective: Italy

The Welfare State theorists and their policy makers believe the Social State is in charge of the well-being of citizens. That is ultimately the provision of "equality in opportunity" required by the UDHR, but in a reinforced sense. Indeed, it means that public institutions are in duty to tackle all shortcomings and failures, which impede the fulfilment of the right of Public Health. The Single-Payer System is a straightforward example: the public institutions are the only one payer of all goods, services and infrastructures required to commoners to get decent health levels. Therefore, it follows that the public institutions deem the market failed when, dealing with weak and poor categories, supply does not meet demand. Economists label this case as a failure in presence of Public Goods. Consequently, it may say that the Welfare State supporters regard Public Health as a Pure Public Good and that policy makers are generally representatives of communities used to that approach.

This way Solidarity stands for both economic and social solidarity as since as the local institutions and central governments directly finance healthcare through public debts and payroll and/or property taxes, much often progressive, such that each taxpayer contributes to the well-being of himself and of all the other ones. Despite the similarity with the individual mandate system for which the obligation to insure is anyhow made possible by public resources (see Netherland above), the pure Single-Payer System gets rid of the insurance step and provides payments to the suppliers, whether they are public or private. Then, it stands apart from the neoliberal systems because it covers all the costs items, not just specific cases. Actually, there are still no national healthcare paying for all goods and services regardless any kind of needs, whether they are of primary importance, such as life-saving drugs and surgeries, or ancillary, such as, instead, aesthetic interventions. In this regard, in fact, there are diverging opinions on the extent of goods, services and infrastructures suitable to achieve adequate levels of Public Health. Consequently, the actualisation of the Universal Coverage Principle may differ within those nations adopting Single-Payer Systems of healthcare. According the major theorist of welfare, Sir William

Beveridge, contributions to Social Insurance Schemes are the alternative way to taxation to grant Universal Coverage, as since they do not stick to "the assumed capacity to pay"[xxviii]. Italy applies a Beveridge's model-based to its management of healthcare[xxix], according to which public institutions grant Universal Coverage of medical support via the Italian National Health Service (INHS) or *Servizio Sanitario Nazionale* (SSN) since 1978[xxx], and also on regional and managerial basis since 1992[xxxi]. In particular, Italy ties contributions to general taxation, intended as "the assumed capacity to pay" of individuals, so that it addresses the community as the households of local residents and legal immigrants. Nevertheless, the negative economic cycles along with tax evasion forced the government in 1989 to open to Out-of-Pocket payments[xxxii] for most of the population majority -largely known as "tickets" but actually case-specific taxation-, which in 2019 made up around 23% of total health expenditures. Therefore, the law does not prevent public and accredited private undertakers from competing with the INHS, but at full price, to cover through direct payments or private health insurances. In turn, they offer advantages in terms of time saving, high specialisation and customized diagnosis.

Figure 1.2-Scheme of Italian healthcare system

2.C Health-related choices

This thesis attends two premises when dealing with decision-making.

The first one concerns the study subjects, who are those demanding health-related goods, services and infrastructures. That implies community members are to make choices for their own good and consequent outcomes deliver benefits or shortcomings as well to other fellow citizens. Under an economic point of view, private choices entail cost opportunities, such that the best selections would not involve them at all. In real health decision contexts instead, the opportunity cost criteria is unsuitable as since as humans are not rational enough to get and to evaluate all information needed for comparisons within alternatives nor they

impartially assess the risks involved[xxxiii]. The same issues pertains also to suppliers of healthcare, and they are to make multilateral choices too, even though they take advantage of specialized skills and knowledge.

However, in democratic countries, public decision makers rule according to the will of the majority of those represented, either directly and indirectly, and, as Thaler and Sunstein claim, they owe their particular condition to a greater access to relevant information for the public purposes. Suppliers of healthcare and public institutions are both policy makers but they differ necessarily in interests, since the former ones are on case-by-case basis and so they are their associated behavioural biases. On the other hand, this thesis lingers on outcomes of aggregate behaviours and therefore it omits to discuss the issue of cognitive biases among healthcare providers. Thus, I suggest anyone who is willing is deepen the topic to read Campbell et al. (2017)[xxxiv], Saposnik et al. (2016)[xxxv] and Seshia et al. (2015)[xxxvi].

The second premise outlines the nature of "clumped-together" good Healthcare.

Indeed, I already claimed Healthcare is actually a set of items. If each citizen disposed of an equal-valued basket of health-related things, he would get through a standardized decision-making process. In reality, this is a strong assumption because it is straightforward choosing from over-the-counter medications is not comparable with the dilemma of whether or not to undergo a surgery.

In fact, it worth drawing down clarifications. As first, all goods affecting the state of one's health are health-related goods, so even food, cigarettes, drugs and alcohol matter. Even though public institutions usually theorize and arrange health policies on the outlook of the healthcare sector, commoners much often do not. This implies bounded-rationality on both parts: the former might overlook potential shortcomings; the latter might misunderstand which and on which extent their choices are health-related.

It follows community members might neglect many collective goals, such as achieving a decent level of Public Health, even if they share the same views with their representatives. As mentioned in a previous paragraph, children obesity is a medical issue and links to foods habits as well to one's distorted risk perception on future health. On the other hand, children usually enjoy junk food as since they put first its taste, cheap prices and social aggregation in consuming it[xxxvii].

Thus, the first two premises of this thesis lead to an additional premise involving the placement of cognitive biases. Indeed the extent by which one's believes (i.e. mental schema) matter more that objective phenomena is due to cognitive biases. I will explain this

issue much more in detail in the next two paragraph. In particular, I will first report pieces of literature about cognitive biases in health-related decision processes and then I will provide a simplistic schema on how these and mental schema influence the functioning of human mind.

3- COGNITIVE BIASES IN LITERATURE

Health-related decision processes are also strategic processes. That is any health-related decision faces uncertainty or ambiguity in whatever stage. Moreover, any health-related choice involves a number of aspects and linkages hard to cope with. Indeed, health-related choices do not just involve many economic sectors, but as well, they bring about consequences on the long-term, both on individuals and on the whole society. Consequently, any member of a community should spot and decline in advance any alternative causing negative externalities. However, human cognitive limits grant room to recurrent mistakes.

In the subsequent paragraph, I will look through health-related cognitive biases regarding risk-perception, time accounting and sociality as scholars detected so far. It will follow an argumentation about mental schemes with respect to neoliberal and welfarist streams of thought. Then, finally, I will submit a detailed description of libertarian paternalism according to Thaler and Sunstein, trying to figure out how the individual perceived utility function might be arranged in a common interest framework.

Risk perception

It is fundamental to discern uncertainty from ambiguity.

According to Shackle (1955): “There are utilities that you cannot know a priori, before a bet, so hypothesis on these utilities are difficult to banish from one’s mind: this is uncertainty”[xxxviii]. That is decision makers get surprised, as they have ever known all possible outcomes but they underrated the likelihood of certain events. Indeed, the weighting of probabilities depends both on innate risk attitudes and on risk perceptions. Once again, risk perceptions of health-related threats depend on affect towards someone or something and on someone’s experience[xxxix]. Loewenstein (2000) underlines the role of strong emotions along with feelings and basic physical needs in distorting deliberate decision-processes (***Affect***

Heuristic)[xl]. Besides, according to Kahneman and Tversky (1974), ***Availability Heuristic*** occur when "People assess the frequency of a class or the probability of an event by the ease with which instances or occurrences can be brought to mind. For example, one may assess the risk of heart attack among middle-aged people by recalling such occurrences among one's acquaintances"[xli].

Both of these heuristics relate to a certain grade of loss aversion. In addition to this, Kahneman and Tversky's Prospect Theory combines both risk perception and loss aversion in the way people sharpen their gut of risk avoidance once facing prospects of gains. They also brought about evidence around health-related choices regarding losses thanks to the famous test around a hypothetical "Asian disease": selected students from Stanford University and British Columbia University were asked to behave as US policy makers in charge to deal with an outbreak of an Asian disease, killing 600 people. Results from two tests showed off students are more risk averse in a frame of saved lives, and, on the contrary, more risk taking in a frame of fatalities[xlii] (***Frame Effect***).

Otherwise, health-related choices taken in ambiguous scenarios miss of probability weights. In general, Ellsberg proved people are ***Ambiguity Averse***, when uncertain frameworks are still available[xliii]. However, as since as this thesis concerns just health-related choices, I exclude other ambiguous-related issues, such as ambiguous clinical decisions and any possible trade-off within ambiguous health-related choices and other fields of ambiguity. In the first regard, I call to the articles of Pauker and Kopelman (1992, 1993, and 1994)[xliv]. Besides, I refer back to Curley et Al. (1984) who addresses specific preferences to ambiguous health-related alternatives with respect to ambiguous choices involving money[xlv].

Time accounting

As cited before, the challenge of the EUT axiom has been a major breakthrough for Behavioural Economics. Besides Kahneman and Tversky, other scholars attempted to revise it. In particular, Savage and De Finetti replaced its objective probabilities with subjective probabilities under uncertainty (SEU), thus keeping the axioms of Completeness, Transitivity and Continuity still valid[xlvi].

However, none of them look through the issue of intertemporal choices, which necessarily involve trade-offs between far-sighted and insane activities. That is typically the case of dull but healthy decisions against harmful but appealing practises. The exponential version of Samuelson's Discounted Utility Model (1937; from now on "EDU") took steps forward the

concepts of impatience (or time discount factor), prudent saving, self-binding capacity and endowment effect in relation to the trade-off choice between present and future consuming[xlvii]. Furthermore, Laibson's Quasi-Hyperbolic Discount Model (1997)[xlviii] looked to Loewenstein and Prelec (1992)[xlix] and showed off why people generally prefer present consuming (***Present Bias***) and why they –wrongly- presume they will maintain the same preference order in time (***Projection Bias***).

According to O'Donoghue and Rabin (1999), the Projection Bias is due to an irrational and **naïve** behaviour, while sophisticated agents are still present-biased but as well able to predict shifts in preference orders[l].

In addition, certain specific issues as children obesity can be analysed as a time inconsistency issue, even though academics still argue about many other factors implying abnormal weight gains (Courtemanche et Al, 2011[li]).

Sociality

This label relates to the theories of Social Learning.

The first traces back to Albert Bandura's 1971 homonym book[lii], according to which all individuals look up to other individuals, mimic them and deduce models in order to please their feelings, dispositions and conducts. That is a way to get learned of social phenomena with diverse outcomes. Indeed Social Learning necessarily links to systems of incentives and expectations, which might paradoxically lead to harmful results, especially regarding health-related issues. Outstanding examples are vaccine scares (Bauch et Al., 2012[liii]). Besides the involvement of several heuristics, such as Affect Heuristic, Risk Aversion and Framing Effect, experiments shows off the role of the ***Confirmation Bias*** as the increasing numbers of free-riding behaviours might push those uncertain to strengthen their fear around autism and so to avoid vaccines.

The other facet of Social Learning implies the ***Herd Effect.*** That implies people mimicking others' behaviours regardless of his/her information. A renowned citation is the Keynes' 1936 "Beauty Pageant" choice, whose judges, he claimed, did not opt for the most beautiful contestant, but rather for who they thought most complied with the public tastes. The same occurs as well in financial markets, when financial bubbles inflate prices and finally blow up and in medical tests (Cohen et Al., 2013[liv]). That is as well because it stood out a certain grade of Ambiguity Aversion towards scientifically unknown consequences.

Even though “wait and see” is a Nash Equilibrium Strategy according to Bhattacharyya et Al. (2011), it also is likely to peak contagions beyond controllability[lv].

In addition, herd behaviours rely on uncoordinated interactions. On a local basis, group identity allows better and more resilient connections between individuals[lvi]. Some ethologists, including William Hamilton, argue that serves as a way to avoid predators, as herds of herbivores typically do[lvii]. Therefore, whenever individuals face significant threats, they do not just align behaviours but also their feelings behind the choices made. That is the case of Mass Hysterias, which may lead people to overestimate risks and expected negative outcomes or even to spot threats whereas they do not exists (as instance rush for canned food during in US, 1962 [lviii]). Anyhow, it is hard to split panic buying from stockpiling as since as both call for large spending in goods, beyond normal expectation of consumption. Moreover, they follow systemic threats, whose psychological effects scientists cannot reproduce over a limited sample of participants. Thus, scientists generally spot panic buying behaviours after they take place in real environments but there exist still academic attempts to foresee them according to consumers’ discount factors and expected prices. However, this last topic outreaches beyond the ultimate scope of this thesis, that is to inquire the rationality of demand agents, and so I call to read Ching A.T et Al. (2017) for those willing to deepen it[lix].

Mental Schemes

The psychologist Jean Piaget first described Mental Schemes or Schema in 1923[lx]. These are a set of interrelated concepts, which humans pass by through generations to interpret the phenomenal world regardless of any data and scientific knowledge. According to Piaget, each individual own schema as since as they are cognitive filters to adapt to a social environment. Thus, people may either adapt thing along their schema or accommodate them to new challenges.

The thorny problem is that schema may outlive changing times whether there still exist communities sharing them, even thou they push people to behave counterproductive. Indeed schema imply cultural and identity factors, by which human build up and/or strengthen social ties. Hence, under a social perspective, one individual might gauge much more counterproductive to ruin his social relations at the present than to challenge current schema to address the emerging issues, especially if outcomes will come out in distant times. The evolution of collective schemes is then possible if cultural and identity factors

change at the same time when single individuals or tight minorities promote any novelties or existing opposing schema.

The divergent vision of Public Health of the neoliberal and the welfarist steams of thought are collective scheme, in a broad sense. In fact, both policymakers and citizens in the two nations I dealt with above, approach their national healthcare systems in diverse ways because they do not share the same concepts of what is Public Health, which are foreground issues and which goals are deemed to be pursued.

In fact, cognitive biases make people diverge from rational thinking and so it is in doubt whether cognitive biases affect first schema or vice versa. In the first case, collective schema bring about specific cognitive biases. In the second case instead, cognitive biases rely on individuals' specific biases, and that may underpin the concepts and linkages of shared schema. It follows that each individual is limitedly capable to modify his own schema, and eventually even influence to some degree those of the other agents. If that occurs, individuals modify their social environment through altruism because of non-separable preferences.

However, that case does not rule out the possibility that an individual performs biases because of sharing schema.

Libertarian paternalism

As I already discussed about, there is a gap between the welfare point of view and the neo-liberal stream of thought. The first mind set implies bounded choices upon individuals, that is public authorities are in charge of providing public goods, but at the cost of cutting off citizens' opportunities to free-run. In a certain ways it follows that public decision makers distrust the goodwill of citizens and so they establish rules and laws in order to try to ensure the outcomes that maximise a specific (social) welfare function. Therefore, the paternalistic point of view rules out that people are capable to choose on the collective best interests. On the contrary, neoliberalists claim that all individuals are fully aware of the benefits and drawbacks of each alternative. According to the latter, liberty of choice is even essential to comply with representative democracies. Although Thaler and Sunstein's "libertarian paternalism" sounds like an oxymoron, it drew the eyes of many policy makers. It is actually an interesting attempt to conjugate the two schema on Public Good, and, on specific purpose of this thesis, on Public Health. As mentioned above, libertarian paternalists or new paternalists believe that policy makers are Choice Architects, who nudge free-decision

makers towards “better ends”. However, that does not mean that policy makers are bias-free: as since as they are representatives, they do care of mental schema of the majority to seek for political consensus. There is a rich literature about the trade-off of consensus against spotting changes. In a behavioural framework consensus is an instant reward, while spotting changes yields time-delayed reward, as political stability. As instance, Calvo and Martin (2010) claimed the first minister of Spain, Mr Zapatero, put great effort in empowering of violence-victim women as never done before and that increasingly grew women’s consensus towards his party[lxi]. Then in a Kuhnian perspective, Policy Makers outline the agendas of scientific communities, thus reinforcing their footprint on society (see: Cole and Fiore, 2014 on tobacco in US during 1964)[lxii].

It then follows another issue: the compliance to rules. In fact, libertarian paternalism does not rule out prohibitions and regulations, whose extent is actually a stir among academics. Indeed, nudging activities call for acceptance in the large public, which means that, by the same time, people must trust the policy makers and these, in turn, must observe the right of privacy (Evers et Al., 2018)[lxiii]. Therefore, traditional rules apply whenever nudges are inapplicable or policy maker are not able to apply them.

It also follows logically that there exist a risk of behavioural manipulation, whose exceeding limits are likely to harm the policy makers themselves. I believe that is why all policy makers do not usually directly determine nudges on their own, but they rely on external expert or on consulting bodies, such as the Behavioural Insight team in UK. Anyhow, I will address this topic further in this thesis. Now it is important to underline that behavioural nudges may be effective tools to counteract the impacts of schema and cognitive biases and that, if they succeed, they bring changes on the state of affairs.

4- COMPLEXITY IN HEALTH-RELATED DECISION-MAKING

Overall, all health-related baskets of items imply complex decision-making process, with no trivial outcomes. In this regard, I outline a simple schema on how mental schema and cognitive biases affect the way people approach to health-related choices, according to Frederick’s[lxiv] decomposition of decision processes, as cited at the beginning of this thesis. I also apply the System 1 and System 2 distinction of Kahneman and Trevsky in order to draw out the several variables affecting health-related decisions. In particular, I label System 1 as the set of all variables involving objective phenomena, while I address System 2 as the

factors building up Mental Schema and which are out of fully conscious control. Moreover, System 1 and System 2 also generate a "Composited" set of variables, according to which individuals are not able to split the role of external phenomena and mental schemes. In this regard, I call to read Rothe C. (2015) on the roles of covariance and Composition Effect in determining individual-specific reasoning[lxv]. Anyhow, I will discuss further this schema in chapter 2, in relation to the models of individual and aggregate perceived utility of consumption of health-related goods.

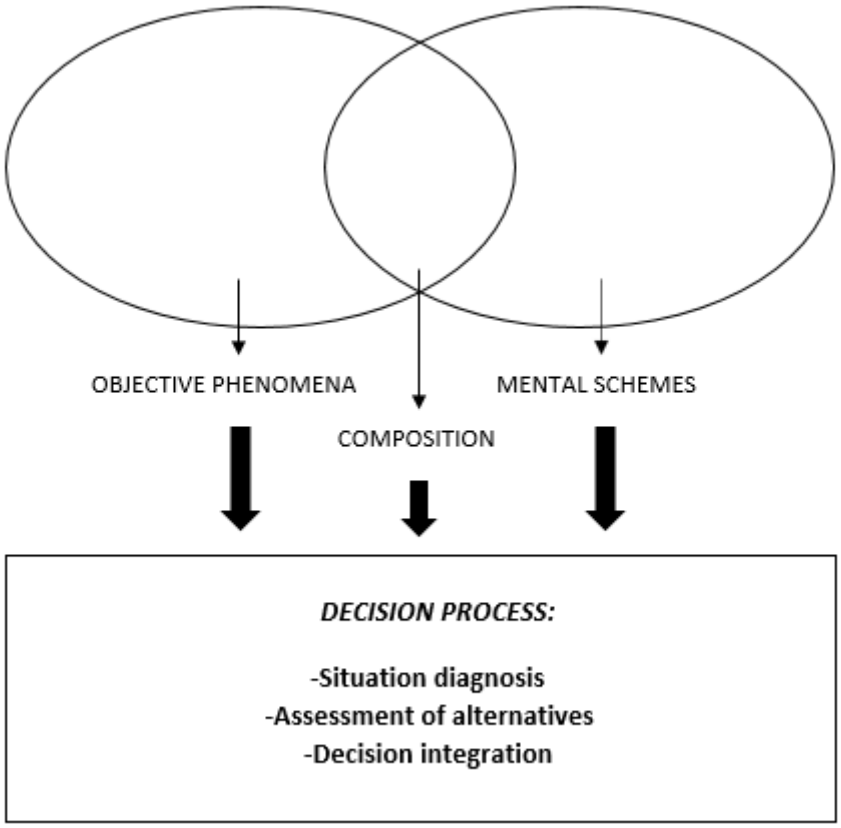

Figure 1.3-Scheme of mental processes involved in health-related decision-making

5- A NEW THREAT: CORONAVIRUS DISEASE

Coronavirus Disease or Covid-19 is a new disease caused by SARS-COV 2, which stands for Severe Acute Respiratory Syndrome Coronavirus 2 because of it genetic similarities with the SARS-COV 1 of 2002-2004[lxvi]. Virologists classify both as positive-sense single-stranded RNA viruses but according to the World Health Organisation (WHO) SARS-COV 2 is ten times more receptive on humans than how its genetic predecessor was[lxvii]. At the

10th of November the WHO publicly acknowledged as common symptoms fever, dry cough and fatigue while as some severe symptoms pneumonia and confusion. Because of its high reproducibility, SARS-COV 2 has been worldwide spreading since at least January 2020, bringing about almost two million deaths by the end of 2020.
As I previously written the aim of this thesis is to check if health-related choices are consistent with rationality, with special focus on behaviours towards the Covid-19 disease. In order to accomplish that task I need first to draw down a timeline including the WHO advices and the measures taken by the four country, which I selected according to their specific approach to Public Health and market of healthcare. In particular, I wrote the below table inserting the main legislative measures and public relations interventions undertaken by governments and public institutions at central or federal levels.

That is I employed the following selection criteria of contents:

- -expected behavioural effects on personal choices;
- -likely of causing aggregate effects on the spread of Covid-19;
- -impacting habits and health-related consumptions;
- -at least nation-wide targeted;
- -about non-exclusive interests;
- -from official communication sources.

I also remark I labelled “Country” as the area in which measures took place over the period 31/12/2019-31/12/2020. The claims and advices of the WHO pertain to the whole set of participants to that private organisation, not to the entire world. That is why I address the WHO as a country on its own.
Finally, I did not fulfil this table of information recoveries and deaths on purpose. I just report first cases of infections in order to outline the beginning of the epidemics in each country. Indeed, I will make this data available when I will perform data analysis in Chapter 3.

TIMELINE OF EVENTS RELATED TO COVID-19		
DATE	*COUNTRY*	*DESCRIBTION*
31/12/2019	WHO	The municipality of Wuhan, Hubei (China) reported cases of pneumonia to the Chinese WHO office.[2]
30/01/2020	WHO	The WHO claimed Covid-19 to be Public Health Emergency of International Concern.[3]
30/01/2020	Italy	Prime Minister Giuseppe Conte announced two first cases of Covid-19 disease. In a press conference, he claimed, "the situation is under control".[4]
31/01/2020	Italy	The Council of Ministers declared the state of emergency over six months.[5]
11/02/2020	WHO	The WHO called the virus as Covid-19.[6]
27/02/2020	Netherland	First reported case of Covid-19 disease to WHO.[7]
4/03/2020	Netherland	The Dutch Ministry of Foreign Affair advised to avoid travelling to Northern Italy.[8]
8/03/2020	Italy	The Government quarantine Lombardy along with other 11 provinces to prevent large-scale contagion.[9]
9/03/2020	Italy	The Council of Ministers lifted up a national lockdown to continue until 3rdApril (then postponed 18th May). Only essential business open. Borders closed. 14-day quarantine for the sick and their contacts always mandatory. Face masks always mandatory.[10]
11/03/2020	WHO	The WHO called Covid-19 as a pandemic.[11]
12/03/2020	Netherland	The Government urges to work and from home. Advices to avoid social contacts and to stay at home in case of alarming symptoms.[12]

[2] https://www.who.int/news/item/27-04-2020-who-timeline---covid-19; last visit h. 17.46 14/01/2021
[3] See footnote (1)
[4] https://www.agi.it/cronaca/coronavirus_due_casi_italia-6980052/news/2020-01-30/; last visit h.19.06 14/01/2021
[5] https://www.gazzettaufficiale.it/eli/id/2020/02/01/20A00737/sg; last visit h.19.07 14/01/2021
[6] See footnote (1)
[7] https://www.rivm.nl/en/novel-coronavirus-covid-19/archive-covid-19-updates; last visit h.17.59 14/01/2021
[8] https://www.dutchnews.nl/news/2020/05/coronavirus-a-timeline-of-the-pandemic-in-the-netherlands/; last visit h.18.12 14/01/2021
[9] https://www.gazzettaufficiale.it/eli/id/2020/03/08/20G00029/sg; last visit h.19.09 14/01/2021
[10] https://www.gazzettaufficiale.it/eli/id/2020/03/09/20A01558/sg; last visit h.19.11 14/01/2019
[11] See footnote (1)
[12] See footnote (5)

15/03/2020	Netherland	Prime Minister Mark Rutte declared the beginning of the "Intelligent Lockdown" until 6thof April: to close schools, to maintain social distancing and to close bar, gyms and fitness venues. [13]
16/03/2020	Netherland	Prime Minister Mark Rutte cited "population immunity" as the aim of his government during an official TV broadcasting.[14]
17/03/2020	Italy	The Government delivered the "Decreto Cura Italia", economic funds to support economy, labour and households.[15]
17/03/2020	Netherland	The Government created the NOW financial scheme to let employers to pay wages. The Employee Insurance Agency (UWV) opened submissions until 31st May 2020.[16]
23/03/2020	Netherland	The Dutch Government banned gatherings of more than 3 people. Ban also on "Contact Professions". Other shops open as long as comply with social distancing.[17]
31/03/2020	Netherland	"Intelligent Lockdown" extended until 28th April 2020.[18]
6/05/2020	Netherland	Cabinet published a plan for staged relaxation, conditional to social distancing. Face Mask made compulsory form 1stJune.[19]
5/06/2020	WHO	The WHO recommended the usage of facemasks to prevent contagion where social distancing is not possible.[20]
15/06/2020	Italy	The Government launches the Immuni App, to track on land the movements of the diseased.[21]

[13] See footnote (5)
[14] https://www.government.nl/documents/speeches/2020/03/16/television-address-by-prime-minister-mark-rutte-of-the-netherlands; last visit h.19.12 14/01/2021
[15] https://www.gazzettaufficiale.it/eli/id/2020/03/17/20G00034/sg; last visit h.19.19 14/01/2021
[16] https://www.government.nl/latest/news/2020/03/19/coronavirus-dutch-government-adopts-package-of-new-measures-designed-to-save-jobs-and-the-economy; last visit h.19.15 14/01/2021
[17] See footnote (5)
[18] See footnote (5)
[19] See footnote (5)
[20] https://apps.who.int/iris/handle/10665/332293 ; last visit h.17.51 14/01/2021
[21] https://www.ilsole24ore.com/art/immuni-via-dall-8-giugno-4-regioni-app-scaricata-2-milioni-italiani-ADb3l8V?refresh_ce=1; last visit h.19.22 14/01/2021

6/07/2020	Netherland	The Employee Insurance Agency (UWV) opened submissions for the NOW2 job retention scheme to allow employers to pay wages. Valid within 6/07/20-31/08/2020.[22]
29/07/2020	Italy	The Council of Ministers extended state of emergency to 15th October 2020.[23]
1/10/2020	Netherland	The Employee Insurance Agency (UWV) opened submissions to the NOW3 job retention scheme to allow employers to pay wages. Valid within 1/10/20-31/12/2020, in first phase.[24]
7/10/2020	Italy	The Council of Ministers extended state of emergency to 31st January 2021.[25]
13/10/2020	Netherland	The Dutch Minister of Justice imposed a partial lockdown over 4 weeks from 14th October.[26]
17/10/2020	Netherland	The Government launched the CoronaMelder App, a GPS-based app to track infections.[27]
28/10/2020	Italy	The Government launched the "Decreto Ristori", new economic aids linked to the new Covid-19 restrictions.[28]
3/11/2020	Italy	The Council of Ministers assigned diverse risks and rules to regions, according to contagion rates. Valid from 5/11/2020 to 3/12/2020.[29]
15/12/2020	Netherland	The Government ordered the "Forced Block" of the nation: schools and non-essential shops closed until 19th January 2021.[30]

[22] https://www.pwc.nl/nl/actueel-en-publicaties/belastingnieuws/loonbelasting-en-sociale-verzekeringen/details-now-2-regeling.html; last visit h.18.18 14/01/2021
[23] https://www.gazzettaufficiale.it/eli/id/2020/07/30/20A04213/sg; last visit h.19.24 14/01/2021
[24] https://www.pwc.nl/nl/actueel-en-publicaties/belastingnieuws/loonbelasting-en-sociale-verzekeringen/voorwaarden-van-now-3-en-aanpassingen-in-now-1-en-now-2.html; last visit h.18.19 14/01/2021
[25] https://www.gazzettaufficiale.it/eli/id/2020/10/07/20A05463/sg; last visit h.19.25 14/01/2021
[26] https://www.government.nl/latest/news/2020/10/13/partial-lockdown-needed-to-bring-down-infections; last visit h.18.24 14/01/2021
[27] https://www.rijksoverheid.nl/onderwerpen/coronavirus-app/nieuws; last visit h.18.25 14/01/2021
[28] https://www.gazzettaufficiale.it/eli/id/2020/10/28/20G00166/sg; last visit h.19.26 14/01/2021
[29] https://www.gazzettaufficiale.it/eli/id/2020/11/04/20A06109/sg; last visit h.19.27 14/01/2021
[30] https://www.government.nl/latest/news/2020/12/14/lockdown-in-order-to-minimise-contact-between-people; last visit h.18.28 14/01/2021

4/12/2020	Italy	The Council of Ministers put limitations on business and movements up to 15th January.[31]
27/12/2020	Italy	First vaccinations to healthcare workers.[32]

When dealing with Covid-19, all policy makers and citizens faced health-related choices, which are ought to influence the state of Public Health. The major initiative to tackle the virus were social distancing and wearing mask because of the possible negative externalities of people choices. Thus, Policy Makers either played as rulers and advisors, as I wrote in the previous paragraph.

Nonetheless, the spread of Covid-19 had an enormous amount of different effects on every field of human life and so it caught the eyes of many academics and experts. At the end of 2020, there still existed a vast literature, even thou most of the work is in the form of working papers. In the next paragraph, I will report some examples on the themes of greater importance for the thesis that is the economic implications and the aggregate behaviours.

Literature on Covid-19

It is worth underlining that any research in Behavioural Economics cannot leave aside the observation of consumptions and investments or of both ones. Indeed, getting through the aggregate behaviours with regard to Covid-19 actually means to inquire into their effects on the Growth Domestic Product of a nation. Under a macroeconomic perspective, Covid-19 brought about a systemic shock, which took over all sectors. Maliszewska et Al. (April 2020) wrote a working paper specifically on the consequences on GDP and on International trade[lxviii]. Nicola et Al. (April 2020) instead looked to the role of the pandemic by the primary, secondary and tertiary sectors, also giving examples[lxix]. Then, other authors looked into the financial market and they outlined likely linkages with government's interventions. These are Ashraf[lxx] (September 2020), who inquired the effects of social distancing, containment and income supports on global financial markets and Albilescu[lxxi] (July 2020), who told about how volatility scattered in US stock markets. Finally Kamdem et Al. (November 2020) drew down a model of Commodity price and developments in Covid-19[lxxii].

[31] https://www.gazzettaufficiale.it/eli/id/2020/12/03/20A06767/sg; last visit h.19.29 14/01/2021

[32] http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioNotizieNuovoCoronavirus.jsp?lingua=italiano&menu=notizie&p=dalministero&id=5242#:~:text=Il%2027%20dicembre%20in%20tutta%20Italia%2C%20cos%C3%AC%20come%20in%20tutta,di%20vaccinazione%20anti%20Covid%2D19.; last visit h.19.30 14/01/2021

On the consumption side, it is hard to cite comprehensive articles. In fact, authors had rather concerned about individual phenomena than on global effects of coronavirus. That is because nations still preserved distinct consumption patterns during the epidemic and policy makers took up diverse strategies to lift up household expenditures, as you can see in the above timeline. For instance, Raifman et Al. (July 2020) argued about the effects of US unemployment insurance on food security[lxxiii]. In Italy Cavazza et Al. (2020) inquired the rise of private consumption on healthcare[lxxiv].

Finally, I turn to the behavioural responses to Coronavirus of citizens and their Policy Makers. The effectiveness and readiness of health-related choices were due first to the predictability of a pandemic assigned by each nation. On future purpose, I just recall here that, in business jargon, unforeseeable and ruinous events are called "Black Swans[lxxv]"(Taleb, 2007) while highly predictable but overlooked events are called "Grey Rhinos[lxxvi]" (Wucker, 2016). Then there are White Swans events, which are highly destructive but predictable [lxxvii] (Terzi, 2010). Besides, Loxton et Al. (July 2020) focused on the consumer behaviour and on how coronavirus upset priority of needs via Herd Effect and Panic Buying[lxxviii]. Furthermore Chan et Al. (November 2020) dealt with changes in risk aptitudes related to mortality and rate of contagion looking at people's mobility to certain facilities[lxxix].

Finally, many academics already wrote of specific cognitive biases with regard to Covid-19 as since as aggregate behaviours are usually fundamental variables during pandemics and Public health is at stake. Indeed, irrational behaviours are likely to cause negative externalities on others' health and on demand of healthcare as well on the functioning of public economics measures. As instance, Harper et Al. (April 2020) suggested that much more fear pushed people in UK to comply better with rules preventing Covid-19 (Affect bias)[lxxx]. Soofi et Al. (May 2020) argued that Present Bias and Framing Effect were the reasons why citizens disregarded rules and behavioural measures[lxxxi]. Putri et Al. (October 2020) shed light on availability bias and herd behaviour among investors worldwide[lxxxii]. Islam et Al. (October 2020) wrote about panic buying events in an international comparison[lxxxiii]. In addition to these, Bargain and Aminjonov (December 2020) observed that mobility significantly reduced wherever trust for policymakers was higher before the pandemic[lxxxiv].

Nevertheless, this thesis address an inedited issue, which is the connection between mental schema and outcomes in terms of virus containment, deaths and spending. In order to reach that result I will also get through a subject so far discussed only informally, namely the nature

of Covid-19 according to the variables of extent of economic destruction and amount of available information.

6- RESEARCH SUBQUESTIONS

The Research subquestions that follow are the backbone of this thesis, as I will prove my research question through them. In particular, under the wide scope of testing rational behaviour in Covid-19 times, I will inquire the presence and the allegedly role of cognitive biases in producing positive and negative outcomes in the Netherland and Italy.
Then, I will proceed to check if the schema on Public Health adopted by their leaders are affecting the human lives and economy. Finally, I will test if there is actually a trade-off between preserving human life and boosting national economy. Overall, I outline hereunder the scientific research questions I am going to model in chapter 2 and, finally, to test in Chapter 3.

Subquestion 1: Was Covid 19 a Black Swan?

That is to check if policy makers could have foreseen its occurrence and if they could had mitigated the risk on health and on economy. This question is also supposed to unfold why certain countries took measures priory then others.

Subquestion 2: Did cognitive biases affect all countries in the same way?

That is to understand how differently the above-cited countries reacted to the Coronavirus threats. Indeed if all reacted in the same way, it would mean that there was an only possible rational reaction to these stimuli.

Sub-question 3: Did a trade-off exist between economy and health?

That is to understand further if Mental Schema were effective during Covid-19 times. In fact, I assume that if a trade-off subsisted, then the neo-liberal oriented countries would put ahead the economic goals, while the welfarist countries would prioritize the solutions to the health issues. That is because of their different regards to the role of citizens and the way they may fulfil their needs.

CHAPTER 2:

THEORY

INTRODUCTION

The objective of this chapter is two-fold.
In the first part, I set up a system of models in order to explain how individuals and society maximize their perceived utility in consuming health-related goods.
In the second part, I will put up the sub-questions of chapter 1 as hypothesis in the framework of the micro and the macro models depicted before. Henceforth, I will outline the limits of each level in terms of availability of data in order to address the methodology of tests in chapter 3.

1-BASIC FUNCTIONING OF HUMAN MIND

This thesis deals with the objective of health of people, in relation to the Covid-19 pandemic. First, it acknowledges that also risk perception of getting ill, through psychological processes, affects health as general human wellbeing. Therefore, I recall here the definition of Health according to the WHO: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"[33]. That is why utilities comprehend two sets of consumptions: those related to personal assessments of risk, involving System 2, and those only concerning objective information (System 1). For simplicity, I assumed that utilities pertain to individuals who are average representatives, such that their utilities are no more agent-specific, as I will discuss in deep later on. In this way, it is also possible to separate preferences, which brings about social welfare functions by additions. Consequently, alternatives of consumptions are not of specific goods or of baskets of goods, but of homogeneous good in the two sets cited above.
Overall, this first paragraph is to model the mind processes involved in the decision process toward goods related to Covid-19. In particular, the models will address the individual choices as micro level and the society choices as macro level. Thus, in this framework, I suppose that the ultimate goal of policy makers is to push single agents to choose an ideal basket of goods (from a health perspective), which is also the one that maximizes the social planner's welfare function.

[33] https://www.who.int/about/who-we-are/constitution last visit 12 05 21 h.15.37

Micro level

As I already addressed in chapter 1, individuals' health related choices are based on objective information, mental schemes and composite effect of the latter two. In modelling terms, this implies that the utility derived from consumption depends on objective information as well on prior beliefs of people. Therefore, the variable "Composite" (P) spots the extent by which the variables "Objective Phenomena" (O) and "Mental Schemes" (S) cross in. Hence, I may build up an initial regressive model for the individual perceived utility from consumption of health-related goods.

$$U_{i,t}\,(c_1, c_2, O, S, P) = \vartheta_0 c_{1,i,t} + \vartheta_1 c_{2,i,t}^{O^{\alpha} S^{\beta} P^{\gamma}} + \varepsilon_i$$

$$\begin{cases} U_{i,t} \;\; utility\ of\ consumer\ i\ at\ time\ t \\ c_{1,i,t} \;\; Covid-risk-free\ consumption\ of\ i\ at\ time\ t \\ c_{2,i,t} \;\; consumption\ of\ i\ at\ time\ t\ at\ risk\ of\ Covid \\ \alpha \;\; weight\ of\ O\ on\ c_{2,i,t} \\ \beta \;\; weight\ of\ S\ on\ c_{2,i,t} \\ \gamma \;\; weight\ of\ P\ on\ c_{2,i,t} \\ \alpha > 0 \\ \beta > 0 \\ \gamma > 0 \\ (\alpha + \beta + \gamma) < 1 \\ \varepsilon_i \;\; error\ term \end{cases}$$

Model 2.1-Regression model of individual perceived utility

There are two kinds of health-related consumptions: those not likely to get affected by Covid-19 related risks (c_1), and those that are perceived to be affected by Covid-19 related risks (c_2). Particularly, the potentials of O, S and P define their weights on the latter.

Each individual is characterized by specific parameters, which determine the weights of the three variables. For simplicity, I assume they concern only the Covid-19 topic and that the effect of cognitive biases is up to the weights of beta of Mental Schemes and of gamma of Composite effect variable. However, policy makers influence the weight of P, as it is also the result of their efforts in terms of regulations and nudges. Therefore, alpha and beta sum up as the difference of gamma from one.

$$\gamma_{i,t} = \pm\chi_i obligations_{i,t} \pm \psi_i prohibitions_{i,t} \pm \varrho_i effect\_nudges_{i,t} \pm \aleph_i others_{i,t} + \Im_{i,t}$$

$$\begin{cases} \gamma_{i,t} \in (0,1) \\ \gamma_{i,t} = 1 - \alpha_{i,t} - \beta_{i,t} \\ \chi_i, \psi_i, \varrho_i, \aleph_i \quad slope\ coefficients\ by\ individual\ innate\ propensities \\ \Im_{i,t} \quad error\ term \end{cases}$$

Model 2.2-Regression of coefficient gamma

Model 2.2 is particularly significant as it looks into the two ways to have public policies against the spread of Covid-19: the coercive strategies and the nudging strategies. In particular, obligations and prohibitions fall into the tools of the first set while "nudges" rely on citizens' trust for public information. In this last case, governments are able to influence the public risk perception with respect to Covid-19 as far as rho coefficient increases. In order to highlight the effects of these two kinds of public policies on consumptions related to risk perception, i subtracted c1 consumption from the regressand.

Finally, it is essential to outline the nature of Objective Phenomena and Mental Schemes. As cited in Chapter 1, they cross over as two sets of variables, which include many factors. To make it clearer, I outline below two linear regressive models of, respectively, $O_{i,t}$ and $S_{i,t}$ in case gamma coefficient of $P_{i,t}$ is zero. Let us note here that qualitative variables require score scales to fit the model.

$$O_{i,t} = \boldsymbol{\gamma}_1 age_{i,t} - \boldsymbol{\gamma}_2 health_{condition_{i,t}} + \boldsymbol{\gamma}_3 drug_{consumption_{i,t}} + \boldsymbol{\gamma}_4 others_{i,t} + \epsilon_{i,t}$$

$$S_{i,t} = \partial_1 risk\_aptitude\_level_{i,t} - \partial_2 patience_{level_{i,t}} + \partial_3 altruism_{level_{i,t}} + \partial_4 emotional_{impact_{i,t}} + \partial_5 memory\_impact_{i,t} + \xi_{i,t}$$

$$U_{i,t}(c_1, c_2, O, S, P) - \vartheta_0 c_{1,i,t} = \vartheta_1 u_{i,t}(c_2, O, S, P) + \varepsilon_{i,t} = \vartheta_1 c_{2,i,t}^{(o_{i,t})^{\alpha}(s_{i,t})^{\beta}} + \varepsilon_{i,t}$$

Models 2.3-Regressions and Utility from mind processes with null gamma

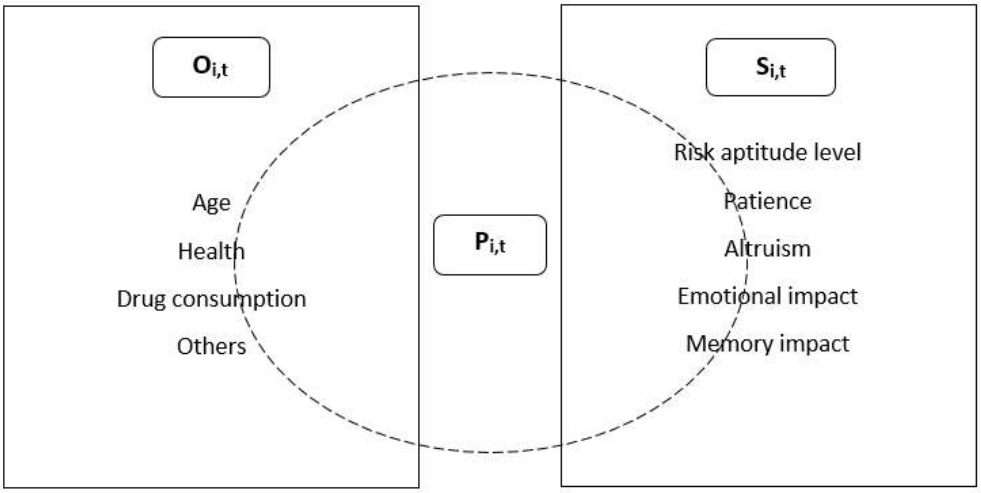

Figure 2.1-Scheme of individual mental sets

In this case, it is usually suggested to inquire if the coefficients are significant or not, in order to make sense of hypothesis on cognitive biases. As instance, one may test if present-bias is affecting decision processes through a significance test on patience slope coefficient. Note also that variables are time-varying because of "t" subscript and that coefficients' sum is less than 1 in the Cobb-Douglas potential factor of Model 2.1. That means that, in time, utility by risk-perception-related consumption does not "explode" at micro level or, alternatively, individual functions are concave, with decreasing marginal utility. Therefore, the models seemed before rule out that individual utilities are not stationary since they all are to converge to a same maximum choice (or homogeneous good) in case of average agents. On another hand, that also imply that choices in 2020 did not depend on previous choices of 2019, as in a AR(1) model, but there may be still stationary time series of variables different from individual utilities, in case any shock during 2020 did not have a long-lasting effect on decisions (see Chapter 3).

Macro level

As cited in Chapter 1, I can sum up individual utilities because of perfect separability of preferences. Dealing with the static model is an issue as since any individual may opt for a certain basket of goods depending on which other baskets of goods the remaining agents select. In the previous paragraph, I got through it, including altruism as a score variable, which yet addresses the degree to which people care for other's wellbeing. According to Fehr and Schmidt (August 1999), this phenomenon is actually due to Inequality Aversion[lxxxv]. It implies all individual to cut down utility from consumption through "guilt" and "envy"

parameters. Below I report the individual model of perceived utility from consumption with these person-specific parameters.

$$U_{i,t}(c_2, O, S, P) = c_{1,i,t} - \vartheta_i \sum_{i \neq j} \max(c_{1,i,t} - c_{1,j,t}, 0) - \epsilon_i \sum_{i \neq j} \max(0, c_{1,j,t} - c_{1,i,t}) + u_i\ (c_2, O, S, P) + \varepsilon_{i,t}$$

$$\begin{cases} 0 < \vartheta_i \leq 1 \ \ guilt\ coefficient \\ \epsilon_i \ \ envy\ coefficient \\ \epsilon_i > \vartheta_i \end{cases}$$

Model 2.4 -Individual utility with other-regarding preferences

It is noteworthy that, even thou individual perceived utility is virtually not additive because of other regarding preferences, the perceived individual utility is still separable.
As since as this thesis generally aims to inquire human rationality towards Covid-19, I can get rid of all parameters and variables relating to consumptions levels out of non-Covid-19 interest, according to the same reasoning applied in the previous paragraph. Thus, the social perceived utility function makes up of additions of individual perceived utilities from mental processes, as in model 3.

$$U_{\sum_{i=1}^{n} u_{i,t}} = \sum_{i \neq j} u_{i,t}(c_{2,i,t}, O, S, P) + \xi_t = \sum_{i \neq j} c_{2,i,t}^{O^{\alpha} S^{\beta} P^{\gamma}} + \xi_t$$

Model 2.5 -Societal perceived utility of consumption from mental processes only

Model 2.5 already implies that the whole society has a concave social welfare function with decreasing marginal utility. However, this thesis may prove social choices as rational only if all societies, namely the Italian and the Dutch nations, pick up the identical alternative of homogeneous good. That is whether their governments take and implement the same strategic decisions to take over the Covid-19 pandemic and all its related issues. It follows

that all average individuals in both nations must have the same order of preferences and the same shape of function.

However, this reasoning call for no-significant impacts of Covid-19 variants, such that there not exist many diverse optimal responses to each virus mutation, given the scientific knowledge at the 31st December 2020.

Furthermore, all individuals, as average agents, had to assign the same weight to each issue of interests, starting from the same variables. Thus, I can write down at least two additive societal utility equations: the societal utility from direct-healthy consumptions and the societal utilities from goods depending on economic factors, which may cause indirect effect on wellbeing (see introduction). However, neither of them substitute model 2.5, as one may regard them as weighted components, which ideally matter equally, in case of no effects from mental schema. For simplicity, I report below the aggregate utility models, which one can turn into individual functions dividing for n.

$$Y_t(C_{1,t}, \boldsymbol{C}_{2,i,t}, O, P, S) = C_{1,t} + \sum_{i=1}^{n} \boldsymbol{C}_{2,i,t}^{\boldsymbol{O}^{a_{i,t}}{}_t \boldsymbol{S}^{b_{i,t}}{}_t \boldsymbol{P}^{c'_{i,t}}{}_t} + \beth_t$$

$$\begin{cases} \boldsymbol{O}_t = \pm services_t \pm \mathfrak{a}_t hospitals_t \pm \mathfrak{b}_t physicians_t \pm \mathfrak{c}_t ICUavalable_t \pm \mathfrak{d}_t others_t + \mathfrak{E}_{i,t} \\ a + b + c = 1 \\ 0 < a < 1 \\ 0 < b < 1 \\ 0 < c < 1 \\ c \text{ as } \gamma \text{ regression in Model 2} \end{cases}$$

Model 2.6-Societal utility from direct factors on health

$$W_t(C_{1,t}, \boldsymbol{c}_{2,i,t}, O, P, S) = C_{1,t} + \sum_{i=1}^{n} \boldsymbol{c}_{2,i,t}^{\mathbb{O}^{\mathfrak{a}_{i,t}}{}_t \mathbb{S}^{\mathfrak{b}_{i,t}}{}_t \mathbb{P}^{\mathfrak{c}_{i,t}}{}_t} + \Upsilon_t$$

$$\begin{cases} \mathbb{O}_t = \pm \mathcal{A}_t subsidies_t \pm \mathcal{B}_t inflation_t \pm \mathcal{C}_t unemployment_t \pm \mathcal{D}_t \boldsymbol{others}_t + \mathcal{E}_t \\ \mathfrak{a} + \mathfrak{b} + \mathfrak{c} = 1 \\ 0 < \mathfrak{a} < 1 \\ 0 < \mathfrak{b} < 1 \\ 0 < \mathfrak{c} < 1 \\ \mathfrak{c} \text{ as } \gamma \text{ regression in Model 2} \end{cases}$$

Model 2.7 - Societal utility from indirect economic factors on health

$$\mathfrak{U}_{\sum_{i=1}^{n} u_{i,t}} = \mathrm{U}_t - C_{1,t} = \sum_{i=1}^{n} \boldsymbol{C}_{2,i,t}^{\boldsymbol{o}^{a_{i,t}}{}_t \boldsymbol{s}^{b_{i,t}}{}_t \boldsymbol{p}^{c_{i,t}}{}_t} + \sum_{i=1}^{n} \boldsymbol{c}_{2,i,t}^{\mathbb{O}^{\mathfrak{a}_{i,t}}{}_t \mathbb{S}^{\mathfrak{b}_{i,t}}{}_t \mathbb{P}^{\mathfrak{c}_{i,t}}{}_t} + \mathrm{OTHER}_{\mathrm{ISSUES}_t} + \mathfrak{f}_t$$

Model 2.8-Risk-related social welfare utility in components

In order to understand how countries weight these fields of intervention, it is first important to look up to the potential coefficients of mental variables of representative agents: equal coefficient for both themes mean that the first term on the right side weights the same as the second term. Apropos of this, it is possible to re-write Model 2.8 more explicitly. I report as well the conditions according to which the society assign equal weights to every theme, along with other two sets of conditions of preference in utility for a certain issue (in order: health, economy). In particular, this thesis assumes that coefficients of Mental Schema play the biggest roles in directing preferences, as I will further explain in the second part of Chapter 2.

$$\mho_{\sum_{i=1}^{n} u_{i,t}} = w_{health,t}(a,b,c)\overline{Y_t} + w_{economy,t}(\mathbb{a},\mathbb{b},\mathbb{c})\overline{W_t} + w_{others,t}(a,\mathbb{b},c)\overline{\mathrm{OTHER_{ISSUES}}_t} + \mathbb{f}_t$$

Model 2.9-Social welfare function as a weighted sum of themed utilities

$$\begin{cases} a = \mathbb{a} = a \\ b = \mathbb{b} = \mathbb{b} \\ c = \mathbb{c} = c \end{cases}$$

$$\begin{cases} a > \mathbb{a} > a \\ b > \mathbb{b} > \mathbb{b} \\ c > \mathbb{c} > c \end{cases}$$

$$\begin{cases} \mathbb{a} > a > a \\ \mathbb{b} > b > \mathbb{b} \\ \mathbb{c} > c > c \end{cases}$$

Figure 2.2-Conditions for weights

Considerations

Utility functions have been common tools for economist over the last two centuries. That is because cardinal utility addresses the magnitude of pleasure due to certain goods or factors[lxxxvi]. However, this may be still a somewhat abstract concept whenever there are no possible ways to set up a "Hedonimeter", which Edgeworth F.Y. (1881)[lxxxvii] portrayed as an physics-like instrument to underpin the calculus of pleasure or happiness on psychophysical basis[lxxxviii]. On the other hand, Fisher I. brought about an alternative endeavour to assess the "units" of well-being, by indirect measure of "revealing" choices and actions. On this

regard, I call to read Fisher I. (1927) for deeper understanding of his statistical method to assess marginal utility[lxxxix].

It is clear-cut that Fisher could never foresee the outspread of computer science, and, consequently, of social media. Indeed, nowadays there actually exists almost prefect machines able to detect public sentiments on web, just as Edgeworth conceived in the late XIX century[34]. Thus, free and paid software platforms let individuals, firms and researchers to get through any topic and subtopic according to which keywords and connectors they choose. In particular, in 2020, tons of literature pieces dwelled on topics related to social media perception of the Covid-19 threats (Li D. et Al.[xc], Hung M. et Al.[xci], Burzyńska J. et Al.[xcii]). Then, there are as well plenty of articles about social media communication role on the spreading of this virus (Kuchler et Al.[xciii], Cinelli M. et Al.[xciv], Bailey M. et Al.[xcv]). However, as since as there are no still a unique approach to social media I ruled out the effect of social media on utility.

The models in the precedent paragraphs take steps from the concept of utility as a measurable fact and but they also address it as a hypothetical dependent variable, whose components elicit it through indirect linkages. Indeed, no social media or data platform allows splitting sharply sub-issues, with no covariates and errors. As instance, no tool of social data analysis is able to spot sanitary utility of consumption from mental processes regardless of the economic utility perceived during Covid-19 because the analysist's choice of keywords is anyhow finite and subjective. Therefore, the dependent variables above are meant to be abstract ones, whose independent variables come in handy to backword-deduct their nature and domain.

As a second stage, I call to get through the reasoning beyond period consumptions at micro and macro levels. In Chapter 1, I already argued about present biased agents coping with consumption choices during the 2020 Covid-19 pandemic. Almost all models above design agents as naïve consumers as they do not into account consumptions expectations but they just look at items right now available. In technical jargon, this is a Hyperbolic Discount bias and it makes sense as since I assume policy makers had already took over the public opinion addressing by the start of the pandemic. That is individual preferences at the micro level are actually already affected by policy directions and, as well, biases. Furthermore, from the policy makers' point of view present bias affects each citizen, as since policy makers care of "smoothed" representations of singular individuals, the same way as marketing analysists

[34] "Hedonometer" is today a project of sentiment analysis on Twitter.
http://hedonometer.org/about.html last visit 05/02/2021 h.18.50

spot “consumer persona” to build up market strategies. In order to uphold this strong assumption, I call to Lothe S. (2020)[xcvi] of the University of Pennsylvania. Anyhow, there are no still clear reasons why policy makers postponed decisions during the Covid-19 crisis, even thou there have been many attempts so far to outline their behaviour.

One hint may come from the political psychologists Fiske A.P. & Tetlock P.E. (1997)[xcvii], who coined and proved the “Taboo trade-off aversion”: policy makers might had coped with “moral costs” of choosing between life-entrenched issues and other ones, thus struggling to end up with decisions. On the other hand, Wisse B. et Al. (2019)[xcviii] suggested that those in power fearing to lose their positions are more eager to perform self-serving behaviours, so during Covid-19 politics might had prioritize decisions suitable to increase their popularity instead of others better to counteract the illness. Finally, Rieder G. and Simon J. (2016)[xcix] inquired the recent political lust for numerical evidence to retort public distrust and scepticism: in case of the Covid-19 outbreak, policy makers lacked of updated data of similar worldwide disasters, and so it might be they took time in order to get information to justify restrictions on movements and economy. I believe that is an interesting topic and it worth more consideration. However, it does exceed the range of this thesis, which instead takes as granted the present biased preferences of individuals and societies, regardless of the reasons backing this kind of behaviour.

Henceforth, I can draw down some consideration around the micro and the macro levels. In fact, policy makers adopt clustering criteria to analyse data on citizens and so micro level individuals are actually fictional characters. That makes macro level representation diverge from reality as policy makers regards society as an aggregation of ideal individuals and not of real ones. The latter, indeed, are likely to exhibit choice inconsistencies or to change their mind about specific topics. Instead, macro levels utilities above spot “smoothed” preferences on sanitary and economic issues related to Covid-19. It follows that all models in previous paragraphs are theoretical models, but, in addition to this, micro utilities serve merely as basis to build up macro utilities. Then, the latter approximate reality by the independent variables, which they depend on. This approach makes sense as analysts generally get macro data by statistical inference from sample surveys, and not by population census. Furthermore, not all social media platforms have users who are representative of population of a country by age, gender, educational levels, ethnicity, wealth and other identity factors (i.e. Facebook, Twitter and Tik Tok had different target audience in 2020).

2-HYPHOTESIS

This paragraph is to merge models with subquestions of chapter 1, in order to get hypotheses. Indeed, it is of upmost importance to outline the setting of each supposition in order to make better sense of its goal. Therefore, tools to mine data and proxy variables of interest need to be consistent both with the involved circumstances and with the parameters, which I will test in chapter 3.

Hypothesis 1: Covid-19 outbreak is a Black Swan Event

As already told in Chapter 1, Black Swan events are all those causing ruinous and unforeseeable consequences. However, that is not enough to stress out if Covid-19 belonged to this class of occurrences, as there are many players involved. This thesis pays particular attention to policy makers, who generally address citizens and investors through regulations, laws and public speeches. Academics own a deeper understanding and knowledge on their specific fields, and may play both as counsellors and as reviewers of policy makers. First, they may support political paradigms. That is when no new information come forth. Second, they may oppose the choices of those in power unless they acknowledge information as scientifically and undeniably verified. As a third case, only few of them argue against policy makers as enough data are still missing to persuade at least all experts of one field. The author of 2007 book "the Black Swan", Nassim Nicholas Taleb stated on 21thApril 2020 that Covid-19 was not a Black Swan[35]. According to him and others, including Bill Gates (2015)[36], the virus would had spread worldwide and non-linearly because of "increased connectivity"[c]. It follows that the views of who described it as a Black Swan and those of the aforementioned experts it diverged because of two factors: how they reacted to it and how they portrayed it. Indeed this distinction is not obvious as these elements are somewhat woven because of mental schemes.

In chapter 1 I addressed mental schemes as a system of beliefs put up as to orient oneself through the social environment. Shiller R.J. (2019) in "Narrative Economics: how stories go viral and drive major economic events"[ci] actually outline narrative in approximately the same way as I described mental scheme. Therefore, that is a set of unrelated issues, which gets

[35] https://www.newyorker.com/news/daily-comment/the-pandemic-isnt-a-black-swan-but-a-portent-of-a-more-fragile-global-system last access 11/02/21 h.18.37

[36] https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready/transcript last access 11/02/21 h.18.39

more consensus the more other narratives get to the same conclusion, by Consilience principle[cii]. Bitcoin is an outstanding example of successful narrative: even thou crypto-value have no value per se, millions of people held up the business because of the story telling about future scenarios, anarchic hackers and redistribution of wealth. Regarding to Covid-19, pro and anti-Black Swan rendering confided in divergent mental schema or narratives. In turn, as Model 3 designed, these deliver a certain amount of utility depending on many variables, ending up imbuing the whole stages of policy-making.

Text analysis of materials fits right the purpose to disentangle these two narratives.

In particular, official press conferences of governments embody well their reactions at the beginning of the pandemic as questions are supposed to catch natural and outright answers. On the other hand, interviews to Taleb Nicholas Nissim in 2020 embody the scientific point of view of a successful innovator of the "risk paradigm", as the Kuhn's theory of innovative management describes (see Chapter 1). Accordingly, the choice of proper sources moulds that analysis, which eventually takes place at the macro level, as denoted in the last paragraph.

Hypothesis 2: Cognitive biases affected countries in the same way

This hypothesis may address two separate issues. First, people in different countries behave differently with respect to Covid-19 risks, because of different biases. That is a micro level topic, as analysts needs to spot mental schemes from random samples of population. Nevertheless, as I already told in previous paragraphs, policy makers were constantly influencing people in order to achieve common goal, such that we owe them much of the composition of individual preferences. Therefore, it is worth revising this hypothesis in the sense of same cognitive biases affecting diverse population in a same way. It follows that its counterhypothesis relates to various outcomes within nations because of divergent choices of their own public decision makers. In fact, governments played as protagonists but they took action in response to signals of strategic groups of interests. There exist a vast literature about interest groups. About lobbyism, it is legal in the US by the First Amendment and by national legislations[ciii].

On the other hand, the EU does not compel member countries to apply any legislation, which often depends on government customs. As instance, Dutch ministers still enforce the "polder model", according to which they take up important policy decisions through consultations with institutionalized organisations, which preserve interests of investors, manufactures,

consumers and socio-environmental activists[civ]. Besides, according to De Vries J. (2014) this government practise is common and largely welcomed because of many narratives around its historical origins, according to which the Middle Age Dutch implemented similar models to manage dams for common sake, despite ethnic and religious divisions. However, as Dekker F. (2017) points out, trade unions of employed workers has been losing ground during the last decades and they have been increasingly replaced by representatives of production categories or individual companies, in the sense of American-like lobbyists[cv].

On the contrary, in Italy things are not so clear-cut at legislative level. In fact, there still does not exist any national law on interest groups as since legislators actually regard them as regional issues[37]. Anyhow, the Ministry of Economic Development (MISE) has made progress by first providing a voluntary register for lobbyists along with conduct rules[38], according to international agreements of the Open Government Partnership (2011)[39] and then by turning this plan into an internal Directive (2018)[40]. However, in 2020, the legal matter of interests groups was so much incomplete and inaccurate that only the Tuscany region had an updated and complete register of representatives of interests allowed to deal with local authorities[41]. It follows that the Italian Government kept been used to dialogue with civil partners through ad hoc meeting and on the discretionary basis of the ministers. That leads to several consequences on public perception of Italian government and casts doubts on its representativeness, which makes sense also because of chronic instability of governments, whose pace of crisis does not keep up with changes in the Italian society[cvi]. In fact, it is due to cite the narrative of the Elitist movement of Politics by Gaetano Mosca[cvii] and Vilfredo Pareto[cviii], which in short promotes the governments made out of only elite members in accordance to their allegedly best levels of consciousness, education, open-mind and business prowess. However, on the other side, “elite” may characterize a privileged class, as there were aristocrats by birth lineage, to which commoners cannot get access. This latter narrative has a tricky impact on policy makers as, on one hand, they need to convene with parties to get to decisions, but, on the other hand, they are prone to behave as to mimic commoners' behaviours in order to get larger consent, even ending up taking ineffective or useless measures against Covid-19. I believe that was a critical issue in Italy

[37] https://www.lexology.com/library/detail.aspx?g=8254d5fb-d453-413f-a16a-892569daa5cd last access 19/02/2021 h.16.03
[38] http://open.gov.it/2016/09/20/pubblicazione-terzo-nap/ last access 19/02/21 h.16.12
[39] http://open.gov.it/open-government-partnership/come-funziona-ogp/ last access 19/02/21 h.16.16
[40] http://registrotrasparenza.mise.gov.it/images/direttiva_firmata.pdf last access 19/02/21 h.16.19
[41] https://www.consiglio.regione.toscana.it/default?nome=gruppiinteresse last access 19/02/21 h.16.26

during 2020 because of the increasing wealth inequality among population (Gini index EDI 2019: 32.8[42]; Gini index EDI 2020: 35.92[43]).

Here hence, it worth considering how to compare effects of different political customs on stringency index in order to proper analyse mental schemes for the government of each country. In fact, it is still possible to draw not-obvious argumentations about how countries addressed the Covid-19 issue is I acknowledge their Stringency index not as just a mere calculation of measures implied but as a response to interests groups. In this regard, I spot four typologies of pressure: of stock-market investors, of labour market, of medical experts and of common citizens. Then, I also assume that each group compete with each other to catch the attention of legislator, although National Constitutions usually take as granted they should satisfy all needs equally. Apropos of that, decision-making process may suffer from delays or postponements in available data delivery, which do not depend on public will but which do not disclaim efforts of governments towards certain interests group. As instance, data on unemployment are available from the month after. It follows that the very difference among countries towards Covid-19 grounds on the weights policy makers assign on each kind of pressure, in terms of ranking rather than in a cardinal sense.

In conclusion, the analysis of this hypothesis aims to understand if divergent schema underpin policy-making processes and if these may be actually the Neoliberal and the Welfarist schemes of Chapter 1.

Hypothesis 3: there exist a trade-off between Economy and Health.

In order to ground this hypothesis I need first to define what a trade-off is and what purpose it has in regard to behavioural economics. Indeed, it is worth recalling trade-off theory dates back to Modigliani F. and Miller M.H. (1958)[cix] and it originally addressed the choices of capital differentiation of firms under specific premises. In particular, Proposition I (MMI) stated that stock market investors should be indifferent between firms financing on capital and firms financing on debt as long as there are no taxes, no information asymmetry, same interests rate, no transaction costs and market efficiency. Therefore trade-offs occur whenever firms are indifferent too within these two ways of financing themselves. That is, between stocks and bounds. However, nowadays academics usually refer to trade-offs as

[42] http://appsso.eurostat.ec.europa.eu/nui/show.do?lang=en&dataset=ilc_di12 last access 19/02/21 h.18.05
[43] https://www.statista.com/forecasts/1171540/gini-index-by-country last access 19/02/21 h.18.01

situations in which decision agents should be indifferent within two options but they actually opt for one of them.

Although it may seem to have little in common with Covid-19 management, finance may shed useful insights on criteria applied in public decision-makings. As already discussed apropos of Hypothesis 2, policy makers accomplish first certain goals whenever pressure groups succeed in manipulating narratives around topics of interests. However, governments still own enough share of discretionary freedom, even though, they make sense of social phenomena on the ground of their smoothed-knowledge of personal preference. Thus the argument of this hypothesis takes steps from a new point of view, as it aims to inquire whether, in real world, there might exist reasons why governments, as high representatives of population and market agents, should not have been be indifferent to trade-offs between Health and Economy, and thus, irrational.

Firstly, Apropos of the comparison with MMI, national policy makers play the role of investors and so, Health and Economy stand as alternative investments. On the other hand, the worth of a nation exceeds both Economic Wealth and Public Health, even though nations may benefit or not from a long-lasting preference for a particular field of interest. That is, as instance, when people turned against the Absolute Monarchy in 1789 -as rulers put ahead the interests of aristocrats- and they found eventually a new nation, the Republic of France. However, nations such as both Italy and Netherlands, which were joining EU 2020, could not face such risks of failure, so rulers were actually more choose between balanced or unbalanced public polices for “Economic Wealth” or for “Public Health”.

In addition, no government worldwide had special information about Covid-19 related issues, so I assumed that there were no asymmetric information between topics. Then, according to the definition of Williamson O.E. (1981)[cx], transaction costs are in place when stages of production occurs. These, in finance, end up being costs to perform transactions, as intermediaries, fees, entrance costs and others. Apropos of Economy and Health, there have been no real transaction cost for governments, except for those actually induced by press groups at mental scheme level. However, there are at least two reasons why WWI cannot apply to public Covid-19 decision-making processes in a strong sense. First, governments apply taxations. Economic Wealth discounts in many countable ways, while Value Added taxation indirectly affects Public Health because of the collateral bounds on healthcare expenses. Consequently, equalizing taxation rates among several kinds of public goods is a possible arrangement, but it actually ends up being a strong and arbitrary assumption. Second, government cannot weight the importance of topics instantaneously

because of the delays in getting information I discussed in the previous paragraph. Thus, there does not exist a strong efficient market because it is neither efficient as no government could foresee how the virus would have mutated or ceased.

Nevertheless, I can still apply Modigliani F. and Miller M.H. first proposition in a relative sense, trying to figure out whether Italy and the Netherlands were both indifferent in relation to the aforementioned topics of interests or at least in which extents they stepped away from a perfect trade-off condition.

In order to prove trade-offs in real world, it worth first looking up to trade-offs in mental schemes about. This stage of analysis comprises the role of public opinion on journals, whether it stands more for Economic Wealth or Public Health. Thereafter, the actual trade-offs between public opinions and government responses set the distance between narratives and real world. In turn, the University of Oxford computed variables to proxy the "investments" of governments against Covid-19: "Economic Support Index" approximates its liquidity injection to support Economic Wealth, while the "Containment health index" features the lockdowns and activity closures needed to fold the cumulative curves of infections and deaths.

FURTHER CONSIDERATIONS

This chapter was to frame the research of Chapter 1 into a descriptive landscape. On this purpose, I first detailed the decision makers' processes as models to maximize. Then I acknowledged decision makers as governments. Finally, in the second part of this chapter, I turned the three research sub-questions of Chapter 1 into Hypothesis. In this regard, they make up three subsequent stages of proving irrational behaviours of governments, as I show in the below schema. Finally, I will test them all in Chapter 3.

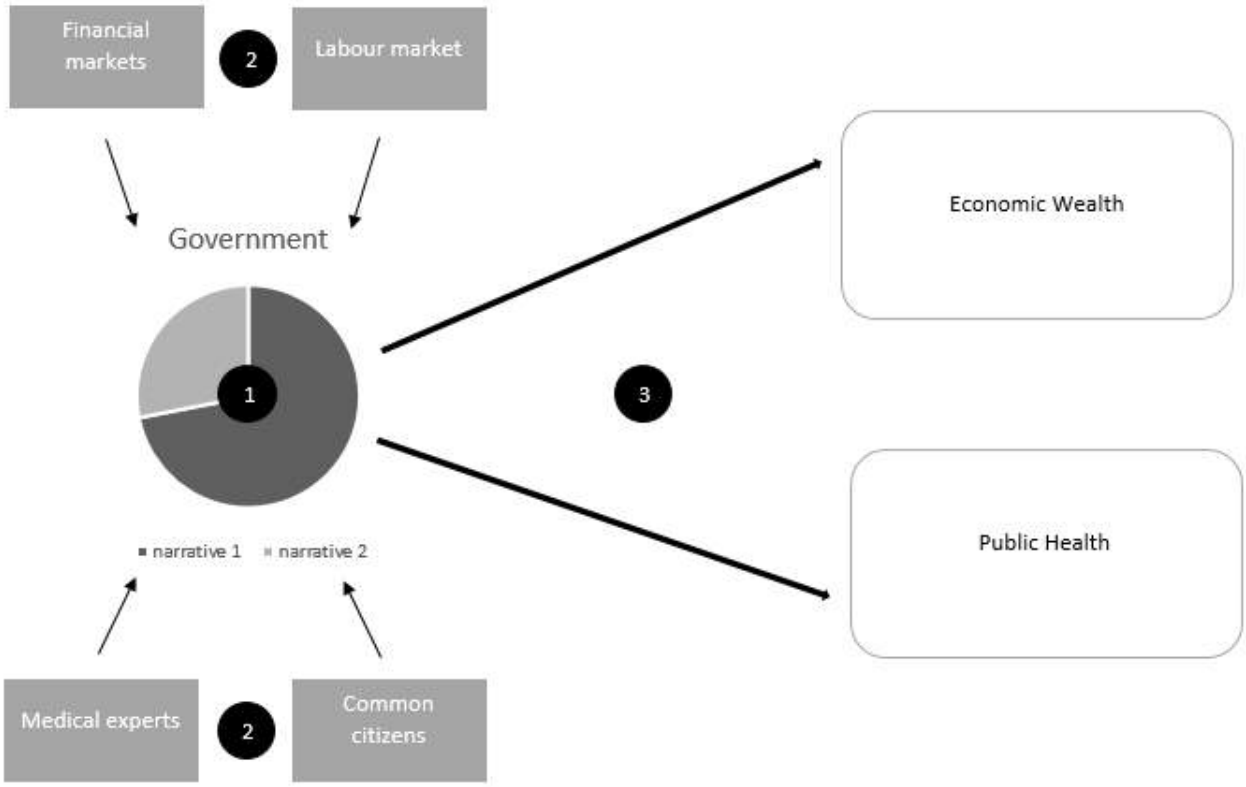

Figure 2.3-Scheme on sequence of hypothesis

CHAPTER 3:
ANALYSIS

INTRODUCTION

In this chapter, I will process the analysis needed to answer the research question, which aimed to inquire the rationality of market agent in a Covid-19 context of uncertainty. As I already addressed market agents as citizens and governments as representatives of people's wills in chapter 1, I will now go into the three hypothesis according to the logical order established in chapter 2. Indeed, these are due also to be as framing three distinct perspectives of rationality:

1 - Mentality of governments;
2 - Undertaken activities by governments;
3 - General public opinion on points 1 and 2.

Therefore, the research question ends up being a null hypothesis of bounded-rational governments against an alternative hypothesis of irrational governments. Consequently, I may prove this alternative hypothesis as long as all the three hypothesis of chapter 2 are false.

BLOCK 1: Covid-19 outbreak is a Black Swan Event

- **Methodology**

I will test the first hypothesis on the ground of several transcriptions of interviews. On the side of governments, I selected only press conferences that occurred in 2020, in which ministers talked most of the time, Covid-19 was an issue and no foreign guests intervened. Then, I translated all text into British English through the free-translation online platform Deepl.com[44]. I collected 23 texts of the Italian government from 22/02/20 to 3/12/20 and 17 texts of the Dutch government from 12/03/20 to 27/11/20. I got all texts of Italian press conferences as subtitles of videos uploaded on the government's official Youtube Channel "Palazzo Chigi"[45], while Rutte's government provided all the transcriptions on its institutional

[44] https://www.deepl.com/translator last visit 6/04/21 h.15.33
[45] https://www.youtube.com/user/governoit last visit 7/04/21 h. 11.12.

website[46]. I put together all them in an excel file, I got many double observations because of the limit of 255 character per cell. Particularly about Italy, I added one more observation on the days 13/05/20, 3/06/20, 7/07/20, 7/08/20 and 9/09/20. Thus, observations regarding the Conte's government turned out to amount to 28 in total. On the other hand, the Dutch observations summed up to 30, as there were doublets on the days 7/04/20, 9/04/20, 1/05/20, 8/05/20, 5/06/20, 19/06/20, 10/07/20, 9/10/20 and 27/11/20. In addition, the set of Dutch press conferences counted two triplets, respectively on the days 1/09/20 and 13/10/20. However, I did regard none of doublets and triplets as obstacles for the analysis because texts' distribution among time is fair enough.
As a second step, I performed a text analysis through the R package Quanteda. I picked up all tools fit to make Italian and Dutch press conferences comparable. That are wordclouds, co-occurrence networks and anticipation Vs surprise polarity charts over time. However, I first took out all words, which would have cause misunderstandings such as stop words, first names, second names, foreign words and interlayers. I list below all deletes per government.

Italian government: "also", "can", "say", "said", "one", "like", "come", "see", "know", "one", "obviously", "take", "thank", "per", "di", "give", "thanks", "two", "think", "course", "go", "put", "president", "minister", "ministers", "e", "che".

Dutch government: "bos", "rutte", "de", "van", "der", "den", "jonge", "nijs", "dissel", "question", "boven", "nieusuur", "jansen", "lambie", "telegraaf", "rtl", "journaal", "borgman", "rooy", "hoedeman", "breedveld", "wester", "jonker", "schram", "hagen", "steming", "stemeding", "soest", "aharouay", "ornstein", "broek", "geerts", "hendrickx", "berg", "nos", "hart", "zoeten", "aa", "silver", "winther", "kruif", "mebius", "meijer", "der", "leij", "bruins", "zilver", "fresen", "lengton", "algemeen", "dagblad", "goodwill", "fillings", "leeuwen", "hamar", "also", "can", "say", "said", "one", "like", "come", "see", "know", "one", "obviously", "take", "thank", "per", "di", "give", "thanks", "two", "think", "course", "go", "put", "president", "minister", "ministers".

On the side of scientific experts, I looked into the Youtube interviews of Taleb Nicholas Nissim, professor of risk engineering and author of "The Black Swan" (2010, Random House[cxi]). In particular, I collected 11 interviews from several video channels from 19/03/20

[46] https://www.rijksoverheid.nl/documenten?trefwoord=Covid&startdatum=01-01-2020&einddatum=31-12-2020&onderdeel=Alle+ministeries&type=Mediatekst last visit 7/04/21 h. 11.21

to 16/11/20, and they ended up being 17 text on an excel file: there were in fact four doublets on the days 19/05/20, 3/07/20, 22/09/20, 28/09/20 and a triplet on 21/10/20. However, texts plat over time smoothly enough. Regarding idioms, Nissim currently spoke a high-level academic English, so I regarded its language as comparable to British English on a text analysis purpose. However, I applied same criteria of text selection on R Quanteda as for governments' press conferences. That is, I ruled out texts not focusing on the Covid-19 issue, with interventions by foreign guests and in which Nissim did not take over the conversations. In addition, I performed wordclouds, net plots, and polarity charts as for press conferences, in order to draw final considerations from both sides. Therefore, I also deleted words likely to distort analysis, according to the same criteria applied in the governmental speeches. Here, the terms I deleted.

Taleb Nicholas Nissim: "like", "look", "also", "get", "oh", "go", "going", "one", "two", "know", "nassim", "nasim", "taleb", "course", "talib", "ok", "okay", "u", "m", "um", "uhm", "uh", "mn", "think", "see", "yes", "yeah", "thing", "things", "say", "said", "saying", "got","give","gonna", "can", "let".

On a third stage, it is worth dealing with the methodology of word clouds, net plots and polarity charts. Because of the large numbers of words, I complied with a minimum threshold rule in frequencies in order to keep words in analysis. Therefore, word clouds portrayed just words appearing at least 20 times, and so, they put in big just words occurring more than this lower bound frequency. Furthermore, apropos of wordclouds, I took as granted that the size of a word is proportional to its relative frequency in collected documents. Then, I set up co-occurrence network based on feature concurrence matrices, with minimum frequency count of 50%, so that to shrink results the more as possible. As a last step, I constructed polarity charts running also packages "seededlda", "syushet" and "LSX"[cxii] and then I rotated their axes by hand in order to make them more understandable. In particular, this analysis looked for words concerning "surprise" and "anticipation". On this purpose, I uploaded the "NRC" dictionary, which usually was used to identify and categorize words according to 8 different emotions (trust, anticipation, fear, anger, surprise, joy, disgust, sadness) and to two kinds of emotional reaction (positive and negative)[47]. Thus, Polarity charts only concerned words in texts categorized as being related to "surprise" and "anticipation", which I considered as opposite reactions to Covid-related issues. In fact, x-axis showed time values,

[47] http://saifmohammad.com/WebPages/NRC-Emotion-Lexicon.htm last visit 7/04/21 h.17.13

and y-axis regarded a standardized scale of polarity: the much more observations were close to zero, the more agents got surprised, and vice versa. Consequently, it is worth discussing the order of these analyses. Indeed, the ultimate purpose of hypothesis 1 is to check if certain mental schemes shape the risk perception more than others do. That is, mental schemes determine which issue worry most agents and whether it is a Black Swan event. Thus, word clouds and net plots are to display basic concepts and their connections, while polarity charts are to test whether mental schema shaped agents' behaviours in 2020.

- **Outcomes**

This paragraph concerns the text-analysis of the first hypothesis and it aims to reject the null proposition according which market agents at macro level (governments) behaved rationally during 2020. As I already discussed briefly in the previous paragraph, I am going to display all outcomes on a specific order. Furthermore I will first deal with governments, and hence with speeches of Taleb Nicholas Nissim.

Governments

To begin with, figures below are the two word clouds of Netherlands and of Italy.

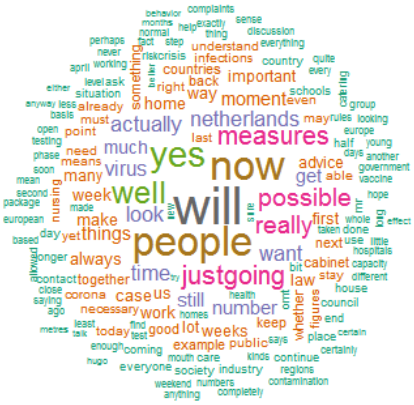

Figure 3.1-Dutch wordcloud

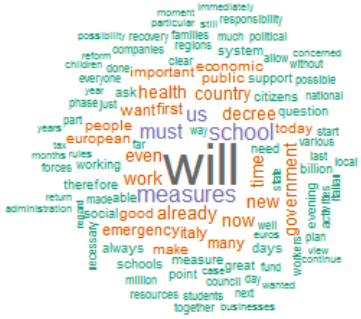

Figure 3.2 Italian wordcloud

They have both words in common and other ones characteristic to each country. On one side, this make sense as both agents were of the same kind and both were delivering official speeches. Hence, leaving out the terms in blue, both often quote "will", "measures", "time", "many", "now", "public", "important", "make", "good", "already", " first "and" people "and the respective country names. On the other side, these two governments differ in perspectives

as the Dutch decision-makers stands more for neoliberal policies, while Italy usually promotes welfarist solutions, just as I already discussed about in Chapter 1 and in Chapter 2. Accordingly, the Rutte's governments cited "advice" and "understand", but it also appointed greater importance to the word "people". It makes sense under a "Nudge" perspective of its Polder Model. In fact, there are also terms such as "cabinets" and "figures", through which the governments might have pushed people towards better achievements against Covid-19. Thus, the health terms "corona", "virus" and "infections" are also relevant. Furthermore, it is worth recalling Minister Rutte publicly opted for an "Intelligent Lockdown", which actually consisted in non-mandatory advices to citizens and undertakers. Conte's Government did not stressed so much on people's responsibility but it relied on efforts of public institutions and/or legal tools. In fact, the Italian wordcloud holds in the terms of "emergency", "decree", "government", "european". In addition, it cites the fields of public intervention as "economic", "work" and "health".

As a second step, I performed a net plot analysis in order to catch ties within concepts. Of course, net plots contain different terms than wordclouds and there is a big number of linkages. In order to steer my analysis towards meaningful outputs, I focused on two themes per country: "nudges" and "virus" for Netherlands and "obligations" and "health" for Italy. Each first and second field of a country is an opposing approach to the other country's ones.

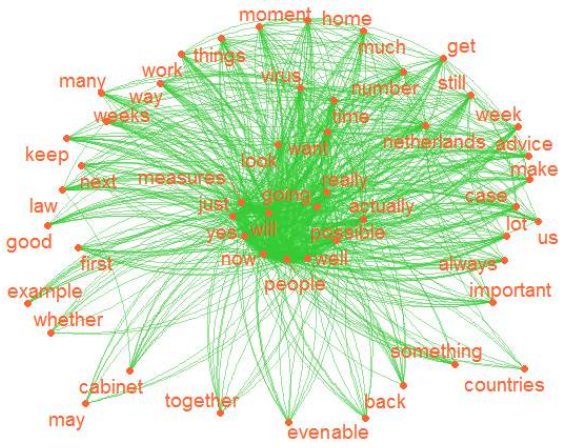

Figure 3.3-Dutch co-occurence network

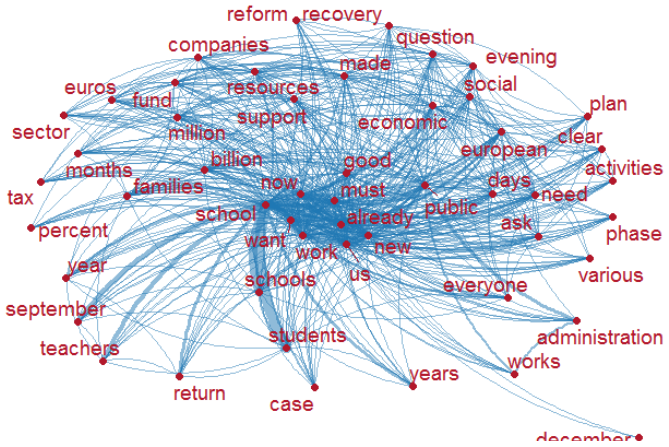

Figure 3.4-Italian co-occurence network

In figure 3.3, the plot shows almost the same words as the wordcloud. On the contrary, the Italian co-occurrence network gets more specific on both the themes. In particular, the Dutch one does not mention economic terms but it stresses on the importance of "people", "advice", which are eventually connected to willingness terms as "will", "want", "make", "going", "now". Therefore, it is possible to set up syllogisms in order to make sense of them.

On the economic side, the Rutte's government relied on people's will as since as "important" relates to "people", "people" relates to "will", and so "important" to "will". On the sanitary side, "advice" relates to "going" and "going relates to "virus". Briefly, the Dutch government believed that both economic and health situations would have been fixed by nudging free choices of people. However, that does mean also that the ministers were particularly worried about the unforeseeable behaviours of citizens. In fact, this plot also contains words about this concern such as "possible", "evenable" and "whether".

By contrast, the Italian net plot depicts words of economy and education, which the analysis suggests being the main policy fields of the Conte's government. They are terms expressing concepts in economic detail as "euros", "million", "billion", "fund", "sector", "companies", "resources", "works", "activities" or they are characteristic to the national education system as "teachers", "students", "school", "schools" and "September". Apropos of this latter, other time expressions appear as "December", "days", "months", "year" and "phase". Thus, I may apply syllogism with respect to the roles of "public" and "must", which call back to all coercive terms I spotted in the Italian wordcloud above: as instance "public" relates to "must", "must" relates to "resources", and so "public" relates to "resources". Otherwise, "school" relates to "must", "must" relates to "public" and so "school" relates to "public". Surprisingly, only "case" refers to the sanitary area, but it strongly links to "students" and "school". It follows that the Italian ministers believed that the public sector should have been a fundamental role in tackling the emergency. Furthermore, they indirectly tied "resources" with "now", and "now" to "case". That is, according to their mental schema, the more they placed economic resources now the less infection cases will be in future. Therefore, effects of public spending was the most concerning Covid-related issue for the Conte's government.

As a third step, I have to state whether the Italian and Dutch issues of concern are actually Black Swan. To do so, I need to check the dynamics of surprise Vs anticipation across 2020, because Black Swans are, by definition, unexpected and unforeseeable events, with consequents effects on the emotional sphere of decision agents. I report below the two time charts of Netherland and Italy: the maximum level of Index is the maximum anticipation, while the lowest one is the maximum surprise.

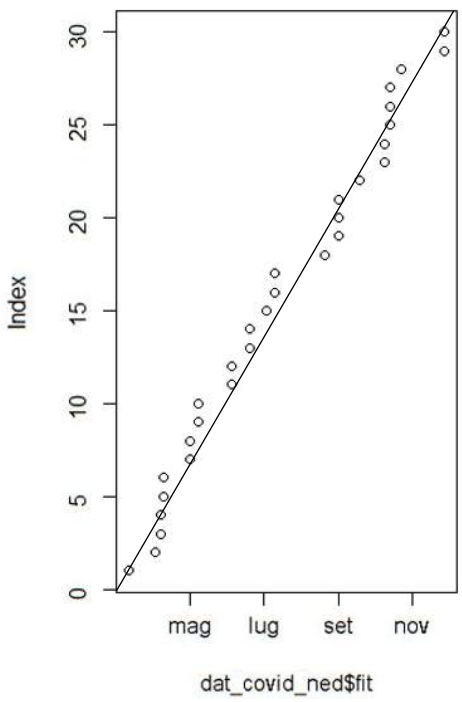

Figure 3.5- Surprise-anticipation Dutch polarity chart

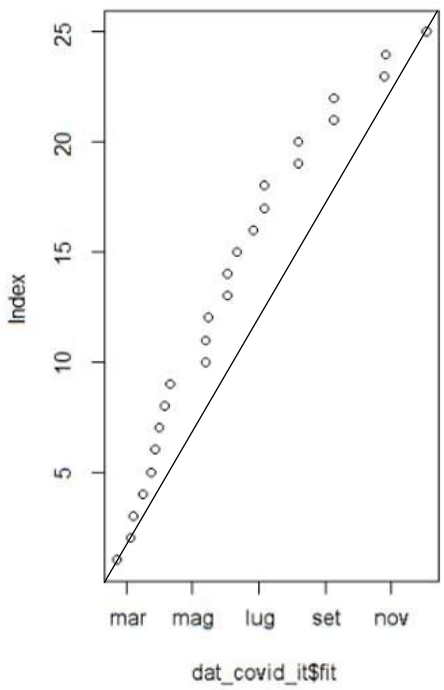

Figure 3.6- Surprise-anticipation Italian polarity chart

These charts shows that both governments responded emotionally to their threats in a similar way. That is, Covid-related issues caught them surprised. However, their emotional polarity evolved over time according to divergent patterns. Rutte's government got accustomed to uncertainty of behaviours progressively and thus fitted values on chart had a linear trend. On the other hand, Conte's government struggled to come to terms to the unrestrained effects of its policies and this is why fitted points have a logistic trend.

Taleb Nicholas Nissim

At this point of the analysis, it is due to present all output about Taleb Nicholas Nissim. As since as I applied same reasoning criteria as for government, I cut short explanations and I report his wordcloud below.

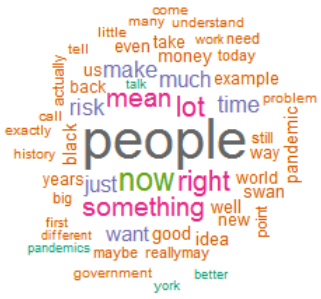

Figure 3.7-Nissim's wordcloud

At a first sight, it is outstandingly important the word “people”. Then, Taleb Nicholas Nissim stressed on words “something”, “risk”, “understand”, “time”, “black”, “swan”, “pandemic” and “history”. In particular, “history”, “something” and “risk” were characteristic to his speeches as since as they do not appear in neither of the governmental clouds. Therefore, I deduce they own a key role on Nissim’s mental schema: it is also worth recalling he is a risk engineer and he cultivates a wide range of interests, among which languages[48] and history[49].

Now, I just report below the second figure about Taleb Nicholas Nissim, the co-occurrence network.

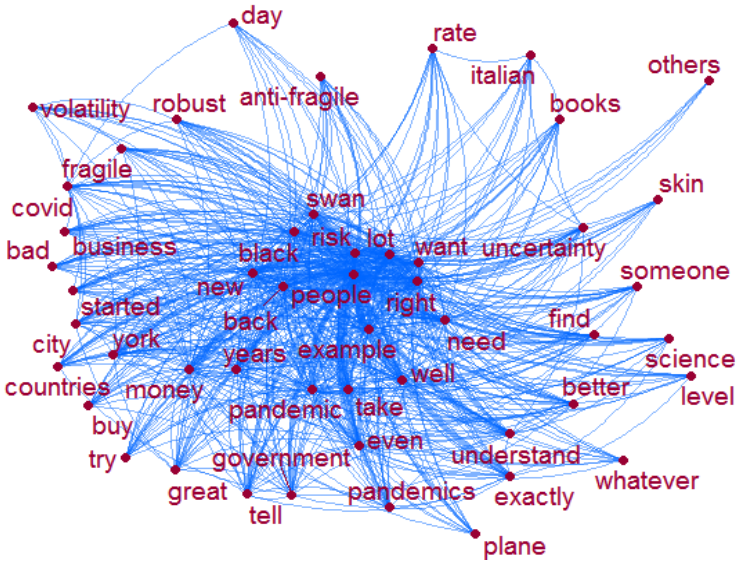

Figure 3.8-Nissim's co-occurrence network

[48] https://www.youtube.com/watch?v=LBztYP9tQ5o last visit 11 04 21 h.17.22

[49] https://www.youtube.com/watch?v=CyOsUbK8PiE last visit 11 04 21 h.17.22

As for governments, Nissim's co-occurrence network contains different words but I still can set up syllogisms on its two main themes: government and science. In fact, "government" relates to "people", "people" relates to "risk" and, finally, "risk" relates to "black": it means that Nissim regarded the set of governmental reactions as a Black Swan. Then, "science" relates to "people", "people" relates to "right" and so, "right" relates to "anti-fragile". That is the right way to get anti-fragile systems is to rely on science. Then, about both syllogism, it is worth acknowledging the central role of "people", which comes up also in the Dutch government speeches, but with a different meaning sense. In order to prove it, I report below the last figure of Nissim, the anticipation Vs surprise polarity chart, in which levels of Index work as seen before, regarding governments.

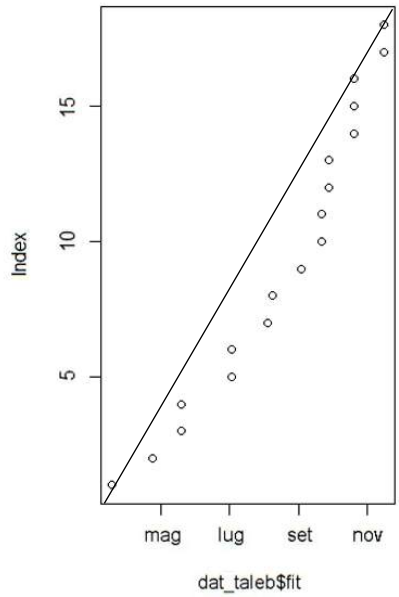

Figure 3.9-Surprise-anticipation Nissim's polarity chart

The late interest of interviewers on Nissim's point of view delayed time-periods. In reality, Nissim Nicholas Taleb first expressed his concerns about Covid-19 spread on the 26th of January 2020, and it is logical to infer he was even more surprised before. Subsequently, anticipation polarity grew up and fitted values had an exponential trend. That is, Taleb Nicholas Nissim got over his uncertainty issue faster than both governments in relation to their respective concerning points.

- **Conclusion**

The above analysis suggest that the Covid-19 outbreak was not a Black Swan. In fact, no agents discussed about it but they rather looked upon other issues of concern, which are actually the real Black Swans for them. It makes sense, for at least two potential reasons.First, governments had to employ communication strategies in order to persuade people they were strong and advised enough to be entitled to govern throughout hard times. Therefore, that does not rule out at all they could have regarded the Covid-19 outbreak as a Black Swan, but, anyhow, this possibility could pertain to the private opinions of ministers. As a further argument, Covid-19 as a non-black-swan does not imply governments could have been able to respond properly to this threat. That is due to their existing rational limit on which Taleb Nicholas Nissim got surprised, for which reason I draw the conclusion that the Dutch and the Italian government did not prevent negative effects of it because they were just not able to count probabilities of a pandemic. This consideration is particularly significant in relation to this thesis' macro hypothesis of irrationality, because they could have regarded the Covid-19 event as ambiguous rather than uncertain.

Second, Taleb Nicholas Nissim did not consider the Covid-19 outbreak as a Black Swan event, but as a White Swan event. However, I recall I put analysis on his speech on a purpose of comparison. Hence, Taleb Nicholas Nissim would have been embodied the rational and scientific though against the irrationality of governmental behaviours. Therefore, if I rule out the existence of purely rational agents, as I discussed widely in Chapter 1, Taleb Nicholas Nissim is the most possible rational agents. On one hand, he is skilled and knowledged in many scholar fields and so he owns richer perspectives on issues. On the other hand, he is an independent thinker so polarity fitted values have not correlation with governments' ones. That is properly the reason why "people" in the Dutch term co-occurrence network has not the same meaning than in Nissim's one: in the latter "people" is likely to matter as those who the governments should eventually benefit though science. In fact, fitted values of surprise-anticipation polarity does not have the same trend as those of governments'. Indeed, in relation to the Kuhn's theory in Chapter I, Taleb Nicholas Nissim is as an innovator because he suggests a new paradigm for government: to design anti-fragile systems.

BLOCK 2: Cognitive biases affected countries in the same way

- **Methodology**

As I wrote in Chapter 2, whenever governments reacted against any Covid-related issues in the same way, rationality is preserved. Although, Block 1 proved they spotted and framed divergent issues, which is already irrational on its own. In addition to this, Block 2 aims to understand if their undertaken activities were irrational or not. In fact, bounded-rational agents should take care of outer stimuli equally, such that all decision makers face problems in comparable ways. As discussed about in Chapter 2, there are four main sources of stimuli on governments: financial investors, medical experts, labour market and citizens. In order to perform analysis I collected on an excel file all 2020 daily data of five variables, which I obtained from diverse sources, and which I uploaded to Gretl, a statistical software, specially fitted for time-series analysis[50].

The "Government Containment Index" (GCI) is the variable for governmental actions and it is part of the Oxford Covid-19 Government Response Tracker (OxCGRT)[51] online project, led by the University of Oxford along with the Blavatnik School of Government. They still daily updated GCI 2021 but I took just values over 2020, which actually shortened to those within 23/01/20 to 30/12/20 for Italy (null values: 21) and to those within 27/01/20 to 30/12/20 for Netherlands (null values: 25). Furthermore, GCI range within 0 to 100, on an increasing scale of efforts, which experts calculated on the basis of a pondered average of indicators[52] of *containment and closure policies* and of *health system policies*. In particular containment and closure policies indicators are: school closing (0-3), workplace closing (0-3), cancel public events (0-2), restrictions on gatherings (0-4), close public transport (0-2), stay at home requirements (0-3), restrictions on internal movement (0-2) and international travel controls (0-4). On the other side, health system policies indicators are public information campaigns (0-2), testing policies (0-3), contact tracing (0-2), emergency investment in healthcare (monetary values in USD), investments in vaccines (monetary values in USD), facial coverings (0-4) and vaccination policies (0-5). However, GCI in this analysis does not comprehend the variable "protection for the elderly" (0-3) as since I collected data before

[50] http://gretl.sourceforge.net/ last visit 14 04 21 h.20.31
[51] https://covidtracker.bsg.ox.ac.uk/ last visit 15 04 21 h.11.27
[52] https://github.com/OxCGRT/covid-policy-tracker/blob/master/documentation/codebook.md last visit 15 04 21

15/03/2021[53], when GCI turned into the "Containment and Health Index" (CHI). For clarity, I add below the formulas of a pondered index and of GCI on a date t.

$$I_{j,t} = 100\,\frac{v_{j,t} - 0{,}5(F_j - f_{j,t})}{N_j}$$

$$GCI_{j,t} = \frac{1}{k}\sum_{j=1}^{k} I_{j,t}$$

$$\begin{cases} v_{j,t} & ordinal\ value\ of\ index\ j\ in\ time\ t \\ F_j & presence\ of\ binary\ flag\ for\ geographic\ scope\ (0{,}1) \\ f_{j,t} & flag\ for\ geographic\ scope\ (0{,}1) \\ N_j & maximum\ value\ for\ unpondered\ index\ j \\ k & number\ of\ indicators \end{cases}$$

Model 3.1 Calculations of indexes

Stock market indices are representatives of financial investors. I opted for FITSE mib as the index for the Italian market agents and for AEX as the index for the Dutch ones. Although these two indicators mirror divergent market scales and comprehend value titles of different industries, they are proxies of the investors' mood at a certain time. For simplicity, I assumed that this is influencing the governments' actions and not vice versa, even though these effects are both actually taking place in real world. In addition, it is important to split the effects governmental actions from those of communication, which, again for reasons of simplicity, I deliberately omitted. Therefore, I got them all as closure daily values in euro currency and from free-access online platforms (Yahoo finance for Netherlands[54], Investing.com for Italy[55]). In particular, I downloaded data on weekdays, since AEX and FTSE mib do not record transactions on weekends and on national holidays, so there are 108 missing values for the Dutch index and 109 missing values for the Italian index, on a period from 2/01/20 to 30/12/20.

On the side of medical experts, I looked up to the numbers of ICU occupied by Covid-19 patients and I got them from the European Centre for Disease Prevention and Control (ECDC), a communitarian agency based in Solna, Sweden[56]. Therefore, missing values are present whenever Covid-19 was still unknown of officially not spread. In particular, within

[53] https://github.com/OxCGRT/covid-policy-tracker/blob/master/documentation/index_methodology.md last visit 15 04 21 h.11.53

[54] https://it.finance.yahoo.com/quote/%5EAEX/history?p=%5EAEX last visit 16 04 21 h.11.25

[55] https://it.investing.com/indices/it-mib-40-historical-data last visit 16 04 21 h.11.27

[56] https://www.google.com/search?q=ECDC&rlz=1C1AWFA_enIT743IT743&oq=ECDC+&aqs=chrome..69i57j0l5j69i60l2.6316j0j7&sourceid=chrome&ie=UTF-8 last visit 16 04 21 h.11.42

2/01/20 and 30/12/20, Dutch data series started on 27/02/20 (missing values: 56) and Italian data opened up on 24/02/20 (missing values: 53) and they were still currently available on 16/04/21. The reason why I opted for this indicator is that it is not collinear to GCI but it still provide information on the workload of hospital workers, who were on the front line against the spread of Covid-19. For the same reasoning above, I omitted the analysis of effects of public policies on ICU occupancy.

Then, I added the independent variables of unemployment rate in both Countries. As since as national bureau of statistics (Istat in Italy[57], CBS in Netherlands) usually take track of these on a monthly base, governments could looked at unemployment rates just on one-month-shifted time pace. That is why I reported on my excel file only 1-period-lagged data, keeping as granted unoccupied were on the same rate along the whole duration of the previous month. Therefore, there are 30 missing values per country on the period 2/01/20-30/12/20 because they are actually unemployment rate data of 2019.

Finally, I looked through the effects of common people's concern around the epidemic, so I took advantage of Google Trends. As I discussed about in Chapter 2, the more citizens typewrite a word or a topic on Google Search, the more they put attention on it and so it is more likely they are concerned around it. That is, I believe, a good proxy of people thoughts as it cast glimpses on how people emotionally reacted to Covid-19. Therefore, I collected data around the searches of "Covid-19" and "coronavirus" in Italy and Netherlands and I found out 17 null values in both countries, by the beginning of 2020, within 2/01/20 and 30/12/20. That is Google did not regard as significant researches on these terms before 19/01/20. As before, for simplicity I exclude that governmental actions had an impact on people's mood.

Finally, I may draw a simple linear regression model of effects of pressure groups.

$$GCI_{j,t} = \alpha_j closeIndex_{j,t} + \beta_j Daily\_ICUocc_{j,t} + \gamma_j unpost_{j,t-1} + \delta_j coronavirusc_{j,t} + \varepsilon_{j,t}$$

Model 3.2 Linear regression model of groups on GCI

This equation is the ground for the second block of analysis, which I performed both on coefficients and on time series, as I suggested in Chapter 2 about Government's utility functions. It follows that hypothesis 2 is rejected when outcomes are significantly characteristic to each country's government.

[57] http://dati.istat.it/Index.aspx?QueryId=25247&lang=en last visit 16 04 21 h.12.26

As a preparatory step, I ruled out 150 observations with missing data values in one or more variables and the remaining 215 pertained to the period 27/02/20-30/12/20. Then I standardized and log-linearized all them in order to make comparison within countries and in order to highlight daily growths or falls in variables. Finally, I had an informal analysis through time-series charts.

As a first step, I made OLS models to understand which variables are significant on the decision process of governments. This matters because hypothesis 2 call for rational agents, who should look upon each pressure group equally. On statistical purpose, I defined confidence intervals as 95%, which is the most common in socio-economic statistical papers and studies. I applied these same criteria also in the Chow or Structural Break test, which I chose to spot any changes in the "containment" criteria weight (i.e. estimated coefficients) for the two governments. In fact, hypothesis 2 implicitly implies that decision-makers have the same order of preferences over time, even regarding pressure groups.

As a second step, I turn cross sectional data into time-series data on Gretl and I had an augmented Dickey-Fuller test of Unit-Root, which spots non-stationary series of variables whenever the coefficient of their autoregressive formula is close to one. About GCI, the aim is to check if outcomes of governmental processes are stationary or not. That is if governments have coherent behaviours over time, which is eventually a feature of bounded-rational market agents, as in the macro hypothesis of this thesis.

On a statistical side, I performed two analysis (with trend, with constant and trend), at the variable level, with 14 backwards lags and using the Akaike Information Criterion.

I concluded the second block analysis with vector autoregressive models and tests (VAR). Before starting, I checked whether variables were independently distributed through an autocorrelation test of order 1. Then I put four out of five variables as endogenous and I constructed a VAR with five equations, which I tested looking at p-values, Adjusted R-Squared and F statistics with zero bounds. However, I did not regard unemployment as endogenous but as exogenous because it is actually a lagged variable. Therefore, I chose VAR to test whether and how relations within pressure groups relate to GCI through behavioural biases.

- **Stylized facts and time-series**

Before to begin, I report above the time series plots of each variable, with red lines for the Italian government and blue ones for the Dutch counterpart. This is an informal analysis to

spot likely trends or waves, which could, eventually, had a role later on. Then, they are also useful to guess whether governments implied different strategies, according to different kinds of pressures.

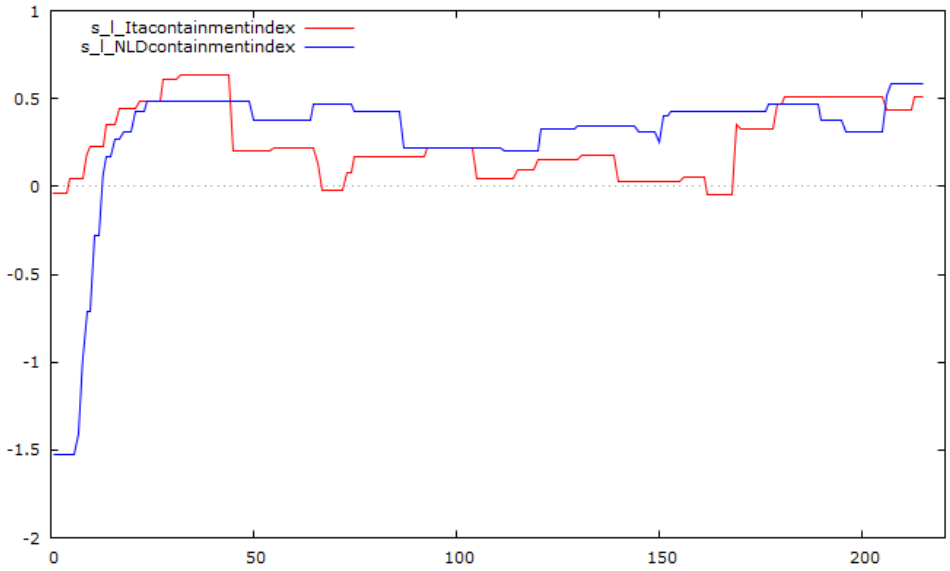

Figure 3.10- Time series chart of containment indexes

As since as variables are log-linearized and standardized, I draw comparison on their growth paces: the Conte's government dealt with the Covid-19 crisis before that the Rutte's ministers so it kept high level of efforts over the whole period of 215 observations. On the other hand, the Dutch government rushed to keep up with the Italian standards within the time-period of the first 50 observations. Furthermore, in Italy growth in containment index slightly slowed down by the middle of the period, while this phenomenon did not take place in Netherlands.

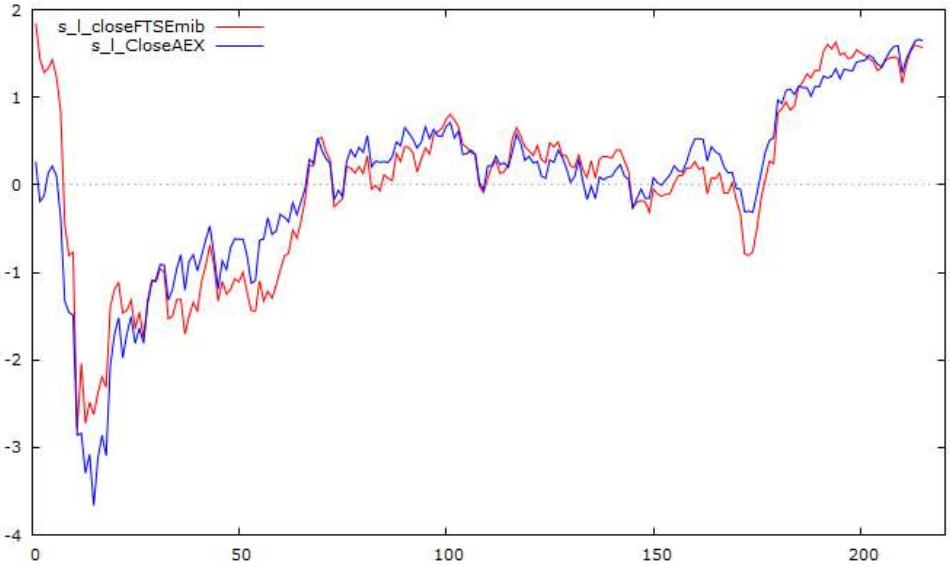

Figure 3.11-Time series plot of financial indexes

About indexes, they both grew similarly, even though the FTSEmib Index had more dramatic changes than the AEX index. This pattern could be due to the earlier Covid-related effects in Italy. However, stock markets are globally interdependent with each other so, macro trends in common are actually the norm. In particular, there have been two drops in values, the first and the biggest in the first quarter of observations, and the second on the third, which are approximately the periods of early spring and autumn 2020.

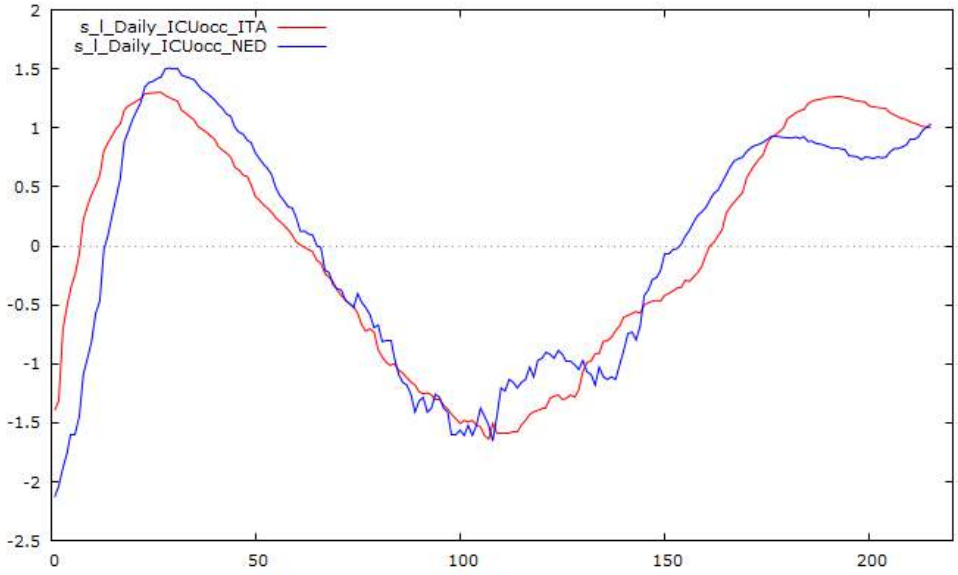

Figure 3.12-Time series plot of ICU occupied by day

The variables of ICU occupied by days also had closed patterns within the two countries, with earlier peaks in Italy. In addition, the Dutch healthcare system faced a new rise of infections by the end of the period.

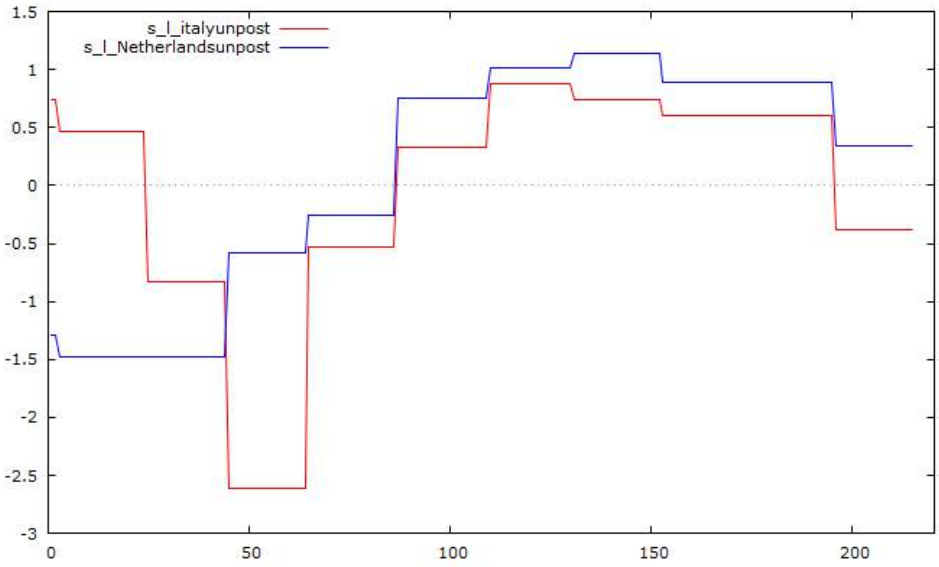

Figure 3.13-Time series chart of 1-lagged unemployment

The time series chart of unemployment has a step-like appearance. That is because they are actually monthly data, which I matched to each day of a month. Furthermore, it is worth recalling these are postponed values, so the upcoming analysis will not rely on the first quarter of observations. However, I still note there have been more severe drops in unemployment levels in Italy, which is a more positive indicator than in Netherlands.

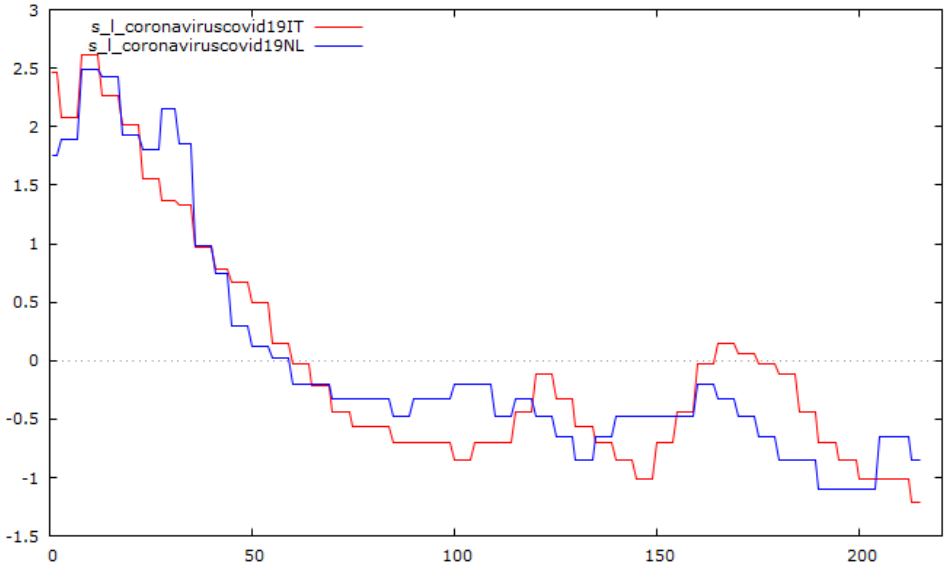

Figure 3.14-Time series plot of Google Trends

Finally, this chart depict how attention over “Covid-19” and “coronavirus” terms varied over time. Patterns are still similar for both countries, even though Italian citizens’ interest on it declined sharply by the middle of the period (i.e. summer months) and rushed to a peak by the fourth quarter (i.e. autumn).

- **Outcomes**

As a second step, I turn to the OLS analysis of the simple linear regression, which I wrote previously in this block’s methodology. The aim is to understand whether governments acknowledged all pressure groups’ issues equally on a statistical significance perspective. Therefore, along with OLS, I perform Chow tests in order to spot any possible structural breaks in influences on governmental actions.

I first start with the OLS for the Italian variables. Adjusted R-squared is high enough and only the numbers of occupied ICU are significant over the whole time-period.

Gretl outcome 3.1- OLS model for the Italian government

Model 1: OLS, using observations 1-215
Dependent variable: s_l_Itacontainmentindex

	Coefficient	Std. Error	t-ratio	p-value	
const	0.254250	0.0101812	24.97	<0.0001	***
s_l_closeFTSEmib	−0.00268558	0.0166781	−0.1610	0.8722	
s_l_Daily_ICUocc_ITA	0.159366	0.0104355	15.27	<0.0001	***
s_l_italyunpost	−0.000726986	0.0106056	−0.06855	0.9454	
s_l_coronaviruscovid19IT	−0.0218256	0.0142453	−1.532	0.1270	

Mean dependent var	0.252277	S.D. dependent var	0.203155
Sum squared resid	3.857869	S.E. of regression	0.135539
R-squared	0.563202	Adjusted R-squared	0.554882
F(4, 210)	67.69288	P-value(F)	1.02e-36
Log-likelihood	127.1345	Akaike criterion	−244.2689
Schwarz criterion	−227.4157	Hannan-Quinn	−237.4594

Gretl outcome 3.2-Chow test for the Italian government

Augmented regression for Chow test
OLS, using observations 1-215
Dependent variable: s_l_Itacontainmentindex

	coefficient	std. error	t-ratio	p-value	
const	0.367171	0.0278302	13.19	3.54e-029	***
s_l_closeFTSEmib	−0.0237748	0.0251164	−0.9466	0.3450	
s_l_Daily_ICUocc~	0.247992	0.0279247	8.881	3.38e-016	***
s_l_italyunpost	0.0732242	0.0124812	5.867	1.76e-08	***
s_l_coronavirusc~	−0.119241	0.0184301	−6.470	7.07e-010	***
splitdum	−0.145955	0.0450891	−3.237	0.0014	***
sd_s_l_closeFTSE~	0.233628	0.0406072	5.753	3.15e-08	***
sd_s_l_Daily_ICU~	−0.143687	0.0323436	−4.443	1.45e-05	***
sd_s_l_italyunpo~	−0.0552493	0.0443160	−1.247	0.2139	
sd_s_l_coronavir~	0.156784	0.0471837	3.323	0.0011	***

Mean dependent var 0.252277 S.D. dependent var 0.203155
Sum squared resid 2.542274 S.E. of regression 0.111361
R-squared 0.712157 Adjusted R-squared 0.699520
F(9, 205) 56.35490 P-value(F) 1.14e-50
Log-likelihood 171.9680 Akaike criterion −323.9359
Schwarz criterion −290.2295 Hannan-Quinn −310.3170

Chow test for structural break at observation 108
F(5, 205) = 21.217 with p-value 0.0000

Apropos of Chow test, I find out that the Conte's government did not statistically look after the financial index FTSEmib in the first time subset, while it disregard the growth of unemployment in the second time subset.

On the side of Netherlands, the government significantly listened to all pressure groups during 2020, with except of the representatives of labour market. Then, adjusted R-squared is slightly better for the Dutch model than for the Italian one.

Gretl outcome 3.3- OLS model for the Dutch government

Model 2: OLS, using observations 1-215
Dependent variable: s_l_NLDcontainmentindex

	Coefficient	Std. Error	t-ratio	p-value	
const	0.228781	0.0168021	13.62	<0.0001	***
s_l_CloseAEX	−0.260945	0.0286688	−9.102	<0.0001	***
s_l_Daily_ICUocc_NED	0.211126	0.0171312	12.32	<0.0001	***
s_l_Netherlandsunpost	0.0103419	0.0339949	0.3042	0.7613	
s_l_coronaviruscovid19NL	−0.386521	0.0399965	−9.664	<0.0001	***

Mean dependent var	0.293371	S.D. dependent var	0.379136
Sum squared resid	10.50302	S.E. of regression	0.223639
R-squared	0.658563	Adjusted R-squared	0.652060
F(4, 210)	101.2619	P-value(F)	6.98e-48
Log-likelihood	19.46802	Akaike criterion	−28.93604
Schwarz criterion	−12.08285	Hannan-Quinn	−22.12658

Gretl outcome 3.4- Chow test for the Dutch government

Augmented regression for Chow test
OLS, using observations 1-215
Dependent variable: s_l_NLDcontainmentindex

	coefficient	std. error	t-ratio	p-value	
const	0.529642	0.0246608	21.48	2.27e-054	***
s_l_CloseAEX	−0.155589	0.0276788	−5.621	6.15e-08	***
s_l_Daily_ICUocc~	0.450864	0.0206374	21.85	1.97e-055	***
s_l_Netherlandsu~	0.431228	0.0402871	10.70	1.59e-021	***
s_l_coronavirusc~	−0.201892	0.0324667	−6.218	2.77e-09	***
splitdum	−0.134206	0.0968606	−1.386	0.1674	
sd_s_l_CloseAEX	0.185994	0.0596462	3.118	0.0021	***
sd_s_l_Daily_ICU~	−0.362786	0.0297541	−12.19	4.52e-026	***
sd_s_l_Netherlan~	−0.398786	0.103783	−3.843	0.0002	***
sd_s_l_coronavir~	0.287498	0.0795691	3.613	0.0004	***

Mean dependent var 0.293371 S.D. dependent var 0.379136
Sum squared resid 4.324164 S.E. of regression 0.145236

R-squared 0.859428 Adjusted R-squared 0.853257
F(9, 205) 139.2588 P-value(F) 2.73e-82
Log-likelihood 114.8683 Akaike criterion −209.7366
Schwarz criterion −176.0302 Hannan-Quinn −196.1176

Chow test for structural break at observation 108
F(5, 205) = 58.5855 with p-value 0.0000

This Chow test shows that the Dutch government cared of all group during both time subset, which may be an odd outcome in comparison to the OLS regression results. However, OLS test and Structural Break analysis do not need to coincide.

On a third step, I turn cross sectional data into time series at the daily frequency. As a first analysis, I run an Augmented Dickey-Fuller test of unit root on both containment indexes. In fact, stationary series would prove that governments were repeating the same choices in time, and, if different cognitive biases affected them, that they were irrational in a lasting way.

Gretl outcome 3.5- Augmented Dickey-Fuller test for Italy

Augmented Dickey-Fuller test for s_l_Itacontainmentindex
testing down from 14 lags, criterion AIC
sample size 214
unit-root null hypothesis: a = 1

test with constant
including 0 lags of (1-L)s_l_Itacontainmentindex
model: (1-L)y = b0 + (a-1)*y(-1) + e
estimated value of (a - 1): -0.0341272
test statistic: tau_c(1) = -1.95456
p-value 0.3069
1st-order autocorrelation coeff. for e: 0.028

with constant and trend
including 0 lags of (1-L)s_l_Itacontainmentindex
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + e
estimated value of (a - 1): -0.0341405
test statistic: tau_ct(1) = -1.94792
p-value 0.6257
1st-order autocorrelation coeff. for e: 0.028

As far as Italy is concerned, p-values are not significant in any case, which means that the Italian government were not choosing its strategies in a stationary way. That is, it did not had a long-term strategy in relation to Covid-related issues. However, this is a two-fold-

meaning outcome. In fact, it is good that someone imply long-term strategies just if they are effective and rational.

Gretl outcome 3.6- Augmented Dickey-Fuller test for Netherlands

```
Augmented Dickey-Fuller test for s_l_NLDcontainmentindex
testing down from 14 lags, criterion AIC
sample size 209
unit-root null hypothesis: a = 1

  test with constant
  including 5 lags of (1-L)s_l_NLDcontainmentindex
  model: (1-L)y = b0 + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.139689
  test statistic: tau_c(1) = -10.4891
  asymptotic p-value 8.788e-021
  1st-order autocorrelation coeff. for e: -0.106
  lagged differences: F(5, 202) = 6.597 [0.0000]

  with constant and trend
  including 5 lags of (1-L)s_l_NLDcontainmentindex
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.141055
  test statistic: tau_ct(1) = -10.3297
  asymptotic p-value 3.865e-021
  1st-order autocorrelation coeff. for e: -0.106
  lagged differences: F(5, 201) = 6.550 [0.0000]
```

On the contrary, this test for Netherlands reports significant p-values and consequently its GCI is stationary. It means that the Dutch government carried on its projects with a coherent course of action, as the Chow test results already indirectly suggested.

Finally, I conclude this paragraph with VAR tests. Apropos of these, I told earlier that they call for consistent and independently distributed estimators. The choice of variables from several and diverse sources along with reasonable adjusted p-values in OLS models are already clues in favour. However, in order to prove that, once at all, they need to be not statistically auto-correlated.

Gretl outcome 3.7- Autocorrelation test for Italian GCI

```
Test for autocorrelation until order 1

        Rao F    Approx dist.  p-value
lag 1     0,905    F(25, 740)    0,5991
```

$$\begin{cases} GCI_{IT,t} = \alpha_{IT} GCI_{IT,t-1} + \beta_{IT} closeFTSE_{IT,t-1} + \gamma_{IT} Daily\_ICUocc_{IT,t-1} + \delta_{IT} coronaviruscc_{IT,t-1} + \varepsilon_{IT,t} \\ closeFTSE_{IT,t} = \alpha_{IT} GCI_{IT,t-1} + \beta_{IT} closeFTSE_{IT,t-1} + \gamma_{IT} Daily\_ICUocc_{IT,t-1} + \delta_{IT} coronaviruscc_{IT,t-1} + \varepsilon_{IT,t} \\ Daily\_ICUocc_{IT,t} = \alpha_{IT} GCI_{IT,t-1} + \beta_{IT} closeFTSE_{IT,t-1} + \gamma_{IT} Daily\_ICUocc_{IT,t-1} + \delta_{IT} coronaviruscc_{IT,t-1} + \varepsilon_{IT,t} \\ coronaviruscc_{IT,t} = \alpha_{IT} GCI_{IT,t-1} + \beta_{IT} closeFTSE_{IT,t-1} + \gamma_{IT} Daily\_ICUocc_{IT,t-1} + \delta_{IT} coronaviruscc_{IT,t-1} + \varepsilon_{IT,t} \end{cases}$$

Model 3.3- Italian VAR system of equations

Gretl outcome 3.8- Tests on Italian VAR equations

VAR system, lag order 1
OLS estimates, observations 2-215 (T = 214)
Log-likelihood = 929.66158
Determinant of covariance matrix = 1.9804648e-009
AIC = -8.5015
BIC = -8.1869
HQC = -8.3744
Portmanteau test: LB(48) = 1121.95, df = 752 [0.0000]

Equation 1: s_l_Itacontainmentindex

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0263854	0.00755683	3.492	0.0006	***
s_l_Itacontainmentindex_1	0.907737	0.0257865	35.20	<0.0001	***
s_l_closeFTSEmib_1	0.00319450	0.00572820	0.5577	0.5777	
s_l_Daily_ICUocc_ITA_1	0.0148778	0.00555872	2.676	0.0080	***
s_l_coronaviruscovid19IT_1	0.00651024	0.00522097	1.247	0.2138	

Mean dependent var	0.253648	S.D. dependent var	0.202631
Sum squared resid	0.535391	S.E. of regression	0.050613
R-squared	0.938782	Adjusted R-squared	0.937610
F(4, 209)	801.2586	P-value(F)	1.7e-125
rho	0.028791	Durbin-Watson	1.940821

F-tests of zero restrictions:
All lags of s_l_ItacontainmentindexF(1, 209) = 1239.2 [0.0000]
All lags of s_l_closeFTSEmib F(1, 209) = 0.31101 [0.5777]
All lags of s_l_Daily_ICUocc_ITAF(1, 209) = 7.1636 [0.0080]
All lags of s_l_coronaviruscovid19ITF(1, 209) = 1.5549 [0.2138]

Equation 2: s_l_closeFTSEmib

	Coefficient	Std. Error	t-ratio	p-value	
const	−0.0492402	0.0283831	−1.735	0.0842	*
s_l_Itacontainmentindex_1	0.100854	0.0968528	1.041	0.2989	

s_l_closeFTSEmib_1	0.899675	0.0215148	41.82	<0.0001	***
s_l_Daily_ICUocc_ITA_1	0.0132608	0.0208782	0.6351	0.5260	
s_l_coronaviruscovid19IT_1	−0.0974314	0.0196097	−4.969	<0.0001	***

Mean dependent var	−0.305488	S.D. dependent var	0.775056
Sum squared resid	7.552825	S.E. of regression	0.190100
R-squared	0.940971	Adjusted R-squared	0.939841
F(4, 209)	832.9109	P-value(F)	3.7e-127
rho	−0.137026	Durbin-Watson	2.272573

F-tests of zero restrictions:
All lags of s_l_ItacontainmentindexF(1, 209) = 1.0843 [0.2989]
All lags of s_l_closeFTSEmib F(1, 209) = 1748.6 [0.0000]
All lags of s_l_Daily_ICUocc_ITAF(1, 209) = 0.40341 [0.5260]
All lags of s_l_coronaviruscovid19ITF(1, 209) = 24.686 [0.0000]

Equation 3: s_l_Daily_ICUocc_ITA

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0528386	0.00797992	6.621	<0.0001	***
s_l_Itacontainmentindex_1	−0.123522	0.0272302	−4.536	<0.0001	***
s_l_closeFTSEmib_1	0.0497560	0.00604890	8.226	<0.0001	***
s_l_Daily_ICUocc_ITA_1	1.00273	0.00586993	170.8	<0.0001	***
s_l_coronaviruscovid19IT_1	0.0596025	0.00551327	10.81	<0.0001	***

Mean dependent var	−0.001293	S.D. dependent var	0.987514
Sum squared resid	0.597019	S.E. of regression	0.053447
R-squared	0.997126	Adjusted R-squared	0.997071
F(4, 209)	18126.50	P-value(F)	2.7e-264
rho	0.225666	Durbin-Watson	1.504106

F-tests of zero restrictions:
All lags of s_l_ItacontainmentindexF(1, 209) = 20.577 [0.0000]
All lags of s_l_closeFTSEmib F(1, 209) = 67.661 [0.0000]
All lags of s_l_Daily_ICUocc_ITAF(1, 209) = 29181 [0.0000]
All lags of s_l_coronaviruscovid19ITF(1, 209) = 116.87 [0.0000]

Equation 4: s_l_coronaviruscovid19IT

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0120639	0.0137345	0.8784	0.3808	
s_l_Itacontainmentindex_1	−0.101964	0.0468670	−2.176	0.0307	**
s_l_closeFTSEmib_1	0.00269631	0.0104110	0.2590	0.7959	
s_l_Daily_ICUocc_ITA_1	0.00616563	0.0101030	0.6103	0.5423	
s_l_coronaviruscovid19IT_1	0.987147	0.00948910	104.0	<0.0001	***

Mean dependent var	0.061165	S.D. dependent var	0.888856
Sum squared resid	1.768558	S.E. of regression	0.091989
R-squared	0.989491	Adjusted R-squared	0.989289
F(4, 209)	4919.502	P-value(F)	1.9e-205
rho	−0.069478	Durbin-Watson	2.138556

F-tests of zero restrictions:
All lags of s_l_ItacontainmentindexF(1, 209) = 4.7333 [0.0307]
All lags of s_l_closeFTSEmib F(1, 209) = 0.067074 [0.7959]
All lags of s_l_Daily_ICUocc_ITAF(1, 209) = 0.37244 [0.5423]
All lags of s_l_coronaviruscovid19ITF(1, 209) = 10822 [0.0000]

The autocorrelation test has insignificant p-value, so variables for Italy are not auto-correlated. Consequently, whatever comment on VAR models make sense.

Significant outcomes in Equation 1 are those of the OLS model above. Then, FTSE growth only responded to variations of popular attention around Covid-19 as since as only "s_l_coronaviruscovid19IT_1" had p-value below 5%. On the other side, changes in occupancy of ICU depended on all the other variables. Finally, people's concern around Covid-19 grounded just on changes in public policies of containment.

Gretl outcome 3.9- Autocorrelation test for Dutch GCI

Test for autocorrelation until order 1

	Rao F	Approx dist.	p-value
lag 1	1,783	F(25, 740)	0,0110

$$\begin{cases} GCI_{NL,t} = \alpha_{NL} GCI_{NL,t-1} + \beta_{NL} closeAEX_{NL,t-1} + \gamma_{NL} Daily\_ICUocc_{NL,t-1} + \delta_{NL} coronavirusc_{NL,t-1} + \varepsilon_{NL,t} \\ closeAEX_{NL,t} = \alpha_{NL} GCI_{NL,t-1} + \beta_{NL} closeAEX_{NL,t-1} + \gamma_{NL} Daily\_ICUocc_{NL,t-1} + \delta_{NL} coronavirusc_{NL,t-1} + \varepsilon_{NL,t} \\ Daily\_ICUocc_{NL,t} = \alpha_{NL} GCI_{NL,t-1} + \beta_{NL} closeAEX_{NL,t-1} + \gamma_{NL} Daily\_ICUocc_{NL,t-1} + \delta_{IT} coronavirusc_{NL,t-1} + \varepsilon_{NL,t} \\ coronavirusc_{NL,t} = \alpha_{NL} GCI_{NL,t-1} + \beta_{IT} closeAEX_{NL,t-1} + \gamma_{NL} Daily\_ICUocc_{NL,t-1} + \delta_{NL} coronavirusc_{NL,t-1} + \varepsilon_{NL,t} \end{cases}$$

Model 3.4- Dutch VAR system of equations

Gretl outcome 3.10- Tests on Dutch VAR equations

VAR system, lag order 1
OLS estimates, observations 2-215 (T = 214)
Log-likelihood = 804.07402
Determinant of covariance matrix = 6.4047963e-009
AIC = -7.3278
BIC = -7.0132
HQC = -7.2007
Portmanteau test: LB(48) = 1028.9, df = 752 [0.0000]

Equation 1: s_l_NLDcontainmentindex

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0286979	0.00547336	5.243	<0.0001	***
s_l_NLDcontainmentindex_1	0.929388	0.0164160	56.61	<0.0001	***
s_l_CloseAEX_1	−0.00962309	0.00807207	−1.192	0.2346	
s_l_Daily_ICUocc_NED_1	0.00689480	0.00504825	1.366	0.1735	
s_l_coronaviruscovid19NL_1	0.000697406	0.00911945	0.07647	0.9391	

Mean dependent var	0.301877	S.D. dependent var	0.358873
Sum squared resid	0.590712	S.E. of regression	0.053164
R-squared	0.978466	Adjusted R-squared	0.978054
F(4, 209)	2374.195	P-value(F)	6.7e-173
rho	0.081653	Durbin-Watson	1.810715

F-tests of zero restrictions:
All lags of s_l_NLDcontainmentindexF(1, 209) = 3205.2 [0.0000]
All lags of s_l_CloseAEX F(1, 209) = 1.4212 [0.2346]
All lags of s_l_Daily_ICUocc_NEDF(1, 209) = 1.8654 [0.1735]
All lags of s_l_coronaviruscovid19NLF(1, 209) = 0.0058484 [0.9391]

Equation 2: s_l_CloseAEX

	Coefficient	Std. Error	t-ratio	p-value	
const	−0.0297431	0.0213115	−1.396	0.1643	
s_l_NLDcontainmentindex_1	0.0426062	0.0639186	0.6666	0.5058	
s_l_CloseAEX_1	0.900539	0.0314300	28.65	<0.0001	***
s_l_Daily_ICUocc_NED_1	0.0289008	0.0196563	1.470	0.1430	
s_l_coronaviruscovid19NL_1	−0.0938884	0.0355082	−2.644	0.0088	***

Mean dependent var	−0.203803	S.D. dependent var	0.963424
Sum squared resid	8.955630	S.E. of regression	0.207002
R-squared	0.954702	Adjusted R-squared	0.953835
F(4, 209)	1101.214	P-value(F)	3.7e-139
rho	−0.054215	Durbin-Watson	2.107094

F-tests of zero restrictions:
All lags of s_l_NLDcontainmentindexF(1, 209) = 0.44432 [0.5058]
All lags of s_l_CloseAEX F(1, 209) = 820.95 [0.0000]
All lags of s_l_Daily_ICUocc_NEDF(1, 209) = 2.1618 [0.1430]
All lags of s_l_coronaviruscovid19NLF(1, 209) = 6.9914 [0.0088]

Equation 3: s_l_Daily_ICUocc_NED

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0380854	0.00799298	4.765	<0.0001	***
s_l_NLDcontainmentindex_1	−0.0988342	0.0239730	−4.123	<0.0001	***
s_l_CloseAEX_1	−0.0260686	0.0117880	−2.211	0.0281	**

s_l_Daily_ICUocc_NED_1	1.00406	0.00737217	136.2	<0.0001	***
s_l_coronaviruscovid19NL_1	−0.00541057	0.0133175	−0.4063	0.6850	

Mean dependent var	−0.017162	S.D. dependent var	0.985595
Sum squared resid	1.259754	S.E. of regression	0.077637
R-squared	0.993912	Adjusted R-squared	0.993795
F(4, 209)	8529.526	P-value(F)	3.2e-230
rho	0.238716	Durbin-Watson	1.515413

F-tests of zero restrictions:
All lags of s_l_NLDcontainmentindexF(1, 209) = 16.997 [0.0001]
All lags of s_l_CloseAEX F(1, 209) = 4.8905 [0.0281]
All lags of s_l_Daily_ICUocc_NEDF(1, 209) = 18549 [0.0000]
All lags of s_l_coronaviruscovid19NLF(1, 209) = 0.16506 [0.6850]

Equation 4: s_l_coronaviruscovid19NL

	Coefficient	Std. Error	t-ratio	p-value	
const	0.0147619	0.0114777	1.286	0.1998	
s_l_NLDcontainmentindex_1	−0.112308	0.0344244	−3.262	0.0013	***
s_l_CloseAEX_1	−0.0193842	0.0169272	−1.145	0.2535	
s_l_Daily_ICUocc_NED_1	0.00464578	0.0105862	0.4389	0.6612	
s_l_coronaviruscovid19NL_1	0.953980	0.0191235	49.89	<0.0001	***

Mean dependent var	−0.050064	S.D. dependent var	1.010619
Sum squared resid	2.597617	S.E. of regression	0.111484
R-squared	0.988060	Adjusted R-squared	0.987831
F(4, 209)	4323.630	P-value(F)	1.2e-199
rho	−0.053555	Durbin-Watson	2.103203

F-tests of zero restrictions:
All lags of s_l_NLDcontainmentindexF(1, 209) = 10.644 [0.0013]
All lags of s_l_CloseAEX F(1, 209) = 1.3114 [0.2535]
All lags of s_l_Daily_ICUocc_NEDF(1, 209) = 0.19259 [0.6612]
All lags of s_l_coronaviruscovid19NLF(1, 209) = 2488.5 [0.0000]

According to the first VAR equation, in Netherland GCI is an autoregressive function of just itself, while equations 2 and 4 depends on past values of the same variables as in Italy concerning the same equations. In addition, equation 3 differs because variations in daily-occupied ICU in Netherlands do not depend on people's concern around Covid-19. That is very important as since as Block 1 demonstrated that the Rutte's governments stressed on the importance of people's good behaviours. In particular, it cast a doubt concerning the third block: whether Netherlands preferred the economic recovery to the public health.

- **Conclusion**

Once again, Block 2 demonstrates that both government were irrational in dealing with Covid-related issues. However, the Italian leaders developed and put in practise strategies incoherently, while the Dutch government did not. That is because Chow tests along with Dickey-Fuller test suggest that their biases were different (and potentially time-varying). In addition, VAR tests provides further evidence to the second alternative hypothesis of this thesis but on a peculiar way: different sets of biases affected these two governments.

Firstly, the OLS model as well as the first VAR equation proved that the Italian government in 2020 strictly focused on variations in occupied ICU and this can be explained by Affect Heuristics. In fact, the growth of those seriously infected by Covid-19 was potentially influencing emotions of decision makers, who were more prone to overlook other important issues, even on the medical side. Therefore, this is also a potential explanation of excess mortality out of average trends and for no Covid-related reasons. About it and for regional insights, I call to read Scortichini M. et Al. (2020)[cxiii].

Secondly, Present Bias affected decisions of both countries. On the side of Italy, Conte first overlooked the reactions of financial investors, and then it disregarded the growth of unemployment. On the side of Netherlands, even Rutte did not care of unemployment too much, as showed in the OLS model. However, this choice is potentially a damage because increasing unemployment rates foster discontent around the governments, and encourage people to gather to protest, which worse infection rates and so ICU occupancy. Furthermore, a Projection Bias affected the governmental strategies, just because of the coherent behaviours of the Dutch legislators. In fact, as the chart of unemployment time series depicts, they got the decision to overlook unemployment since the very beginning of the Covid-19 emergency. That is, they believed that their strategy would had been effective even in a distant future.

BLOCK 3: There is no trade-off between economy and health

- **Methodology**

This block is to test whether countries had preferences over specific issues. In case of it, governments were irrationally thinking and operating against Covid-19 related issues as since as VAR Equations 3 in previous analyses demonstrated that there were close autoregressive relationships within economic variables and health indicators. Thus, I opted for tests fitted to comprise both issues at once. In fact, public opinion about governments traditionally goes through media sources and it does not split official purposes from their implementations. Furthermore, in recent times, media readers addressed social media communication by leaders and politicians as equal to press conferences, governmental bulletins, accountings and outcomes statistics[cxiv]. However, I got the decision not to include social media analysis in this thesis as it worth a complex and deeper argumentation, which exceeds the test of rationality of governments.

Consequently, I collected time-series of daily frequency of some key words on journals through the online repository service Media Cloud[58]. In particular, I ran the "Explorer" tool and I selected articles from only national-interest online media from 27/02/20 to 30/12/20 (the same period of Block 2). Thus, I applied the Boolean operator "OR" in order not to cut down frequencies of articles. Above I report fourteen key words for each country and so, seven for each theme, health and economy.

Italy

- *Health:* "coronavirus", "Covid-19", "emergenza sanitaria"," nuovi casi", "decessi", "pandemia", "terapia intensiva".
- *Economy:* "crisi", "povertà", "disoccupazione", "economia", "imprese", "sussidi", "lavoro".

Netherlands

- *Health:* "coronavirus", "Covid-19", "sanitair noodgeval", "nieuwe gevallen", "sterfgevallen", "pandemie", "intensieve zorg".

[58] https://mediacloud.org/ last visit 20 04 21 h.20.05

- *Economy:* “crisis”, “armoede”, “werkloosheid”, “economie”, “bedrijven”, “subsidies”, “werk”.

These key words in English end up being:

- *Health:* "Coronavirus", "Covid-19", "health emergency", "new cases", "deaths", "pandemic", "intensive care".
- *Economy:* "Crisis", "poverty", "unemployment", "economy", "businesses", "subsidies", "work".

As a second step, I ran a Gretl analysis on these time series. In order to spot trade-offs, I first had 299 differences values between daily values of health and of economy per country and then I got their means. Therefore, I tested if they were not significantly different from zero, taking as granted that alternative hypothesis implied a trade-off by a government. Furthermore, it is worth looking into the stability of press opinions around governments and so, in case of trade-offs, to check if national media had convergent points of views during 2020. Apropos of it, I launched Dickey Fuller tests of unit roots on Gretl. Thus, I acknowledged differences as time series of 299 observations, and I applied the AIC criterion on 15 lags backwards, both on a test with constant and on a test with constant and trend. Finally, I opted for 95% confidence intervals for the same reasons I explained in Block 2.

- **Stylized facts and time-series**

As an introduction to the third Block, I attached a chart of time series for health and for economy in the two countries. It is straightforward that the Italian online media stressed more on both themes as lines “sanitary Italy” and “economy Italy” are above than the Dutch ones, in frequency terms. Furthermore, the Dutch media put similar attention on these two issues as since as lines are closer and they are much more likely to overlap.

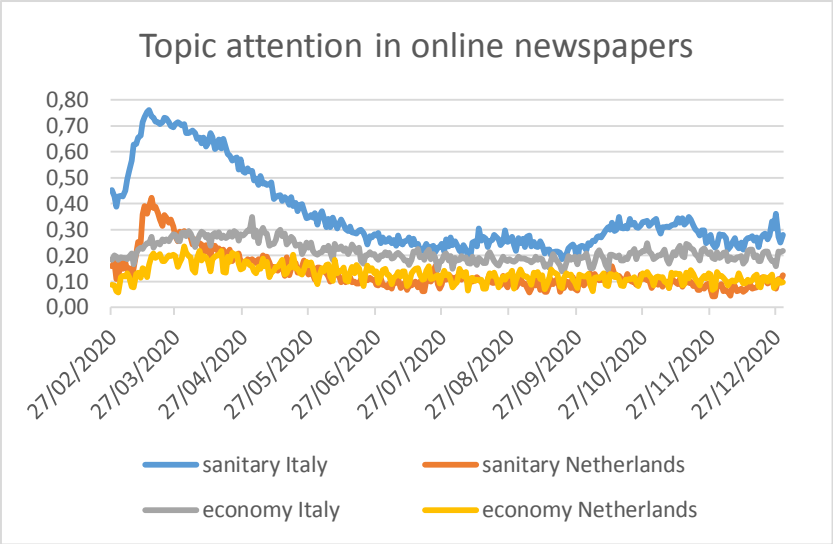

Figure 3.15-Time series chart of themes per country

- **Outcomes**

This Block's analysis begins with a chart depicting the Italian and the Dutch daily differences between sanitary values and economic ones. The Italian time series took on only positive recordings, while that is not the case of Dutch media. In fact, apart from slightly positive differences until May 2020, they reported more economic terms, and, possibly, economic news. However, this is not enough to state that the Italian media spotted a trade-off on behalf of sanitary issues, while the Dutch colleagues did the opposite, as I suggested in Chapter 1.

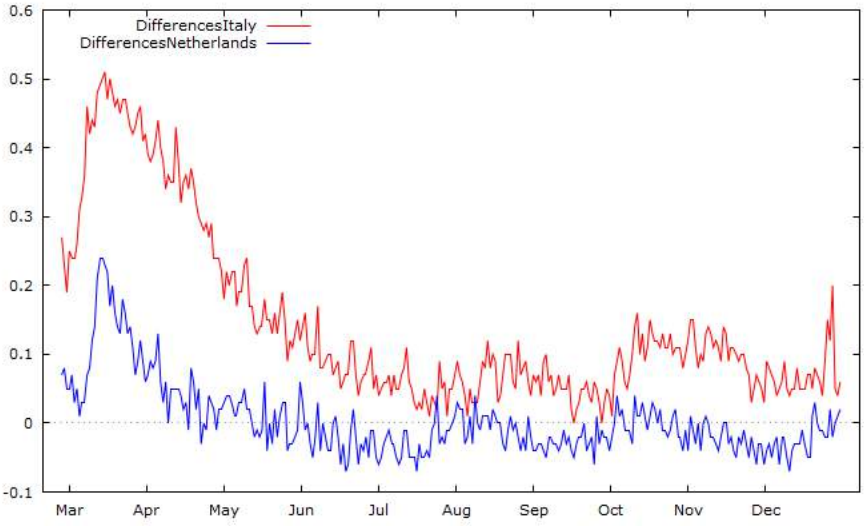

Figure 3.16-Time series plot of differences

In order to find out eventual trade-offs, I need to perform a test on mean of differences. I began with the Italian time series: as p-value is close to zero, I rejected the null hypothesis according to which the mean is statistically null and there is no-trade off. That is Italian online media acknowledged a preference for sanitary issues Conte's government, as in Figure 3.16.

Gretl outcome 3.11- Hypothesis test on Italian difference mean

```
Null hypothesis: population mean = 0
Sample size: n = 308
Sample mean = 0.14539, std. deviation = 0.128703
Test statistic: t(307) = (0.14539 - 0)/0.00733351 = 19.8254
Two-tailed p-value = 6.778e-057
(one-tailed = 3.389e-057)
```

As I second step I checked if the Italian public opinion had converged mean and variance within 27/02/20-30/12/20. In fact, stationary mean is actually the sample mean of the test above, which I proved to be statistically different from zero. Therefore, a stationary series of differences means that the Italian Online media kept on regarding the government as irrational in a consistent way. However, both Dickey-Fuller tests at variable level rejected this stationary hypothesis, as p-values were above 5%.

Gretl outcome 3.12- Augmented Dickey Fuller tests for Italy

```
Augmented Dickey-Fuller test for DifferencesItaly
testing down from 15 lags, criterion AIC
sample size 297
unit-root null hypothesis: a = 1

  test with constant
  including 10 lags of (1-L)DifferencesItaly
  model: (1-L)y = b0 + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.0284673
  test statistic: tau_c(1) = -2.37952
  asymptotic p-value 0.1476
  1st-order autocorrelation coeff. for e: -0.022
  lagged differences: F(10, 285) = 7.861 [0.0000]

  with constant and trend
  including 10 lags of (1-L)DifferencesItaly
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -0.0330772
  test statistic: tau_ct(1) = -1.8913
  asymptotic p-value 0.659
  1st-order autocorrelation coeff. for e: -0.021
```

lagged differences: F(10, 284) = 7.583 [0.0000]

Then, I went on with the analysis of the Dutch online media articles. As before, two-tailed p-value reject the null hypothesis of no-trade-off, which means that the Rutte's government preferred the economic issues to the sanitary matters. However, as in Italy, online public opinion on differences did not converge by mean and variance.

Gretl outcome 3.13- Hypothesis test on Dutch difference mean

Null hypothesis: population mean = 0
Sample size: n = 308
Sample mean = 0.00461039, std. deviation = 0.0545474
Test statistic: t(307) = (0.00461039 - 0)/0.00310813 = 1.48333
Two-tailed p-value = 0.139
(one-tailed = 0.06951)

Gretl outcome 3.14- Augmented Dickey Fuller tests for Netherlands

Augmented Dickey-Fuller test for DifferencesNetherlands
testing down from 15 lags, criterion AIC
sample size 299
unit-root null hypothesis: a = 1

test with constant
including 8 lags of (1-L)DifferencesNetherlands
model: (1-L)y = b0 + (a-1)*y(-1) + ... + e
estimated value of (a - 1): -0.0691898
test statistic: tau_c(1) = -2.3701
asymptotic p-value 0.1504
1st-order autocorrelation coeff. for e: 0.013
lagged differences: F(8, 289) = 9.088 [0.0000]

with constant and trend
including 8 lags of (1-L)DifferencesNetherlands
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
estimated value of (a - 1): -0.111167
test statistic: tau_ct(1) = -2.91845
asymptotic p-value 0.1565
1st-order autocorrelation coeff. for e: 0.011
lagged differences: F(8, 288) = 8.121 [0.0000]

- **Conclusion**

Online media spotted out trade-offs in relation to governmental speeches and implementations about Covid-related issues. Consequently, Block 3 confirms the Italian

system as welfarist and the Dutch system as neo-liberal, as I portrayed them in Chapter 1. In addition, national online media outlines both governments as irrational because they did not weight equally health and economy.

Block 3 did not identify governments as being always stationary irrational, neither had it guaranteed they had a preference over a certain theme in reality, as it just submitted the point of view of online journalists over governmental facts and ideas. Consequently, VAR equations in Block 2 might have suggested that the Dutch government cared more for the economy than for public health because daily ICU did not have a lagged effect on people's attention. However, this is not a sufficient proof of one's country preference, because there is a need for statistical test for both countries on highly technical and confidential data (i.e.: national accountings, decrees, legislative plans, internal notification reports, etc…), which are complex to understand and not always publicly available.

Finally, the analysis on non-stationarity of time-series of differences casts a doubt on the relationship within national online media and governments. In particular, it is possible that government attempted to win the favour of national media so that these could not believe them to renovate the same preferences for particular issues: in this way governments would had the chance to make their irrationality acceptable by the society, and so they would be still legitimate to rule a country. However, this suggestion calls for a proof, which goes further than the aim of this thesis.

CONCLUSION

CONCLUSION

The research question of this thesis pointed out the necessity to inquire whether market agents and governments (as their representatives) were rationally behaving towards Covid-related issues during 2020.

In Chapter 1, I ruled out sanitary experts as representing decision-makers of nations and I turned the attention to the Italian and the Dutch governments, which had the role of aggregating preferences of large communities and of pursuing public interests. In this regard, I proved that only the Dutch ministers carried on “nudging activities” in order to manage the situation, whereas the Italian counterparts opted for more coercive measures. That was because of not only a possible lack of trust by Italians for institutions –as Thaler and Sunstein suggested- but also of mental schemes of leaders, which complied with historical “narratives” of how to rule a country in a pandemic crisis. Indeed, the “elitarian” movement of politics originated in Italy and it bars the attendance of popular interests groups from power. Conversely, the Dutch leaders are traditionally open to dialogue with all social partners according to the “polder model” narratives. It follows that the Rutte’s government was more eager to rely on collaborative behaviours in strategies from citizens then the Conte’s one.

However, no strategies in no country seemed to unbalance to a specific theme of interest, if not for the opinion of online media, which confirmed other kind of mental schema of rulers: the welfarist in Italy, and the neo-liberist in Netherlands. That is the Italian government had a preference to safeguard public health, as a collective interest, and the Dutch government put the economy as first. Therefore, these two countries applied divergent strategies because of different mental schema, along with their consequent diverse concerning points: Rutte and his ministers wondered about the private intentions of citizens, while Conte worried about the likely outcomes of its top-down strategies on specific fields of intervention (i.e. economy, and schools).

Finally, Chapter 3 proved both governments thought and reacted irrationally in relation to Covid-related issues. In addition to this, national media reported them as irrational in online articles of 2020. Therefore, all the tests inferred that the Italian and the Dutch government behaved somehow irrationally while facing the Covid-19 threat, especially since cognitive biases affected them and in a country-specific combination (Italy: Affect Heuristic and Present bias; Netherlands: Projection Bias and Present Bias).

ACKNOWLEDGEMENTS

I sincerely thank my professor and relator, Mr. Carlo Romano Santagiustina for his patience and effort to give me directions and suggestions in order to write this thesis. I am also thankful to the graduation commission for granting me such an interest and attention. Finally, I would never have been able to accomplish my task without the help of the free and efficient services delivered by the university library and by the administrative staff.

REFERENCES

[i] Thaler R.H. and Sunstein C.R. (2008), Nudge. Improving decisions about health, wealth and happiness, Yale University Press.

[ii] Strack F. and Deutsch R.(2004), Reflective and Impulsive Determinants of Social Behaviour, Personality and Social Psychology Review 2004, Vol. 8, No. 3, (pp. 220–247), Lawrence Erlbaum Associates, Inc.,

[iii] Kahneman, D., & Frederick, S. (2002), Representativeness revisited: Attribute substitution in intuitive judgment, T. Gilovich, D. Griffin, & D. Kahneman (Eds.), Heuristic and biases: The psychology of intuitive judgment (pp. 49–81), New York: Cambridge University Press

[iv] Das T.K. and Bing-Sheng Teng (November 1999), Cognitive biases and strategic decision processes: an integrative perspective, Journal of Management Studies 36, (pp.757-778), Wiley-Blackwell Publishers Ltd

[v] Frederick S. (Fall 2005), Cognitive Reflection and Decision Making, Journal of Economic Perspectives 19(4), (pp.25–42), American Economic Association

[vi] Tversky A. and Kahneman D. (1974), Judgment under Uncertainty: Heuristics and Biases, Science Vol. 185, Issue 4157, (pp. 1124-1131), American Association for the Advancement of Science Publishing

[vii] Lyles M.A. and Thomas H. (1988), Strategic Problem Formulation: biases and assumptions embedded in alternative decision-making models, Journal of Management Studies 25, (pp.131-145), Wiley-Blackwell Publishers Ltd

[viii] Nagatsu M. (2015), History of Behavioral Economics, International Encyclopaedia of the Social & Behavioural Sciences, Second Edition, (pp.443–449), Elsevier Ldt

[ix] Simon H.A., 1996. The Sciences of the Artificial, third ed., MIT Press, Cambridge, MA.

[x] von Neumann, J. and Morgenstern, O. (2004), Theory of Games and Economic Behaviour, sixtieth anniversary ed. Princeton University Press, Princeton, NJ

[xi] Lichtenstein S. and Slovic, P. (1971), Reversals of preferences between bids and choices in gambling decisions, Journal of Experimental Psychology 89, (pp.46–55), American Psychological Association Publishers

[xii] Lichtenstein S. and Slovic P. (1973), Response-induced reversals of preference in gambling – extended replication in Las-Vegas, Journal of Experimental Psychology 101, (pp.16–20), American Psychological Association Publishers

[xiii] Dillenberg D., Postlewaite A. and Rozen K. (2017), Optimism and Pessimism with Expected Utility, Journal of the European Economic Association, (pp.1-18), Oxford University Press

[xiv] Fleurbaey M. and Schokkaert E. (2013), Behavioral Welfare Economics and Redistribution, American Economic Journal: Microeconomics 5(3), (pp.180-205), American Economic Association

[xv] Baujard A. (October 2010), Collective interest vs. individual interest in Bentham's Felicific Calculus. Questioning welfarism and fairness, European Journal of the History of Economic Thought 17(4), (pp.607-634), Taylor & Francis (Routledge)

[xvi] Van Lange P.A.M. , Joireman J., Craig D. Parks C.D. and Van Dijk E. (2013), The psychology of social dilemmas: A review, Organizational Behavior and Human Decision Processes 120, (pp.125–141), Elsevier Inc.

[xvii] Laibson D. (1997), Golden eggs and hyperbolic discounting, Quarterly Journal of Economics 112(2), (pp.443-477), Oxford University Press (Harvard University, Department of Economics)

[xviii] Thaler R. (1981), Some empirical evidence on dynamic inconsistency, Economic Letters-JOURNAL Vol.8, (pp.201-207), Elsevier Inc.

[xix] Yamagishi, T. (1988), Exit from the group as an individualistic solution to the free rider problem in the United States and Japan, Journal of Experimental Social Psychology, 24, (pp.530–542), Elsevier Inc.

[xx] United Nations (10 December 1948), The Universal Declaration of Human Rights, General Assembly resolution 217 A.

[xxi] Kuhn T.S. (1962), The Structure of scientific revolutions, International Encyclopaedia of Unified Science, Volumes I-II: Foundations of the Unity of Science, University of Chicago Press.

[xxii] Khorasani S.T. and Almasifard M. (2017), Evolution of Management Theory within 20 Century: A Systemic Overview of Paradigm Shifts in Management, International Review of Management and Marketing 7(3), (pp.134-137), Public Knowledge Program

[xxiii] Mattioli G., Roberts C., Julia K. Steinberger J.K and Brown A. (2020), The political economy of car dependence: A systems of provision approach, Energy Research & Social Science (66) 101486, Elsevier Inc.

[xxiv] Bodenheimer T. (November/December 2005), The Political Divide in Health Care: A Liberal Perspective, Health Affairs (Project Hope) 24(6), (pp.1426-1435), The People-To-People Health Foundation Inc.

[xxv] Rawls J.B. (1971), A theory of justice (revised edition 1999), Harvard University Press & Belknap Press

[xxvi] Enthoven A.C. (January 2018), Regulated Competition in Health Insurance Markets: Foreword by Alain Enthoven, Risk Adjustment, Risk Sharing and Premium Regulation in Health Insurance Markets, (pp.21-28), Academic Press

[xxvii] Vaillancourt Rosenau P. and Lako C.J. (December 2008), An Experiment with Regulated Competition and Individual Mandates for Universal Health Care: The New Dutch Health Insurance System, Journal of Health Politics, Policy and Law 33(6), (pp.1031-1055), Duke University Press
[xxviii] Beveridge W. (November 1942), Social Insurance and allied services. Report by Sir William Beveridge, London, His Majesty's Stationary Office
[xxix] Longo F., Ricci A., Armeni P., Furnari A., Bobini M., Vagnarelli G. and Pulleyblank R., Executive summary 2019 OASI report, Observatory on Healthcare Organisations and Policies in Italy, Cergas, SDA Bocconi School of Management
[xxx] Repubblica Italiana, LEGGE 23 dicembre 1978, n. 833, Istituzione del servizio sanitario nazionale, Suppl. Ordinario alla Gazzetta Ufficiale, Serie Generale n.360 del 28-12-1978
[xxxi] Repubblica Italiana, Decreto legislativo 30 dicembre 1992, n. 502, Riordino della disciplina in materia sanitaria, a norma dell'art. 1 della legge 23 ottobre 1992, n. 421. , Suppl. ordinario alla Gazzetta Ufficiale , n. 305, del 30 dicembre 1992
[xxxii] Repubblica Italiana, Decreto 28 aprile 1989, Determinazione delle quote di partecipazione alla spesa per le prestazioni di diagnostica strumentale e di laboratorio e per le altre prestazioni specialistiche diverse dalle visite, Serie Generale della Gazzetta Ufficiale, n.99 del 29-04-1989
[xxxiii] Hoskin R.E. (Spring 1983), Opportunity Cost and Behaviour, Journal of Accounting Research 21(1), (pp. 78-95), Wiley on behalf of Accounting Research Center, Booth School of Business, University of Chicago
[xxxiv] Campbell S.G., Croskerry P. and Petrie D.A. (September 2017), Cognitive biases in health leaders, Health Management Forum, (pp. 1-5), The Canadian College of Health Leaders
[xxxv] Saposnik G., Redelmeier D., Ruff C.C and Tobler P.N.(2016), Cognitive biases associated with medical decisions: a systematic review, BMC Medical Informatics and Decision Making 138(16), BioMed Central
[xxxvi] Seshia S.S., Makhinson M., Young B. (November 2015), 'Cognitive biases plus': covert subverters of healthcare evidence, Evidence-Based Medicine Online First, (pp.1-5), BMJ Publishing Group Ltd
[xxxvii] Bowman S.A, Gortmaker S.L., Ebbeling C.B., Pereira M.A. and Ludwig D.A.(January 2004), Effects of fast-food consumption on energy intake and diet quality among children in a national household survey, Paediatrics 113(1), (pp.112-118), American Academy of Pediatrics
[xxxviii] Shackle G.L.S. (1955), Uncertainty in economics and other reflections, First edition, Cambridge University press
[xxxix] Ferrer R. and Klein W.M. (April 2015), Risk perceptions and health behaviour, Current opinion in psychology, COPSYC 95, Elsevier Ltd.
[xl] Loewenstein G.(May 2000), Emotions in Economic Theory and Economic Behavior, American Economic Review 90(2), (pp. 426-432), American Economic Association
[xli] Kahneman D. and Tversky A. (September 1974), Judgment under Uncertainty: Heuristics and Biases, Science 185(4157), (pp.1124-1131), American Association for the Advancement of Science
[xlii] Kahneman D. and Tversky A. (30 January 1981), The framing of decision and the psychology of choice, Science 211(4481), (pp.453-458), American Association for the Advancement of Science
[xliii] Ellsberg, D. (1961), Risk, ambiguity, and the savage axioms, The Quarterly Journal of Economics 75(4), (pp.643–669), Department of Economics at Harvard University.
[xliv] Pauker S.G. and Kopelman, R. I. (1992), How sure is sure enough?, New England Journal of Medicine 326(10), (pp.688–691), Massachusetts Medical Society
Pauker S.G. and Kopelman R.I. (1992), Treating before knowing, New England Journal of Medicine 327(19), (pp.1366–1369), Massachusetts Medical Society
Pauker S.G. and Kopelman R.I. (1993), A rewarding pursuit of certainty, New England Journal of Medicine 329(15), (pp.1103–1107), Massachusetts Medical Society
Pauker, S.G. and Kopelman R.I. (1994), A masked marauder, New England Journal of Medicine 330(22), (pp.1596–1598), Massachusetts Medical Society
Pauker S.G. and Kopelman R.I. (1994), Some familiar trade-offs, New England Journal of Medicine 331(22), (pp.1511–1514), Massachusetts Medical Society
[xlv] Curley S.P., Eraker S.A. and Yates J.F. (December 1984), An investigation of patient's reactions to therapeutic uncertainty, Medical Decision Making 4(4), (pp.501–511), SAGE Publications on behalf of the Society for Medical Decision Making
[xlvi] De Finetti (1937), La prévision : ses lois logiques, ses sources subjectives, Annales de l'institut Henri Poincaré 7 (1), (pp.1-68)
Savage H. (1954), The foundations of statistics, John Wiley & Sons Ltd.
De Finetti B. and Viertl R. (December 1991), Theory of probability (A critical introductory treatment), Statistical Papers 32(18), vol. I, XIX+300 pp, vol. II, XVIII+375 pp, Wiley and Sons Ltd.
[xlvii] Samuelson P. (February 1937), A note on measurement of utility, The Review of Economic Studies 4(2), (pp.155–161), Oxford University Press

[xlviii] Laibson D. (May 1997), Golden eggs and hyperbolic discounting, Quarterly Journal of Economics 112(2), (pp.443-477), Harvard University Press
[xlix] Loewenstein G. and Prelec D. (May 1992), The Quarterly Journal of Economics 107(2), (pp. 573-597), Oxford University Press
[l] O'Donoghue and Rabin M. (March 1999), Doing it now or later, American Economic Review 89(1), (pp.103-124), American Economic Association
[li] Courtemanche C.J., Heutel G. and McAlvanah P. (October 2011), Impatience, Incentives, and Obesity, NBER working paper 17483, NBER.
[lii] Bandura A. (1st May 1971), Social Learning Theory, Prentice Hall
[liii] Bauch C.T. and Bhattacharyya S. (April 2012), Evolutionary Game Theory and Social Learning Can Determine How Vaccine Scares Unfold, PLoS Comput Biol 8(4), Marcel Salathé, Pennsylvania State University
[liv] Cohen M.J., Brezis M., Block C., Diederich A. and Chinitz D. (November 2013),Vaccination, Herd Behavior, and Herd Immunity, Medical Decision Making 33(8), (pp.1026-1038), SAGE Publications on behalf of the Society for Medical Decision Making
[lv] Bhattacharyya S, Bauch C.T. (July 2011),"Wait and see" vaccinating behaviour during a pandemic: a game theoretic analysis, Vaccine 29(33), (pp.5519-5525), Elsevier Inc.
[lvi] Raafat R.M., Chater N. and Frith C. (October 2009), Trends in Cognitive Sciences 13(10), (pp.420-428), Elsevier Ldt.
[lvii] Hamilton W.D. (May 1971), Geometry for the selfish herd, Journal of Theoretical Biology 31(2), (pp.295–311), Elsevier Ldt.
[lviii] George A.L. (2003), Awaiting Armageddon: How Americans Faced the Cuban Missile Crisis, The University of North Carolina Press
[lix] Ching A.T. and Osborne M. (February 2017), Identification and Estimation of Forward-looking Behavior: The Case of Consumer Stockpiling, Marketing Science 39(4), (pp.707-726), Institute for Operations Research and the Management Sciences
[lx] Piaget J. (1923), Langage et pensée chez l'enfant, Delachaux et Niestlé (edition May 2002)
[lxi] Calvo K. and Martìn I. (February 2010), Ungrateful Citizens? Women's Rights Policies in Zapatero's Spain, South European Society and Politics, South European Society and Politics 14(4), (pp.478-502), Routledge & CRC Press
[lxii] Cole H.M. and Fiore M.C. (January 2014), The War Against Tobacco: 50 Years and Counting, Journal of American Medical Association 311(2), (pp.131-132), American Medical Association
[lxiii] C. Evers C., Marchiori D.R., Junghans A.F., Cremers J. and De Ridde D.T.D. (October 2018), Citizen approval of nudging interventions promoting healthy eating: the role of intrusiveness and trustworthiness, BMC Public Health 18(1182), Springer Nature
[lxiv] See note (v)
[lxv] Rothe C. (July 2015), Decomposing the Composition Effect: The Role of Covariates in Determining Between-Group Differences in Economic Outcomes, Journal of Business & Economic Statistics 33(3), (pp.323-337), Taylor & Francis Online.
[lxvi] World Health Organisation (11th February 2020), WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020
[lxvii] World Health Organisation (24th February 2020), Press Conference of WHO-China Joint Mission on COVID-19
[lxviii] "Maliszewska M., Mattoo A., van der Mensbrugghe D. (April 2020), The Potential Impact of COVID-19 on GDP and Trade : A Preliminary Assessment, Policy Research Working Paper 9211, World Bank, Washington, DC
[lxix] Nicola M., Alsafi Z., Sohrabi C., Kerwan A., Al-Jabir A., Iosifidis C., Agha M. and Agha R. (April 2020), The socio-economic implications of the coronavirus pandemic (COVID-19): A review, International journal of surgery 78, (pp.185–193), Elsevier Ldt.
[lxx] Ashraf B.N. (September 2020), Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets, Journal of Behavioural and Experimental Finance 27 (100371), Elsevier Ldt.
[lxxi] Albulescu C.T. (July 2020), COVID-19 and the United States financial markets' volatility, Finance Research letters, Elsevier Ldt.
[lxxii] Kamdema J.S., Essomba R.B. and Berinyuy J.N. (November 2020); Deep learning models for forecasting and analyzing the implications of COVID-19 spread on some commodities markets volatilities; Chaos, Solitons and Fractals 140 (110215), Elsevier Ldt.
[lxxiii] Raifman J., Bor J and Venkataramani A. (July 2020), Unemployment insurance and food insecurity among people who lost employment in the wake of COVID-19, version 2 research paper in medRxiv, US National Institute of Health.
[lxxiv]Cavazza M., Del Vecchio M., Fenech L., Giudice L., Mallarini E., Preti L.M and Rappini V., MECOSAN 113, (pp.165-175), Franco Angeli Editore.
[lxxv] Taleb N.N. (April 2007), The Black Swan: The Impact of the Highly Improbable, Second Edition, Random House.

[lxxvi] Wucker M. (April 2016), The Gray Rhino: How to recognize and act on the obvious dangers we ignore, St. Martin's Publishing Group.
[lxxvii] Terzi A. (Summer 2010), Keynes's Uncertainty Is Not about White or Black Swans, Journal of Post Keynesian Economics 32(4), (pp.559–565), Taylor & Francis Ltd.
[lxxviii] Loxton M., Truskett R., Scarf B., Sindone L., Baldry G. and Zhao Y. (July 2020); Consumer Behaviour during Crises: Preliminary Research on How Coronavirus Has Manifested Consumer Panic Buying, Herd Mentality, Changing Discretionary Spending and the Role of the Media in Influencing Behaviour; Journal of Risk and Financial Management 13(8), 166, Multidisciplinary Digital Publishing Institute.
[lxxix] Chan H.F., Skali A., Savage D.A., Stadelmann D. and Benno Torgler (November 2020), Risk attitudes and human mobility during the COVID-19 pandemic, Scientific Reports 10(19931), Nature Reseach.
[lxxx] Harper C.A., Satchell L.P., Fido D. and Latzman, R.D. (April 2020), Functional Fear Predicts Public Health Compliance in the COVID-19 Pandemic, International journal of mental health and addiction, (pp.1–14), Advance online publication, Nature Publishing Group.
[lxxxi] Soofi M., Najafi F. and Karami-Matin B. (May 2020), Using Insights from Behavioral Economics to Mitigate the Spread of COVID-19, Applied Health Economics and Health Policy 18, (pp.345–350), Springer Nature.
[lxxxii] Putri M.D.P.W., Xu C.Y. and Akwetteh L.N. (October 2020), Financial Behavior during COVID-19: Cognitive Errors That Can Define Financial Future, Open Journal of Social Sciences 8, (pp.259-269), Scientific Research Publishing.
[lxxxiii] Islam T., Pitafi A.H., Arya V., Wang Y., Akhtar N., Mubarik S. and Xiaobei L. (October 2020), Panic buying in the COVID-19 pandemic: A multi-country examination, Journal of Retailing and Consumer Services 102357, Elsevier Ldt.
[lxxxiv] Bargain O. and Aminjonov U. (October 2020), Trust and compliance to public health policies in times of COVID-19, Journal of Public Economics 192(104316), Elsevier Ldt.
[lxxxv] Fehr E. and Schmidt K.M. (August 1999), A Theory of Fairness, Competition, and Cooperation, The Quarterly Journal of Economics 114(3), (pp.817-868), Oxford University Press.
[lxxxvi] Ellingsen T. (1994), Cardinal Utility: A History of Hedonimetry; Cardinalism, Theory and Decision Library 19, (pp.105-165), Springer.
[lxxxvii] Edgeworth F. Y. (1881), Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences, Augustus M. Kelly publisher.
[lxxxviii] Colander D. (2007), Retrospectives: Edgeworth's Hedonimeter and the Quest to Measure Utility, Journal of Economic Perspectives 21 (2), (pp.215-226), American Economic Association.
[lxxxix] Fisher I. (1927), A Statistical Method for Measuring 'Marginal Utility' and Testing the Justice of a Progressive Income Tax, Economic Essays Contributed in Honor of John Bates Clark, Macmillan (on behalf of the American Economic Association).
[xc] Li D., Chaudhary H. and Zhang Z. (July 2020), Modeling Spatiotemporal Pattern of Depressive Symptoms Caused by COVID-19 Using Social Media Data Mining, International Journal of Environmental Research and Public Health 17(14), (pp.4988-5010), MDPI.
[xci] Hung M., Lauren E., Hon E.S., Birminghan W.C., Xu J., Su S., Hon D.S., Park J., Dang P. and Lipsky M.S. (August 2020), Social Network Analysis of COVID-19 Sentiments: Application of Artificial Intelligence, Journal of Medical Internet Research 22(8), JMIR Publications.
[xcii] Burzyńska J., Bartosiewicz A., Rękas M. (October 2020), The social life of COVID-19: Early insights from social media monitoring data collected in Poland, Health Informatics Journal 26(4), (pp. 3056-3065), SAGE Publishing.
[xciii] Kuchler T., Russell D. and Stroebler J. (April 2020), The Geographic Spread of COVID-19 Correlates with the Structure of Social Networks as Measured by Facebook, NBER Working Paper 26990, National Bureau of Economic Research.
[xciv] Cinelli M., Quattrociocchi W., Galeazzi A., Valensise C.M., Brugnoli E., Schmidt A.L., Zola P., Zollo F. and Scala A. (October 2020), The COVID-19 social media infodemic, Scientific Reports 10(16598), Springer Nature.
[xcv] Bailey M., Johnston D.M., Koenen M., Kuckler T., Russell D. and Strobler J. (December 2020), Social Networks Shape Beliefs and Behavior: Evidence from Social Distancing During the COVID-19 Pandemic, NBER Working Paper 28234, National Bureau of Economic Research.
[xcvi] Lothe S. (October 2020), Hyperbolic Discounting and COVID-19 Policy Responses, Social Impact Research Experience (SIRE) 77, University of Pennsylvania.
[xcvii] Fiske A.P. and Tetlock P.E. (1997), Taboo Trade-offs: Reactions to Transactions That Transgress the Spheres of Justice, Political Psychology 18(2), (pp.255-297), Blackwell Publishing.
[xcviii] Wisse B., Rus D., Keller A.C. and Sleebos E. (2019), Fear of losing power corrupts those who wield it: the combined effects of leader fear of losing power and competitive climate on leader self-serving behaviour, European Journal of Work and Organizational Psychology 28(6), (pp.742-755), Rutledge, Taylor and Francis.
[xcix] Rieder G. and Simon J. (June 2016), Datatrust: Or, the political quest for numerical evidence and the epistemologies of Big Data, Big Data & Society 3(1), (pp.1-6), SAGE Publications Inc. .

[c] Norman J., Bar-Yam Y. and Taleb N.N. (26thJanuary 2020), Systemic Risk of Pandemic via Novel Pathogens – Coronavirus: A Note, New England Complex Systems Institute.
[ci] Shiller J.R. (2019), Narrative Economics: how stories go viral and drive major economic events, Princeton University press.
[cii] Wilson E.O. (1998), Consilience: The Unity of Knowledge, Vintage Books.
[ciii] Mayer L.H.(Spring 2008), What Is This "Lobbying" That We Are so Worried About?, Yale Law & Policy Review 26(2), (pp. 485-566), Yale Law & Policy Review Inc. .
[civ] De Vries J. (2014), The Netherlands and the Polder Model: Questioning the Polder Model Concept, Low Countries Historical Review 129(1) (pp. 99-111), Royal Netherlands Historical Society.
[cv] Dekker F. (June 2017), Challenges for the Dutch polder model, Social Europe, ESPN Flash Report 2017/40, European Commission.
[cvi] Ippolito M. and Cicatiello L. (July 2019), Political instability, economic inequality and social conflict: The case in Italy, Panoeconomicus 66(3), (pp.365-383), Public Knowledge Project.
[cvii] Mosca G.(1927), Il Principe» di Machiavelli quattro secoli dopo la morte del suo autore, Saggi di storia della scienza politica, Politeia 10, Anonima Romana Editoriale.
[cviii] Pareto V. (1916), Trattato di sociologia generale I-II, G.Barbèra Editore.
[cix] Modigliani F. and Miller M.H.(June 1958), the cost of capital, corporation finance and the theory of investment, The American Economic Review 48(3), (pp.261-297), American Economic Association.
[cx] Williamson O.E. (November 1981), The Economics of Organization: The Transaction Cost Approach, American Journal of Sociology 87 (3), (pp. 548-577), The University of Chicago Press.
[cxi] Nissim T.N. (April 2007), The black swan: the impact of the highly improbable, Random House.
[cxii] Roberts M.E., Steward B.M. and Tingley D. (October 2019), stm: R package for Structural Topic Models, Journal of Statistical Software 91(2), Foundation for Open Access Statistics.
[cxiii] Scortichini M., Schneider dos Santos R., De' Donato F., De Sario M., Michelozzi P., Davoli M., Masselot P., Sera F. and Gasparrini A. (December 2020), Excess mortality during the COVID-19 outbreak in Italy: a two-stage interrupted time-series analysis, International Journal of Epidemiology 49(6), (pp.1909–1917), International Epidemiological Association.
[cxiv] Zhang X. and Ha L. (June 2016), Mobile news consumption and political news interest: A time budget perspective, Journal of Applied Journalism & Media Studies 5(2), (pp.277-295), Intellect Books.