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Aims of the Journal: Journal of Regional Socio-Economic Issues (JRSEI) is an international multidisciplinary refereed journal the purpose of which is to present papers manuscripts linked to all aspects of regional socio-economic and business and related issues. The views expressed in this journal are the personal views of the authors and do not necessarily reflect the views of JRSEI journal. The journal invites contributions from both academic and industry scholars. Electronic submissions are highly encouraged (mail to: gkorres@geo.aegean.gr).

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"The variability and striking transmissibility of COVID-19 makes the virus the perfect storm"
Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases.

The Socio-Economic Impact of Coronaviruses and Pandemics

in collaboration with

Economic Geography, Regional Development and Territorial Planning Laboratory, Department of Geography, University of the Aegean

Mental Health Programmes, Department of Sociology, University of the Aegean

"Ergaxia" Laboratory, Department of Sociology, University of the Aegean

The Socio-Economic effects of the coronaviruses and pandemics are paramount**.** An epidemic that could become a global pandemic has multiple effects in economic and social sectors, such as, manufacturing, services, transport, employment and growth. The 2020 pandemic has far-reaching consequences, beyond the spread of the disease and efforts to quarantine it. As the pandemic has spread around the globe, concerns have shifted from supply-side manufacturing issues to decreased business in the services sectors.

As a result, the *Journal of Regional Socio-Economic Issues (JRSEI)* publish the June Issue entitled *the Socio-Economic Impact of Coronaviruses and Pandemics,* aims to increase knowledge and pioneering work, shedding light on future directions of research.

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Flattening the COVID-19 Curve: Lessons from the Kerala Model of Sustainable Development

Abstract:
The world is witness to one of the most challenging periods in history since the Second World War with the onslaught of the COVID-19 pandemic. It has affected five million people globally and has jolted most nations that have ruthlessly put economic growth much above the health of their people and environmental sustainability. The pandemic has sparked a rethinking of much trodden economic development path to a people-centric approach based on building and strengthening social capital and community participation. A range of strategies and partnerships at the global, regional, national and state levels are emerging to stem the disastrous impact of the pandemic. The southern state of Kerala in India has been lauded by the world for minimizing the impact of the pandemic and flattening the COVID-19 curve successfully through its unique model of local governance, effective health communication and democratic community participation for sustainable development. This chapter focuses on the unique dimensions of state governance in Kerala which is a model that is worthy of emulation for socio-economic sustainability across India and the world.

Keywords: CoVID-19 pandemic, health communication, community participation, local governance, Kerala Model, sustainable development

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1. Introduction

India has a strategic geo-political position as the largest country in South Asia consisting of a population of over one billion and is credited as the largest, stable and functioning democracy. India has a population of 1.3 billion and is a country marked by wide interstate and interregional differences in human development. As most other countries, India has also been challenged by the COVID-19 pandemic and is responding through a national strategy focusing on preventive measures, testing, social distancing, containment and treatment to 'flatten the curve' that is implemented by the states in addition to specific local policy measures to protect and sustain communities through the health crisis. While India is among the top 10 nations with the highest number of those affected by SARS-CoV-2 virus, the southwestern coastal state of Kerala has been in the international limelight for its success in managing the COVID-19 pandemic effectively by ramping up the recovery rate and having the least mortality rate.

There are some unique factors why Kerala is an interesting site to study the experience of a health pandemic through its trajectory in sustainable socio-economic development. It has gained international recognition for its high human development status. The state has been in the forefront of achieving universal literacy and health care, poverty reduction through decentralized local governance, technological innovation and community participation. The Kerala model of development is unique for its focus on social justice and equity at moderately low levels of income and wealth; a reduction in birth rates within 20 years to European levels through investment in education and health, land reforms leading to economic security, high level of political participation and a traditionally high status of women. These achievements make the state of Kerala among the best placed to face the COVID-19 challenge in India and the world when considering its disastrous impact on some of the highly developed countries.

Kerala has an area of 38, 863 sq. km. with a population of 33,406,061 and density of 859 persons per sq.km. It is regarded as one of the states with relatively high population density in India (Delhi has the highest density of 11,297). It has a population of 33,406,061 of which 4.8 million are the elderly (13 percent are aged above 60 years and 15 percent are of them are past 80 years).According to the Economic Review 2019 estimates, 20 percent of the Kerala population would be elderly by 2025 (Government of Kerala, 2019). The state also has a high rate of international migration and a large diaspora spread across the world making it extremely vulnerable to the COVID-19 pandemic. The state is also a top popular destination for international tourists. It is also among the states with the highest density of population. It is also home to a large number of migrant workers particularly from the northern and eastern states which are impoverished and less developed regions of India. Such a vulnerable population mix would need carefully designed policies and strategies in terms of creating health awareness, effective communication in multiple languages, targeting health infrastructure to match patient requirements, building community support networks and local governance to combat the pandemic.

Kerala can be compared to many smaller countries in Asia and Europe terms of its size but has a much larger population. For instance, countries such as Taiwan (35,981 sq.km with a population of 23,359,928), Belgium (30,538 sq.km with a population of 10,449,361), Netherlands (41,160 sq.km with a population of 16,877,351) and Switzerland (41,284 sq.km with a population of 8,061,516.) had a higher number of COVID-19 cases and mortality than Kerala even though they rank high in human development. Greece (1,31,990 sq.km with a population of 10.775,557) is the exception in Europe with low number of cases in Europe but still had a higher number of COVID-19 deaths than Kerala. The population of Kerala is also three times bigger than that of Greece. A study of the socio-economic factors, health policies and Kerala's interventions for overcoming the COVID-19 crisis and "flattening the curve" is a

valuable experience for India and the world in protecting community health for sustainable development.

2. Kerala Model of Human Development

In 1957, Kerala democratically elected a communist government, for the first time in the world history, headed by E.M.S. Namboothiripad. This government introduced the revolutionary Land Reform Ordinance which was the result of decades of struggle by Kerala's peasant associations. The land reform initiative abolished tenancy and landlord exploitation, and led to a slew of positive measures including effective public food distribution that provides subsidized rice to low-income households, protective laws for agricultural workers, pensions for retired agricultural laborers and a high rate of government employment for members of formerly lower caste communities. The land reforms implemented by the subsequent government benefited 1.5 million poor households.

Kerala's success in enhancing basic human capabilities, and thereby reducing poverty through educational attainments, improved health services, meaningful land reforms, has a long historical foundation dating back to the nineteenth century. The rulers of the princely state of Travancore (erstwhile Kerala) were at the forefront in the spread of education. A school for girls was established by the Maharaja in 1859. Communities were guided by great visionaries and monastic orders (Ashrams) founded by Sree Narayana Guru, Sree Chattambi Swamigal and Shree Ayyankali who exhorted the poor to educate themselves, to organize themselves and bargain for their rights. Christian Missionaries introduced English education to empower the common people. In 1989, Kottayam was declared the first fully literate municipal town and on February 4 1990, Ernakulam was declared the country's first totally literate district. In 1991, Kerala became the first fully literate state in India with over 90 per cent literacy rate among adults. This is a unique achievement that Kerala holds even today in India.

The National Human Development Report 2009 (Government of India, 2010) ranked Kerala as the first among Indian States in the Human Development Index. The report revealed that Kerala had achieved a high level of human development as early as in the 1990s. Kerala's 1991 birth rate was 20 per 1,000 compared with India's rate of 31 and a world poor country average of 38. In fact, a 1992 survey found that the birth rate had fallen to replacement level. It had achieved replacement level fertility in 1994 though India not been able to achieve this. Kerala's infant mortality was 17 per 1,000 live births versus 85 for India and 91 for other poor countries. Kerala's adult literacy rate was 91 percent while India's was 52 percent and other poor countries had 55 percent. Yet Kerala's per capita income in 1991 was $298 compared to the all-India average of $330 and a world poor country average of $350. By comparison, the USA in 1991 had a per capita GNP of $22,240. Yet Kerala's material quality of life indicators were far closer to those of the USA than to those of the rest of India or those countries with similar income levels.

Demographically, Kerala mirrors the United States on about one-seventieth the wealth. In countries of comparable income, including other states of India, life expectancy is 66 years, and only half the people can read and write. Kerala's birth rate is 14 per 1,000 is the lowest in the country and falling fast while India's rate is 21.6 per 1,000 and that of the U.S. is 16. Kerala's infant mortality rate is 7 per 1,000 births versus 42 for India and 7 for the US. It is the only to have achieved the target set by the UN at 8 for 2020 among the bigger states in India. Its adult literacy rate is 94 per cent compared to India's 66 and the US's 99. Life expectancy at birth in Kerala is 74 years compared to 66 years in India and 77 years in the US.

Female life expectancy in Kerala exceeds that of the male, just as it does in the developed world. Kerala is among the few regions in the developing world with a favourable

sex ratio (1,084 females to every 1,000 males). India has only 940 females per 1,000 males. Kerala's results are due to its avoidance of selective abortion of female fetuses. Kerala has cent percent literacy among women. Literate women are better able to take charge of their lives and they also want a good education for their children; the typical woman marries at 22 in Kerala, compared to 18 in the rest of India. The NITI (National Institution for Transforming India) Aayog which is the central think tank and planning body places Kerala at the top rank leading all states as an achiever in the India's Index SDG score in its 2018 Baseline Report (NITI Aayog, 2018) for its superior performance in providing good health and ensuring wellbeing, reducing poverty and promoting gender equality.

Kerala has received international acclaim owing to its remarkable socio-economic and demographic achievements. The state government maintains strong ties with civil society, particularly since peasants and workers played an active role in shaping the structures and institutions of modern capitalism within the state (Heller, 1999). Kerala is well known for the participation of the Communist Party in the state government, and sustained social mobilization tied to high levels of social development that are unparalleled in low-income societies (Parayil, 1992). From the 1970s many scholars have credited Kerala as the home of the "Kerala Model of Development" (Jeffrey, 2009).

Kerala's impressive health standards include its world class medical institutions and facilities ranging from primary care to tertiary care. The state is the famed home of Ayurveda the illustrious ancient traditional medical science with Ayurveda hospitals run by the government as well as private organisations. It has a statewide infrastructure of 23,940 primary health centres serving 26,000 citizens, each of which support five to six sub-centres that serve a village and community health centre. There are over 2,700 government medical institutions in the state, with 160 beds per 100,000 population, the highest in the country. With virtually all mothers are taught to breastfeed and a state-supported nutrition programme for pregnant and new mothers. There's a dispensary every few kilometers where IUDs and other forms of birth control are freely available. The clinics also provide cheap health care for children. Kerala is the only place in the world to be declared 'baby-friendly' by the WHO and the UNICEF. Kerala's remarkable access to affordable health care has expanded to geriatric care. The state has is also a leader in palliative care with its own Pain and Palliative Care Policy (2008) focused on community-based home care initiatives. It has a palliative care network of over 60 units that serve more than 12 million individuals (Thayyil, 2012). It is at the forefront of continuously investing in health infrastructure and developing health information systems to compile household level data designed to improve population health management and surveillance of communicable diseases.

Kerala's social life is remarkable for people's participation, concerted popular mobilization and public action on development issues. Protests questioning the veracity of public policy and holding public officials accountable is an almost daily part of life in Kerala. People in Kerala are widely exposed to mass media and new media, read the newspapers daily and discuss them. They also write letters to complain about problems and demand solutions. The idea of organizing movements to bring in social change through self-help and seek home-grown solutions without waiting for the central government is well established in Kerala.

Kerala achieved the UNESCO standards of mass media requirements (minimum number of newspaper copies, radio sets, cinema seats and TV sets) in a country which was underdeveloped as early as in the sixties (Kuppuswamy, 1976: 332). In the mid-1980s though Kerala accounted for only 3.5 per cent of India's population, 8.5 per cent of all daily newspapers in India were in Malayalam language After Hindi the language of 38 per cent of India's population, and English language newspapers, Malayalam ranked third in the number of newspapers produced each day. The ratio of Malayalam newspapers to population in 1991 was roughly 71 copies for every 1000 speakers of the language (Manorama Yearbook, 2010). There are more than 120 dailies being published in Kerala, more daily newspapers than any

other region in India. *The Hindu*, *The New Indian Express*, *Malayala Manorama*, *Mathrubhoomi*, *Kerala Kaumudi*, *Desabhimani*, *Deepika*, *Madhyamom* and *Janmabhoomi* are a few of the prominent daily newspapers and have online editions. Apart from the state-owned All India Radio (AIR) and Doordarshan TV channels, there are a dozen private satellite television channels in the local language Malayalam apart from over 200 satellite TV channels in different languages that reach the people in the State. Kerala has the highest exposure to mass media, particularly print media (81 percent) (NHDR 2009, 2010) due to high literacy.

The high levels of exposure to the mass media have led to high levels of political participation among the people of Kerala. The high rate of political participation of the people in Kerala can be illustrated by the high turnout at elections. The voter turnout (percentage of eligible voters) in Kerala during elections is consistently over 70 per cent which is higher than the 60 per cent voter turnout for India (Election Commission of India, 2006). A comparatively petite state in India, Kerala became the role model for other governments in implementing new media for social progress and development of the society. Kerala also leads the way in utilizing information, communication and new media technologies for e-governance and implementing e-governance capacity building initiatives to transform the state to a 'digital society'.

Kerala demonstrates that a low-level economy can create a decent life, abundant in health, education, and community life that are most necessary for all. The Kerala model generally refers to the high achievements of the state on statistical indicators of development. These indicators have been achieved despite low incomes. The Kerala model proves empirically that literacy, low infant mortality, and social progress can be achieved even before reaching industrial world income levels. The Kerala model successfully established that no out-side aid was necessary and society could be transformed without any violent revolution. The widely analyzed and much-lauded Kerala model firmly put the state on par with the finest achievers in the world in terms of human development and quality of life indicators.

3. Local Self Government - Facilitating Linkages

In 1996 the state implemented the People's Campaign for Decentralized Planning which paved the way for decentralized local governance with control over 35 to 45 percent of the state budgetary allocations. Grass root level planning emerged through village collectivities in which people participate in decision making irrespective of any caste or religious differences (Oommen, 2004). Kerala Local Self Government Institutions (LSGIs) have been meaningfully empowered local communities through massive transfer of resources as well as administrative powers. The LSGIs have funded the e-literacy training programme, which is a landmark development making Kerala a leader in the field of e-literacy. The LSGIs facilitate the delivery of public services at the grass root level using the information and communication technologies. Kerala is best performing state in e-governance based on a programme of e-literacy, capacity building, and installation of ubiquitous broadband-enabled computer kiosks based on entrepreneurial public-private partnerships called Akshaya centres (Prasad, 2018, 2012). The World Bank delegation found the Kerala State IT Mission (KSITM) competent to perform the role of an international consultant, especially to developing countries in Asia and Africa (Praveen, 2011).

The development policies are debated, shaped and taken to the people by the Kerala Sastra Sahitya Parishad (KSSP) or Kerala forum for scientific literature, a non-governmental organisation of Kerala established in 1962 with 40-members comprising of a group of writers and college teachers with a limited motive to publish science literature in Malayalam. Later it changed its motto as "science for social revolution" and has now grown into a mass movement with more than 40,000 working members. Its activities are aimed to popularise

science and scientific outlook among the people to bring radical changes in society. The organisation is also involved in developing alternative sustainable models for development. A Research and Development section is also functioning to transform lab technologies to mass technologies and to develop new alternative models. It has extended its activities in different areas like environment, health, education, gender equality, energy, waste management, publication of books and science journals in Malayalam and has become a massive people's science movement. Today it includes people from all walks of life and its units are spread all across the state (www.kssp.in).

Women in India are generally excluded from participation in development policy and action. But in Kerala, the women's self help groups play a pivotal role in local development through the Kudumbashree initiative. The state government established Kudumbashree (prosperity of the family) a female oriented poverty reduction programme in 1997. It is implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala and covered the entire State during 2000-2002. It is a three-tier structure system, Neighbourhood Groups (NHGs) at the lowest level, Area Development Societies (ADS) at the middle level and Community Development Societies (CDS) at the local government level which are designed to promote the welfare of women. The Kudumbashree network by 15th March 2017 had 2,77,175 NHGs affiliated to 19,854 ADSs and 1073 CDSs with a total membership of 43,06,976 women. It is considered to be one of the largest women's networks in the world.

The LSGIs, KSSP and Kudumbashree units are well connected and converge to spearhead development activities and play an important role in any crisis such as floods, disease prevention and environmental conservation. These organizations have made an important contribution to Kerala's people-centric response to the COVID-19 pandemic.

4. People- Centric COVID Response in Kerala

Kerala reported the first COVID-19 case in the country on 30th January 2020 when a student infected with the virus returned from Wuhan, China. Kerala with its early planning and experience in dealing with earlier outbreaks of disease such as chikungunya, dengue, H1N1 and the Nipah virus was the first to formulate and establish a response team and protocols to deal with the pandemic in February 2020. The response team under the astute guidance of the Chief Minister Pinarayi Vijayan and the State Health Minister K.K. Shailaja began steering the state on an early recovery path. Shailaja Teacher as she is popularly called was a teacher before she joined the communist party became the guiding force of the fight against the pandemic. She has been widely interviewed by the international media and *The Guardian* called her the "Coronavirus Slayer" and a "rock star" health minister. Her opinion is being sought by many state governments in India and also neighbouring countries. In a letter of appreciation to K.K. Shailaja, Sri Lanka's former Prime Minister Ranil Wikramasinghe lauded her leadership in responding proactively and boldly in tackling the pandemic. He wrote: "As the Minister of Health of Kerala, you have demonstrated that effective disease control is possible even though resources are limited" (quoted in Srinivasan, 2020).

In March 2020 the Kerala government adopted a farsighted policy approach closed all schools, colleges, public entertainment spaces and banned all public gatherings much before a national lockdown was announced by the country by the end of the month. It started the 'Break the Chain Campaign' to create mass awareness on the spread of the virus, effectively screening of all entrants to the state, testing extensively, setting up testing booths and effectively identifying those who could potentially be affected by the disease, established foolproof contact tracing, quarantine policies and intensive treatment with dedicated COVID hospitals and care centres in all its 14 districts of the state. In April 2020 Kerala began to turn the tide from a state that reported the highest number of infected cases to drop to being one of the lesser affected states. In mid May Kerala reported only 4 deaths out of a population of 35

million, by far the best in the region and anywhere in the world. By end of May 2020, as India had 191,460 cases (93,917 active cases) with 92,133 recoveries and 5410 deaths, Kerala's overall case tally stood at a total of 1269 cases, 669 active cases, 590 having recovered and 10 deaths. Kerala has also fared much better than all the southern states in India in May 2020 (see Table 1).

Table 1: COVID 19 statistics in South India in May 2020

State	Active Cases	Recovered Cases	Deaths	Total Number of Cases
Kerala	669	590	10	1269
Karnataka	1950	1218	53	3221
Telangana	1188	1428	82	2698
Andhra Pradesh	1177	2332	63	3571
Tamil Nadu	12,757	9400	173	22,330

While India had a recovery rate of 48 per cent and death rate of 2.8 percent by May end, Kerala charted steady progress with a high recovery rate of 94 per cent and a negligible death date rate of 0.6 per cent. While it was widely known that the elderly were most vulnerable, it was a miraculous cure for 93-year old Thomas and his wife Mariamma, 86 in Ranni, Pathanamthitta district of Kerala who were infected with the SARS-Cov-2 virus in March 2020. The elderly couple who were discharged in April 2020 brought a ray of hope in Kerala's resistance against the pandemic and could demonstrate its expertise in palliative and geriatric care. It has not only been able to minimize the spread of the pandemic but also revive development through its impressive sustainable strategies. Other states of India and other countries can benefit from the Kerala model involving the local government, community groups, social innovation, mass media and new media, and people's participation in the COVID-19 response.

5. Decentralised Local Government

The panchayats or the Local Self=Government Institutions (LSGIs) of Kerala receive a third of the state's plan funds and are fiscally empowered to implement development decisions in a democratic and decentralized manner. No other state in India has such a well resourced and capable system wherein the LSGIs receive development and maintenance funds, a policy that the Kerala government follows even under chronic fiscal stress. Kerala formulated a decentralised COVID-19 management system by constituting rapid response teams headed by the elected members in all local body wards. The teams comprising health workers Accredited Social Health Activists (ASHA) activists and anganwadi workers were entrusted with the task of checking quarantine violation, trace contacts and also complement the containment efforts of the government.

Another unique feature of local governance is the active role played by women panchayat members who account for 60 per cent of the elected representatives in these bodies. Each panchayat ward has a sanitation committee comprising a ward member, junior public health nurse, junior public health inspector, anganwadi workers who take care of health and nutritional needs of children and ASHA workers promoting maternal and community health. These committees consist entirely of women in many wards in the state (Paul, 2020).

Kerala was the first state to get off the block to ensure universal Public Distribution System (PDS) supplies during the lockdown from mid March. A study by The Centre for Socio-Economic and environmental Studies showed that the people of Kerala relied heavily on the universal PDS for food grains and other essentials under the lockdown (Martin, 2020). The PDS is limited to only the poor in most other states and does not cover the general

population who also struggled during the lockdown due to non availability of food and other essential items. The local administrative bodies at the village level, police, agricultural production and marketing cooperatives, farmers groups and delivery volunteers play a crucial role in ensuring a steady supply chain of food items to ease shortages, stop panic buying and protect people from hunger.

The state has been resilient in overcoming several crises challenges in the past such as the Ockhi cyclone in 2017, the Nipah virus outbreak in 2018 and the floods that ravaged the state in 2018 and 2019. The Nipah virus outbreak had had been successfully controlled under the dynamic leadership of the health minister K.K. Shailaja, gave the State a head start when the threat of COVID-19 emerged. The programme of rigorous infection-control was undertaken in Kerala hospitals from 2017 under the Anti Microbial Resistance programme, in which infection prevention and control (IPC). The IPC is an ongoing programme with daily training sessions in which master trainers among nurses take classes for all nurses and paramedical staff. It is not just the doctors and nurses who are watchful of infection control, but every person who works in the hospital, down to ambulance drivers and the cleaning staff, are important players in keeping infections at bay (Rajagopal, 2020).The setting up of "cough corners" in separate areas of government hospitals to screen and check airborne infectious respiratory diseases has also paid off in the time of the pandemic. The government also lays great stress on protecting the health of first responders. Though around 2000 healthcare workers were infected in India, only 27 of them were infected in Kerala, most of them had either recovered or were on their way to being discharged.

The Chief Minister emphasized that while the health system worked round the clock, it is of utmost importance that citizens shoulder their responsibilities by behaving responsibly to check the spread of the infection. The residents associations of urban areas responded wholeheartedly in several districts and joined the 'Break the Chain" campaign in mid-March 2020. They took to cleaning and disinfecting common utilities at frequent intervals, distributing hand sanitisers, liquid soaps and masks, and providing facilities to wash hands at common places to ensure cleanliness in the surroundings for preventing the spread of the infection. They were also vigilant to provide information on the arrival of residents from abroad to health authorities.

Kerala's Covid-19 story has been remarkable for the leadership of women. Apart from the health minister, the Director of Medical Services (DHS) and the Director of Medical Education (DME) are women. They are ably assisted by 11 women District Medical Officers (DMOs) (total 14 of them), female doctors who outnumber men (65:35) in the state health services, nurses and paramedical staff, junior public health inspectors, a majority of whom are women, and more than 26,000 ASHA workers who are all women. All the members of the Covid Cell, except one are women. As Dr. Remla Beevi A., the DME remarked "We are the 'penpada' (women army) of the state government. What we are seeing is the display of women power in its best form" (Paul, 2020). This is an unparalleled achievement in India and anywhere in the world.

6. Community Mobilisation and Participation

The Kudumbashree initiative has been the training ground for many women to step in to politics by contesting elections in local administrative bodies (panchayats). Nearly 65 per cent of the women elected to the panchayats are Kudumbashree members; this enables them to maintain a continuity in social mobilization at the grass root level. The women self help groups of the Kudumbashree network are the community warriors supporting the resistance against the pandemic in unique ways. The 2.5 million strong women members of Kudumbashree spearhead the 'Break the Chain' campaign of the state government to spread awareness among the citizens and forge their participation to control the unrelenting march of the pandemic. Over 200, 000 volunteers played a crucial role in going door-to door to identify

those at risk, carry out contact tracing in the community and enforcing the home quarantine by motivating citizens to show their support to the government efforts.

The women played a pivotal role in running the community kitchens to deliver 300, 000 meals a day across the state to ensure that no one went hungry during the lockdown and even took care of the needs of those in home quarantine (Paul, 2020; Heller, 2020). Many non-governmental organizations, charitable trusts and government run restaurants joined the recently launched Hunger-Free Kerala Project to start community kitchens and food courts for distributing meals to those in need. Volunteers also delivered food packets to those in quarantine at their doorstep. The women entrepreneurs of Kudumbashree who run micro-enterprises pitched in to supply over three million masks to be distributed to the frontline health workers, police, community volunteers and the public. Kerala is the first state that made the use of masks mandatory for the people as early as in April as one of the preventive measures to check the spread of COVID-19. The women of Kudumbashree have been able to see opportunities amidst the crisis and plan to bring out designer masks through microenterprises which can fetch them sufficient income and also help communities to put up a concerted effort in the resistance against the pandemic.

Kerala has a sizable population that lives and works in other states of India and abroad with a good number of locked houses and other empty buildings. Many people provided their extra rooms and even houses to accommodate those who did not have space in their homes for quarantine. The ancestral home of late V.P.P. Namboodiri, a minister in the Kerala government headed by late Pattom Thanu Pillai in the early 1960s, was handed over to the district authorities by his son for conversion into an isolation ward for COVID-19 patients. It is probably the first instance in India or anywhere in the world, of the affluent and politically powerful handing over their residences in times of a crisis particularly a pandemic.

The government has been increasingly emphasizing sustainable development even during the pandemic. Through the Haritha Kerala Mission which spearheads the organic farming movement, reclamation of waste lands, water conservation projects, protecting biodiversity and engaging citizens through innovative initiatives like kitchen gardening and models for balcony gardens for those who lived in urban flats. This is aimed at providing food security in times of crisis like the pandemic. The government had also started the People's Resource Mapping Program, an attempt to move beyond literacy of its citizens to actively cultivate "land literacy" which picked up momentum during the crisis.

Residents of local villages have begun assembling detailed maps of their area, showing topography, soil type, depth to the water table, and depth to bedrock. Information in hand, local people could sit down and see, for instance, where planting a grove of trees would prevent erosion. And the mapmakers think about local human problems, too. In one village, for instance, residents were spending scarce cash during the dry season to buy vegetables imported from elsewhere in India. Paddy owners were asked to lease their land free of charge between rice crops for market gardens, which were situated by referring to the maps of soil types and the water table. Twenty-five hundred otherwise unemployed youth tended the gardens, and the vegetables were sold at the local market for less than the cost of the imports. This is the direct opposite of a global market. It is exquisitely local-it has all the necessary elements of democracy, literacy, participation, and cooperation for sustainable development.

The Kerala State Biodiversity Board (KSBB) is making use of the lockdown period for updating the People's Biodiversity Registry (PBR) in their respective local bodies.The homestead biodiversity project asks citizens to send picture of plant and animal life in and around their homes with a note on their location along with details of the person who photographed the diversity (Sudhi, 2020). People have also used innovative ways to help farmers to sell their produce during the lockdown which would otherwise have been wasted. The residents of Pinarayi village could order organic vegetables through Veetu Chanda

(Home Market) a Whatsapp group formed in the first week of April 2020 by C. Madhavan Memorial Library in collaboration with Pinarayi West Vegetable Cluster and Youth Volunteers. Vegetables grown by 50 farmers in the area were sold through the social networking platform and delivered to customers by volunteers registered with the group. The Whatsapp delivered vegetables worth Rupees one lakh (over $1300) to customers and this initiative tremendously helped farmers, who were able to earn more money than they could have imagined during the lockdown (*The Hindu*, May8, 2020). The library also distributed free vegetable kits. Many e-platforms have emerged to enable farmers to sell their produce online thus ensuring productivity of the agricultural sector and food security of the communities during the pandemic.

7. Innovation and Technologies for Infection Control

The pandemic has led to innovative approaches and technologies which were hitherto used on a very limited scale in health care and that too by mainly the developed countries. The Kerala government hospital in Ernakulam deployed a robot named KARMI-Bot developed by ASIMOV robotics, a village start-up and donated by the Viswashanthi Foundation run by a very popular actor Mohanlal. The robot was used to serve food and dispense medicines to COVID-19 patients to reduce the risk of infections for doctors and health workers and addressing the shortage of Personal Protective Equipment (PPE) kits by minimizing its use (*The Hindu*, April 25, 2020).

A robot 'Sanitiser Kunjappan' was developed by the Fab Lab of Government Engineering College, Thrissur, as an open-source project to which new feature could be added at a production cost of ₹12,000 (USD 160). The robot could disinfect hospital wards without any human help through a nozzle that can spray a sanitiser to a distance of two metres and distribute food and medicines to patients. The engineering college team of students also developed COVID-WISK (Walk-in Sample Collection Kiosk) to enable safe collection of samples of symptomatic people for the Government Medical College Hospital at Thrissur (*The Hindu*, April 17, 2020).

Innovative methods such as mobile units were used to screen people at their doorsteps and also to reach out to vulnerable populations such as the elderly, disabled and those who not go out for testing in the Pathanamthitta district. A robotic arm was also installed in testing centres to collect swabs for testing which was useful to spare the services for health workers so they could concentrate on patient care and treatment. Two disinfection gates were installed at the Kannur International Airport to screen large groups of passengers simultaneously who reached Kerala in evacuation flights from the Middle-East.

India had virtually negligible production of PPE which posed a challenge to health professionals in their battle against COVID-19. In a innovative breakthrough, the small scale industries were engaged to address the shortage of PPE kits. The industrial unit of K.K. Industries in Ranni, Pathanamthitta district with the assistance of the District Industries Centre began making the PPEs at a quarter of the prevailing market price. The unit had produced 400 kits in four days in May 2020 and poised for large-scale production making the district self-reliant in an hitherto new product. The pandemic had indeed ignited innovation at a time when the world including highly advanced countries of the west were staring at shortages of PPE kits.

The production of masks has also become innovative with 3-D printing technology. A studio in Kottayam district began printing masks with the photo of lower portion of one's face in a bid to make recognition and identification of people easier. These innovative masks which take 15 minutes to make are being sold at Rs.15 (less than a quarter dollar) and have become a hit with the local people who find it faster to

recognize their family and friends when they are wearing a mask. This shows the diversification of small business in tune with the time of the pandemic.

8. Mass Communication and New Media

Kerala was in an advanced stage of preparedness when the state reported the first COVID-19 case in January 2020. The Chief Minister Pinarayi Vijayan had convened a State response team that coordinated 18 different functional teams, held daily press conferences and communicated everyday with the public (Heller, 2020). He repeatedly emphasized that the virus did not discriminate and the whole world was struggling to control the highly contagious virus. This reassurance led people to shun fear and stigma and come forward voluntarily to seek treatment. He also made it clear that the lockdown was not to be viewed as an imposition but as a safe distancing method to control the pandemic. He constantly reminded people that their participation was of utmost importance for success against COVID-19. He reassured those returning to the State from other parts of India and abroad that the government would have to strike a balance between their welfare and the State's containment strategy.

In his interaction with the citizens on May 23, in the first edition of the Twitter India's #AskThe CM series, the Chief Minister of Kerala focused on the role of participatory decentralized Kerala Model in the State's resistance against COVID-19. He spoke on length about the steps taken by each department and the coordination between them that enabled efficient tracing and testing of potential patients, thus gaining global appreciation for arresting the spread of COVID-19. Short films on television and social media made by the film industry and police social media cells with messages on the pandemic in an entertaining format helped to instill courage and confidence among the common people. Blogs by those who recovered from the disease also helped to allay the anxiety of many who were afraid of isolation and the uncertain situation created by the pandemic.

The Kerala Health Department and Home Department have special wings to prevent the spread of misinformation and fake news. The social media wings of the police and health department conduct counter campaigns against fake news using scientific data and encourage the public to maintain astrong vigil against fake news. The government also keeps a close watch on those who make false and dubious claims regarding the pandemic and its cure. The mass media of Kerala also regularly carried health messages, dispelled myths and fears, clearly differentiated between fake news and accurate information on all policy issues.

A Cartoon Wall was created in Thiruvananthapuram, the capital of Kerala, as a part of the "Break the Chain' campaign on May 22, 2020. It was inaugurated by the K. K. Shailaja, the Health Minister. Such cartoon walls were planned in all cities across the State to disseminate messages on washing hands, using masks, maintaining social distancing, and not spitting in public for creating mass awareness among the people for containing the spread of the pandemic. Social media such as Facebook, You tube, Twitter and Whatsapp have enabled virtual communities to connect and take action in the midst of social distancing norms. Whatsapp groups of residential associations have been in action during outbreaks of viral fevers which Kerala faces every year due to heavy monsoon (Sindhu and Prasad, 2019).

The State also has set up call centres with the help of volunteers to deal with calls of concerned citizens on any issue related to the pandemic. Such call centres are also active during natural disasters like floods to assist the affected communities. Specialised call centres for counseling those in distress or depressed have also been set up with the help of psychologists and counselors to protect the mental health of the communities. Communication and media strategies have been effective in creating widespread awareness and the capacity to participate actively in resisting the pandemic.

9. Challenges and the Way Forward

While the pandemic is far from over, K.K. Shailaja in an interview to NDTV a national television channel, reiterated that the State began comprehensive advance planning when Wuhan started reported Coronavirus cases in January. The health department constituted 18 expert groups and training for health care staff began. There was detailed stock-taking of beds, equipment and staff strength in each hospital. This stage of preparedness was completed even before Kerala received its first case from Wuhan on January 30. In the initial stage Kerala had just three cases which were tackled successfully. Till the second phase 70 per cent were imported cases and 10 per cent were contact cases. There were only three deaths out of the 512 cases in the initial two phases. Effective quarantine measures had succeeded in flattening the curve.

She said that the State's effort right from the beginning was to bring all positive cases under government treatment facility and provide free treatment. Many foreigners including tourists and senior citizens were also given free treatment in the government medical colleges. She recalled that the British High Commissioner contacted the Chief Minister's office saying their nationals could be shifted to private hospitals and they would bear the expenses. This was because of the general feeling that government hospitals lack facilities. The Chief Minister said that if the British nationals want to be treated in private hospitals, they may be permitted. However, when they were asked, they preferred to get treated at the government medical college and lauded the facilities. They even gave in writing that they preferred government hospitals. Before leaving India after full recovery, they thanked the State government profusely.

She stressed on the improvement of the public health sector and called for stepping up health funding. At present India spends only 1 per cent of its GDP on health infrastructure, she gave a pragmatic call for increasing it to 10 to 15 per cent to create an affordable people-centric public health system care so that it can cater to the poor and those in need. Kerala has been able to stem the tide of the pandemic largely due to its efficient public health system that has always been a top priority of every political party that governed the State.

Kerala had succeeded in flattening the curve and registering perhaps the lowest death rate in the world besides a very high recovery rate. But when the cases began to rise, the Chief Minister convened a meeting of all departments and entrusted specific responsibilities. Specifically created plans A, B and C to deal with different stages of Covid-19 with low, high and extremely high cases have been put in place. The Health Minister revealed that they had set aside 500-600 beds, 200-300 beds in taluk (village level) hospitals and hotels have been also been earmarked as COVID hospitals. The human resources required for the bed strength has been mobilized by roping in the private sector and training the staff.

After the withdrawal of travel restrictions, Kerala face a massive influx of around 700,000 to 800,000 people who returned through various routes, air, ships, train and road, suddenly due to evacuation by the central government, threatening the containment strategy of the State. Surveillance teams were deployed at airports, entry passes were made mandatory for people coming by road, help desks were set up at the border check posts to segregate people district-wise and send them to their respective destinations. Presently, the majority of people are coming from COVID-19 hotspots where the disease transmission is intense such as the Middle Eastern countries and from States such as Tamil Nadu and Maharashtra in India.

The heavy influx of returnees to Kerala has prompted the LSGIs to bolster their surveillance mechanism by strengthening the existing teams comprising of health workers, ASHA and anganwadi workers with the active participation resident associations and a volunteer corps called the Sannadha Sena (Nair, 2020). This would reduce the stress of the existing teams who have been working tirelessly for four months. It would increase the strength of the existing team to work in batches and prevent complacency and laxity due to

fatigue from over-burdening the response system. The LSGIs have played a pivotal role through their micro-level COVID-19 surveillance and grass root action by converging with community groups and volunteers.

While Kerala prepares to overcome these challenges, it has sent teams of doctors and nurses to assist other countries such as Kuwait and also Maharashtra the worst affected state in India. Following a request from the Maharashtra government, the Kerala Health Minister has sent the heads of a medical team to Mumbai (Emmanuel, 2020). The team of 50 doctors and 100 nurses will set up a 600-bed COVID-19 facility in Mumbai, the city with the highest number of cases in India. This medical team will supplement the Maharashtra government's efforts to curb the pandemic.

Kerala being home to the ancient system of medicine Ayurveda, plans to leverage its strengths to enhance the immunity of the community during the pandemic. The Confederation of Indian Industry (CII) in association with Ayurveda Medicine Manufacturers Association of India (AMMOI), Ayurveda Hospital management Association (AHMA), and the Ayurveda medical Association of India (AMAI) has announced the launch of a chain of Ayurveda immunity clinics across Kerala where free treatment will be provided thrice a week to fight the pandemic. These clinics are in addition to the government Ayurveda clinics that are extremely popular among the people and functioning across the State. Kerala's vast experience in dealing with public health issues and its strong public health sector has received global accolades, especially in the times of the pandemic. Kerala's model of containment of COVID-19 characterised by decentralised people-centric governance marks yet another significant achievement in the world in the face of the collapse of many developed countries with huge funding and advanced medical facilities.

Kerala has a valuable lesson for the rest of India and the world to put people at the centre of governance as only an empowered community can confidently tread the path of sustainable development.

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A threat to the humankind or much ado about nothing? Different perceptions of the coronavirus pandemic based on socio-demographic variables.

Abstract:
Five months since a new coronavirus outbreak started taking a pandemic form (January 2020 to May 2020) is a small period to come to a definite conclusion, but it is a long enough period to assess the threat that this virus represents to the public health. This paper uses demographic and epidemiological data to compare the coronavirus pandemic with the greatest pandemic of the 20th century, which was the Spanish flu. It is found that no comparison can be made, since the Spanish flu had a mortality rate 484 times greater than the current pandemic, based on an equal period comparison (five months). The paper goes on to compare the coronavirus outbreak with a more common and well-documented pandemic, that of seasonal flu. It is established that at least in the European Union, where some of the most stricken countries from coronavirus are situated, the new outbreak causes significantly greater mortality than seasonal flu. The paper also refers to the Non-Pharmaceutical Interventions (NPI) taken from the government of Greece to restrict the coronavirus pandemic. It assesses, by a means of questionnaire, the social disturbance that these interventions have caused, the impact on the personal lives of people and the different degree of acceptability of the restrictive measures by different socio-demographic groups.

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1. Introduction

"The [Spanish] flu? Who cares about it? There were, of course, many households that had been badly stricken from the epidemic. In the theaters and the cinemas there was an empty seat in between two persons, and impatientyoung boys and girls tried, in vain, to sit one next to the other in the dark. Finally, those days the following news had been published in the press: 'The Pasteur Institute prepared a prophylactic vaccine against the Influenza using Pfizer microbes, streptococci and pneumococci'. Yet, only the neighborhood committees, the doctors, the spinsters, and those above 60 years old were concerned with this kind of things; to make a long story short, only prudent people that anticipated their "salvation" from a cocktail of germs. The youth didn't care about flu epidemics and the like." (I.M. Panagiotopoulos, 2020:40).

The above passage refers to the great pandemic of the "Spanish Flu" that swept the world in 1918-19 and killed more than 50,000,000 people, in a global population six times smaller than today's population (Johnson and Muller, 2002).The novel "Astrofeggia" (Starlight), from where the above passage is taken, was first published in 1945, and it is the story of a company of teenagers getting into adulthood in the harsh years immediately after the First World War in Greece. The reference to the 1918 Influenza pandemic or the "Spanish flu" as it came to be known, is not the only reference to infectious and contagious diseases in the novel. People were more concerned those days with tuberculosis, which was endemic in Greece since at least the 19th century and, on the long run, constituted a greater killer than the Spanish flu. Nevertheless, the defiance with which young people confronted the pandemic and the measures taken by the government reflects not only attitudes and stances of a past society that was much more accustomed to the reality of death than our society, but also the different perception and acceptability of the state restrictions during pandemic from the young people as opposed to the older ones, the "prudent ones" as the author calls them with a sarcastic mood.

A parallelism very often takes place between the coronavirus pandemic of 2020 (COVID-19) and the Spanish flu of 1918-19. Although the two pandemics are not comparable for reasons that will be laid down further on, it is worthy to compare the measures taken to stop the spread of the pandemic now and then and, most of all, the acceptance of these measures by the general population. The negative effects of these measures in the personal life of people, the society and the economy of a country are also of immense importance and this paper will try to set these issues in a sensible framework. A comparison is also made between the coronavirus pandemic and the seasonal flu, which is more familiar to present-day populations, takes pandemic form in the winter season and its epidemiology and mortality is more comparable to COVID-19 than to the Spanish flu.

2. Methodology

The paper consists of two parts. The first part substantiates in what degree the new coronavirus (SARS-CoV-2) constitutes a threat for the public health globally and in Greece in particular. To give an order of magnitude of this threat, the COVID-19 outbreak is compared with the greatest pandemic of the 20th century (the Spanish Flu of 1918-19), and also with the annual pandemics caused by seasonal flu and by infections of the respiratory system in general. The non-pharmaceutical interventions (NPI) taken during the Spanish Flu and during COVID-19 are compared so as to give an idea of the different perception that the societies of the near past had had about illness and death compared to societies in the 21st century.

To assess the threat that COVID-19, seasonal flu, and infections of the respiratory system in general represent for the general population the use of the following demographic rates is made:

1) Case fatality rate: Total number of deaths from a specific cause (numerator) divided by the total number of reported cases of that cause (denominator). For example, number of

deaths from SARS-CoV-2 divided by the number of people reported positive to SARS-CoV-2. The rate is expressed as a percent.

2) Mortality rate: Total number of deaths from a specific cause (numerator) divided by the total population (denominator). Mortality rates are expressed as deaths per 1,000 population.

In the second part the results of a survey concerning the Greek society are presented. The survey was conducted by means of a questionnaire between 7 and 16 of April 2020. The questionnaire was sent to 155 students of the Geography Department at the University of the Aegean and was also shared in the social media (in the personal Facebook profile of the author and in a Facebook site for educationalists). The total number of those who answered the questionnaire was 126, with 41 of them being 18-29 years old (most of them "freshers", "sophomores" or graduate students) and the rest coming from a broader pool of participants.

It is imperative to mention here that this survey is subjected to self-selection bias, in the sense that those who chose to respond to the questionnaire might have been individuals strongly opinionated about how the measures taken by their government affected their personal life. The sample, therefore, does not satisfy the Equal Probability of Selection Method (EPSEM), which is essential for a probability sampling procedure. Nevertheless, taking into account that it is very difficult and unlikely in the social sciences to choose a sample that satisfies all the probability sampling criteria, the results of the survey are presented with the conviction that they give a general notion of how the Greek society perceived restrictive measures and in what degree these measures affected the personal lives of people.

3. COVID-19 and the Influenza Pandemic of 1918-19: are they comparable?

The 1918 Influenza Pandemic came in three distinct waves from the spring of 1918 up to the spring of 1919. The first wave, which was mild in its lethality, began in March 1918 among army recruits at Camp Funston, Kansas, in the mid-western USA. It came to Europe in April of that year through American troops and by July it had reached North Africa, India, China and possibly Australia[2]. By June and July, however, this first wave of influenza had faded, leaving behind no more dead than previous influenza pandemics. The second wave started from Europe (most probably form France in late August) in the fall of 1918 and dispersed very quickly around the world. It was this second wave that was more deadly, it presented different clinical picture from the seasonal flu and killed tens of millions of people in less than six months. By January 1919 the second wave of the influenza pandemic had reached almost every inhabited place on earth. In many countries there was a third wave in the winter and spring of 1919, but this is considered a normal series of "trailer" outbreaks (Patterson and Pyle, 1991).

The Influenza pandemic of 1918-19 was mis-named "Spanish Flu" because the Spanish press publicized widely the existence and the prevalence of this disease in May 1918 when it first affected Spain. Until then, the rest of the European countries and the USA, from where, most probably, the pandemic originated, did not publicize news on the pandemic. However, contemporary observers were aware that the term Spanish Flu was inappropriate.

The disease that was to become the 2020 pandemic, on the other hand, made its appearance on China in the fall of 2019. It started as a cluster of pneumonia cases of unknown origin in the city of Wuhan and a notification was made to the World Health Organization

[2]There is dispute here. Patterson and Pyle claim that Australia and New Zealand were first affected in June 1918 (Patterson and Pyle, 1991:8). Johnson and Muller support that Australia delayed the outbreak until early in 1919 "due a partial success of a maritime quarantine" (Johnson and Muller, 2002:107)

(WHO) on December 31. On January 7, 2020 the causative pathogen was identified as a novel coronavirus, distinct from previous ones, but closely related (The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020). The novel coronavirus was named SARS-CoV-2 (Severe Acute Respiratory Syndrome 2) and the disease caused by this virus was named COVID-19. Within the first weeks of 2020 the new disease had infected more than 100,000 people in 100 countries. On the 11th of March 2020 WHO announced COVID-19 outbreak a pandemic (WHO/Europe, 2020).

The clinical and epidemiological picture of the two viruses is different. In 1918 the existence of viruses was unknown. Yet, doctors and even the common folks knew the symptoms of the seasonal flu, which was coming every year, was affecting the whole population and was killing the frailer persons, that is the elderly and the very young (infants and toddlers). The peculiarity of the Spanish flu, which was noticed immediately by the medical staff of that period, was that it was more deadly among young healthy adults, aged 18-40 years, which were people with very robust immune system. It is nowadays widely accepted that the pathogen of the second wave of the Spanish flu, which is responsible for millions of deaths, was a strain of the influenza type A virus, most probably belonging to the group H1N1. Yet, this strain of Spanish flu derived its lethality from the fact that "it penetrated deep into a victim's lungs straightaway, where its virulence could either trigger an overreaction into overdrive by the immune system, filling the lungs with liquid antibodies that caused acute respiratory distress, or make the victim susceptible to bacterial pneumonia" (Philips, 2020:3). Therefore, the young and the healthy, whose immune system was strong, were very likely to over-react to the virus "filling the lungs with liquid antibodies", which very often had had fatal consequences. The elderly and those with a weak immune system were more prone to bacterial pneumonia by not being able to fight the flu virus.

On the other hand, the SARS-CoV-2 virus, which is responsible for the COVID-19 pandemic, is far less lethal, because, most probably, "it does not immediately penetrate the lungs, thereby giving the immune system a chance to counter it before it seriously affects the respiratory system" (Philips, 2020:3). The difference in the severity of the two pandemics is evident in their epidemiological profile as well. Whereas in the 1918-19 pandemic mortality was high among the young and the healthy, in COVID-19 it is the elderly and the immunocompromised that make up the bulk of the deaths. Contrary even to the common seasonal flu, COVID-19 is not dangerous for the young children, as deaths between infants and toddlers are extremely rare (Ferguson et al., 2020:5).

The enormous mortality of the Spanish flu, when compared to COVID-19, will become more obvious when the current outbreak is over. However, table 1 compares the second and deadliest wave of the Spanish flu, which lasted approximately 5 months (from September 1918 to January 1919), with the five-month period that COVID-19 swept the world (January 2020 to May 2020) when these lines were being written, taking into account that by the end of May 2020 COVID-19 was already in recession as the number of confirmed deaths worldwide were decreasing daily (Our World in Data, 2020). Therefore, by having data for the deadliest five-month periods of the two pandemics one can compare them on equal basis. The comparison is overwhelmingly unfair: 39 million deaths from the Spanish flu in a population of 1.8 billion (2% of the world's population) versus 370,000 deaths form COVID-19 in a population of 7.8 billion (barely 0.0045% of the world's population).

Table 1: Mortality estimates by continent and selected European countries for the Spanish flu and COVID-19 during the deadliest five-month periods.

	Second Wave of Spanish flu (September 1918-January 1919)		**COVID-19 pandemic** (January 1, 2020- June 1, 2020)	
Continent	**Deaths**	**Deaths per 1000 population**	**Deaths**	**Deaths per 1000 population**
World	***24.7-39.3 million***	***13.6-21.7***	***371857***	***0.048***
Africa	1.9-2.3 million	14.2-17.7	4222	0.003
America	1.5 million	7.4	163281	0.204
Asia	19-33 million	19.7-34.2	30602	0.007
Europe	2.3 million	4.8	173613	0.232
Oceania	85000	-	132	0.003
Selected European countries	**Deaths**	**Deaths per 1000 population**	**Deaths**	**Deaths per 1000 population**
Germany	250000-300000	4.2-5.0	4426	0.053
France	240000	3.9	28802	0.428
UK	200000	4.9	38489	0.585
Italy	325000-350000	8.8-9.5	33415	0.555
Spain	150000	7.1	27127	0.571
Portugal	59000	9.7	1424	0.140
Greece	21594	4.3	179	0.017

Source: for Spanish flu: Patterson D., 1991:14-15; The figure for Greece is an estimate based on the mortality rate of 4.3 per 1000 (Barro et al., 2020: 20) and on the population of the 1920 census amounted to 5,021,790 (Statistique Générale de la Grèce, 1928). For COVID-19: John Hopkins Coronavirus Resource Center. Retrieved May 31, 2020 from https://coronavirus.jhu.edu/. Deaths for Europe have been taken from European Centre for Disease Prevention and Control. Retrieved May 31, 2020 from https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases Population for calculating rates for 2020 have been taken from The World Factbook URL: https://www.cia.gov/library/publications/the-world-factbook/

Table 1 reveals that Europe is the most heavy-stricken continent by the COVID-19 outbreak with more than 23 deaths per 100,000 population in those five months that data are available. The least affected continents are Africa and Oceania, with barely 3 deaths per 100,000 people. This enormous difference in the mortality of Covid-19 is intriguing and may be due to multiple factors such as the climate of each area, the age-structure of the population, the measures taken by its governments and even different genetic predisposition of different populations (Cao et al., 2020).

4. COVID-19, seasonal flu and the greater category of respiratory ailments.

It was established in section 3 that the 1918-1919 Influenza pandemic dwarfs the mortality of COVID-19 and any comparison only shows how much smaller is the current disease in demographic terms. Having said that, one wonders if the mortality of COVID-19 is more like that of the seasonal flu, which is endemic in almost every country, while in countries of the

Northern hemisphere is especially acute from October to mid-May. In fact, there is a relevant debate in the general and the specialized press as to how the new coronavirus compares with flu (Rettner, 2020; Maragakis L., 2020). In this debate the estimates of the mortality of the two viruses are very different. It seems that every year seasonal flu (which includes all strains of Influenza type A and B viruses) causes between 291,000 and 646,000 deaths worldwide (Maragakis, 2020). COVID-19 had caused approximately 370,000 deaths worldwide in the five-month period from January 2020 to end of May 2020 (John Hopkins Coronavirus Resource Center, 2020).

However, the case fatality rate of COVID-19 is referred as being much greater than that of the flu. Worldwide the case fatality rate of COVID-19 in those 5 months (January to May 2020) was 6.1%, while the seasonal flu has a fatality rate of 0,05% in a yearly basis. The estimates are based on 369,254 deaths from COVID-19 and 6,065,624 cases reported worldwide from January 1, 2020 to May 31, 2020 and an average of 475.000 estimated deaths from flu over 1 billion cases estimated on yearly basis. (Marangakis, 2020; John Hopkins Coronavirus Resource Center, 2020)

However, the higher than that of flu case fatality rate of COVID-19 is due to the way positive cases are identified for the two viruses. In the case of flu there are national surveillance systems that report every Influenza Like Illness (ILI) to the central authorities and subsequently to WHO. COVID-19 on the other hand, is a new disease and the screening of the population is not readily available. In some countries the screening of the population is more systematic (like in Germany), while in some other countries the diagnostic test for SARS-Cov-2 is taken only by those feeling sick and refer to hospitals. That is why fatality rates differ greatly from country to country (11% in Italy, 1% in Germany less than 0.4% in Israel (Henriques M. (2020)) and they are not comparable. A great number of those infected are not identified as cases (Ferguson et al. (2020:5). Unidentified cases may include asymptomatic persons and infections with mild symptoms who are not tested, and they never diagnosed as cases. This means that the case fatality rate for COVID-19 is based on a deficient denominator, and therefore it is presented greater than that of flu. Consequently, we cannot compare fatality rates between COVID-19 and seasonal flu because of the lack of data for the former (positive cases for COVID-19 are under-reported).

Nevertheless, we can compare mortality rates of the two pandemics. Mortality rates differ from case fatality rates, as far as their denominator is concerned. In the numerator both rates have the deaths caused by a disease. In the denominator a fatality rate has only the identified cases of those infected, whereas a mortality rate has the general population. Since the screening of the population for COVID-19 is not so systematic as it is for the seasonal Flu, mortality rates are the only reliable way to compare the lethality of the two pandemics. The latest available data for European Union countries are those of 2017. There are issues of comparability, given that seasonal flu presents great variation from year to year and that 2017 is a 12-month period, whereas COVID-19 is only present for five months in 2020 (January to May). However, seasonal flu takes endemic form in the winter months, usually form November to April in most European countries. Therefore, the comparison is indicative of the mortality of two diseases.

Table 2: Deaths (numbers and rates) from Respiratory infections and sub-categories of them. Selected European countries and EU28, 2017 and 2020.

	Mortality rates (deaths per 1000 population)		
Geographical Area	Infections of the respiratory system (ICD-10 codes: J00-J99)[3]**in 2017**	Influenza (ICD-10 codes:J09-J11) **in 2017**	COVID-19**in a 5-month period** (January 1 to June 1 2020)
European Union - 28 Countries	0.89	0.016	0.311
Greece	1.29	0.013	0.017

Source: Eurostat, 2020 and John Hopkins Coronavirus Resource Center, 2020. Own calculations.

In the 28 countries of the European Union (including the UK) mortality from COVID-19 is significantly greater than that from influenza. Nevertheless, it is not known whether deaths from COVID-19 will have an additive effect in the mortality rate of all causes (the Crude Death Rate). It is very likely that part of deaths from the coronavirus outbreak are not excess deaths, but deaths of people that would have died anyway during the calendar year from another cause of death. Yet, one must wait until the vital statistics of 2020 are published, to inspect if the Crude Death Rate of the countries is noticeable higher in 2020 than in previous years.

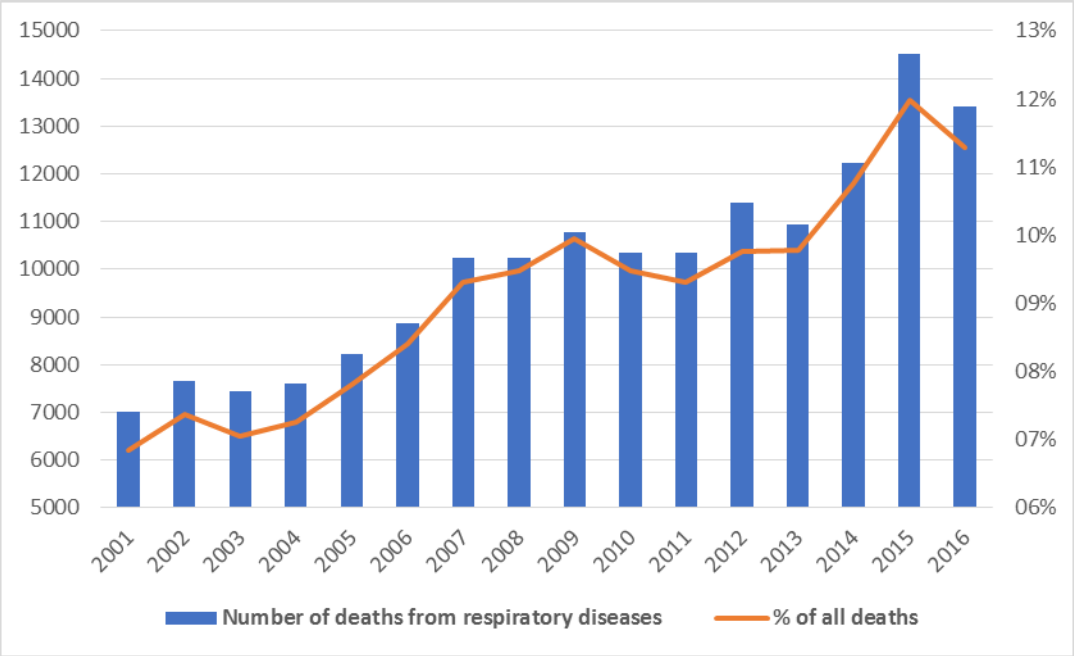
4.1 The case of Greece

In the case of Greece, ailments of the respiratory system nowadays make up the third biggest cause of death in the general population (the other two being circulatory diseases and neoplasm) (Kalogirou et al., 2012). This kind of ailments caused almost 16% of all deaths in first half of the 20th century. They had been receding in the post-war years reaching a minimum of 6% of all deaths by the late 1990s (Gavalas, 2001:222). Nevertheless, from the beginning of the 21st century, there is a surge in deaths related to the ailments of the respiratory system, resulting in 11% to 12% of all deaths to be caused from this kind of diseases (figure 1).

Infections of the respiratory system afflict mainly the elderly, and to a lesser extent the very young (figure 2). From 2001 to 2016 the proportion of the elderly (65+) in the population of Greece passed from 17% to 21% (Gavalas, 2019). At the same period, deaths from respiratory infections increased from 6.8% to 11.3% of all deaths. Therefore, the surge of diseases of the respiratory system is explained, to some extent, by the ageing of the population. However,it is unlikely that the entire increase in deaths of the respiratory system is due to the ageing of the population unless all excess elderly in 2016 compared to 2001, died from a respiratory infection. Most probably there are other, non-demographic factors, behind this surge of the respiratory ailments. This is the framework in which the new pandemic COVID-19, which is also an ailment of the respiratory system, must be seen.

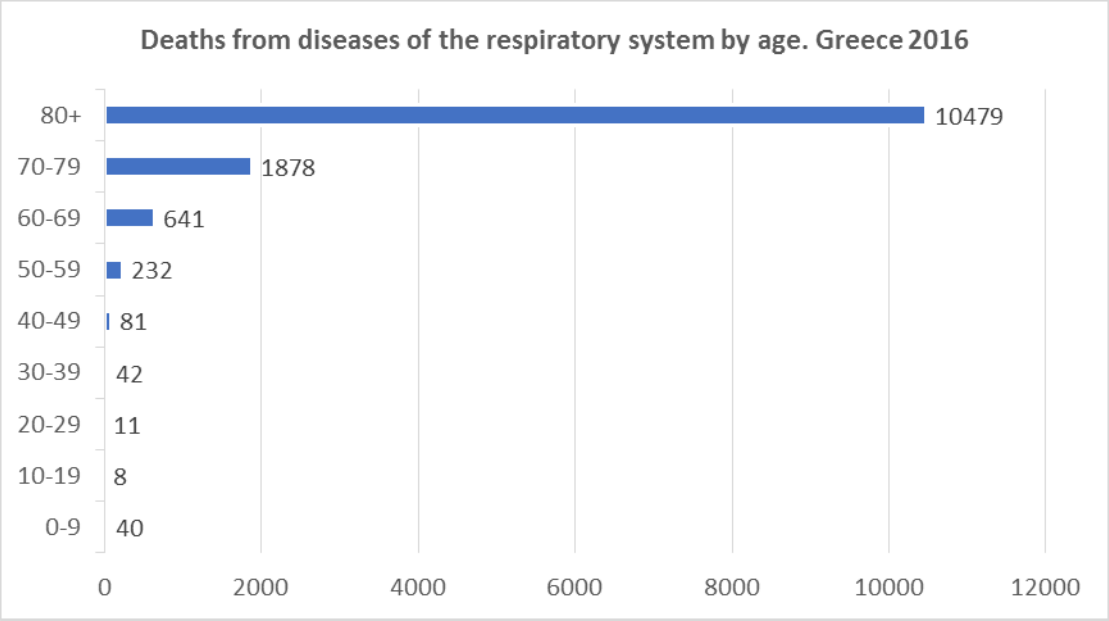
[3] The codes refer to the 10th revision of the International Classification of the Diseases (ICD-10) by the World Health Organization (WHO, 2011)

Figure 1: Number of deaths from diseases of the respiratory system and their share in total deaths. Greece 2001-2016.



Source: data from ELSTAT. Own elaboration

Figure 2: Deaths from diseases of respiratory system by age. Greece 2016.



Source: data from ELSTAT. Own elaboration

At the time being (June 2020) the two epidemics (seasonal flu and COVID-19) cannot be compared because there are no time series of epidemiological data for COVID-19, since it is a very recent epidemic (the first recorded case in Greece was in February 26, 2020). It seems, however, that COVID-19 has greater mortality in the Greek population, although it is still early to assess the burden it causes to the Intensive Care Units (ICU) in Greece. For the period February 24 to May 17 (a 12-week period) COVID-19 had caused more burden to the National Health System of Greece than the seasonal flu causes during the "flu period" which spans from October to mid-May (a 33-week period) (table 3).

Table 3: Deaths and patients in ICU due to seasonal flu (type A and B) during a 33-week period (the whole "flu season") and during a 10-week period (the period where restrictive measures were imposed by the Greek government in 2020). Greece: 2010-2020.

Flu season (33-week period. Weeks 40 to 20)	Deaths from flu	% of deaths during weeks 11 to 20	Patients in ICU fro flu	% in ICU during weeks 11 to 20
2010-11	180	13%	368	3%
2011-12	56	64%	121	32%
2012-13	49	51%	108	28%
2013-14	148	42%	330	25%
2014-15	111	29%	233	22%
2015-16	197	14%	408	3%
2016-17	108	22%	276	12%
2017-18	42	48%	107	24%
2018-19	154	23%	374	8%
2019-20	116	22%	232	3%

Note: Deaths from COVID-19 during a 12-week period (week 9 starting February 24, 2020, to week 20 ending May 17 2020): **162**. Patients hospitalized in ICU during the same period: **260**.

Source: data from EODY's annual and weekly epidemiological reports. https://eody.gov.gr/epidimiologika-statistika-dedomena/etisies-epidimiologikes-ektheseis/#heading-4

However, would the picture have been much worse, had no measures been enacted when COVID-19 broke out in Greece? This is something that cannot be assessed based on empirical data. The fact is that Non-Pharmaceutical Interventions did not seem to have stopped the mortality of the flu pandemic. Those who died from flu after March 11 (the day draconian non-pharmaceutical interventions started with the closing of all educational premises) constituted 22% of the total deaths caused by flu during the "flu season", that is a 33-week period spanning roughly from October to mid-May in Greece. This percentage is greater in years that the flu pandemic is very mild (as it was in 2011-12, in 2012-13 and in 2017-18), but it is smaller in certain years that the flu outbreak is quite acute as it was in 2010-11 and in 2015-16. Nevertheless, the NPI taken by the Greek government seemed to have reduced the number of patients in Intense Care Units. Those who entered ICUs from flu after March 11 made up only 3% of the total patients in ICUs from flu during the flu season. Such a low percentage had been recorded in 2010-11 and 2015-16 as well, but those were years with significantly greater number of patients in ICUs and more deaths also.

5. Non-Pharmaceutical Interventions now (2020) and then (1918-19)

Although the Spanish flu was far more lethal than COVID-19 from the initial stages of the epidemic, the measures taken in 1918 by most of the countries, while very similar with the measures taken in 2020 to restrict the COVID-19 outbreak, did not have the intensity nor the aggressiveness of today's draconian non-pharmaceutical interventions. As far as we know from the relevant bibliography, the strictest measures in 1918-19 were taken in the USA. The measures differed greatly from State to State, but most major cities in USA ordered closure of schools, theaters, churches and case isolation. They also banned mass gathering and suggested

social distancing. In some cases, the public health interventions included mandated mask wearing in public space, public disinfection and making influenza a notifiable disease. However, nowhere measures were as extensive, in terms of closing non-essential businesses, as they were in USA and in many European countries in 2020 due to COVID-19 (Correia et al., 2020:20)[4]. There was also no quarantine of the general population in 1918-19 as it was the case in 2020 in many European countries.

As far as Greece is concerned, the first case of Spanish Flu was reported in Patra in the summer of 1918 and in July 31 the first death is reported in Athens. In mid-October 1918, when the second wave of Spanish Flu was sweeping Greece, the closure of schools was ordered, the inauguration of the academic year in the universities was postponed and courts of Justice and conservatoires stopped their sessions (Lifo team, 2020). However, there is no reference in the relevant bibliography that there was a general lockdown of businesses coupled with a "quarantine" of the whole population, as it was the case in 2020 in Greece. On the contrary, cinemas and theaters in 1918-19 continued their business, albeit with half the audience, and coffee shops and restaurants remained open, except for cases that there was congestion of people as it was the case with the coffee shops in Omonoia square, Athens (Kallianiotis, 2020; Lifo team, 2020).

The government emphasized the fact that every person is responsible for its own health and that citizens should "…take every precaution to protect themselves and the others. To protect yourself from the influenza, you should stay away from people coughing or having a cold and do not go to places that there is a congestion of people. As soon as you feel unwell lay at your bed, drink a bit of hot milk and call the doctor. In this way the illness usually goes by lightly and in a short time. Apart from protecting yourself, it is your duty to protect the rest of the people as well; your relatives, your friends, your associates. Therefore, when you are ill or you feel unwell, do not go close to other people and do not let them come close to you. Do not go to your job or to the coffee shops, so that you do not pass the flu to other people." The above statement is part of the guidelines given by the Greek Public Health Service published in the newspaper "Empros" in the 2nd of November 1918 (Bournova, 2020).

On the other hand, the experience of the Greek population during the COVID-19 outbreak was shaped by strict Non-Pharmaceutical Interventions that were enforced to the whole of Greece. The Greek government imposed an immediate and prolonged lockdown on the country, starting with the closure of schools and educational institutes of all grades on the 11th of March 2020 and continued gradually with the closure of all kinds of businesses and retail shops (restaurants, coffee shops, hotels, electronic retailers, clothes and shoes shops, theaters, cinemas, bookshops etc.) except for the food retailers, pharmacies and gas stations. Gatherings in public or in private places were forbidden, places of worship were closed and, finally, a general "quarantine" was imposed to the population on the 23rd of March coupled by a massive campaign in the mass media urging people to stay home. The "Stay Home" campaign became a standard moto in every newspaper, TV channel, and electronic media. The briefing on the COVID-19 was the 24-hour routine of the mass media and the population was not allowed to circulate except for going to the doctor, replenish their food reserve and for a brief exercise within a small distance from their homes. These "breaches of quarantine" were under the strict control of the police, which was checking the identification cards and the relevant permission documents to see whether the citizens had indeed one of the above reasons to exit home. The so called "quarantine" lasted for six weeks (42 days) but

[4]It is noteworthy that in New York City with a population of 6 million and 8000 reported cases of Spanish flu within a month (September and up to the 6th of October 1918), the schools had not been closed up to October 1918, all stores were open with some modification in their opening hours, so as to reduce crowding in the subway and the transportation lines, and for the churches there were only recommendations to hold no services (*New York Times, Oct 5, 1918 and New York Times, Oct 7, 1918*in Correia et al., 2020:44-45).

restrictions in long distance circulation and the economic lockdown lasted at least for two months and the full exit was not expected to take place before the end of June 2020 (Kathimerini, April 23, 2020). This was one of strictest quarantines imposed in a European country.

The effectiveness of the lockdown, although a matter of debate in the scientific community (Fretheim, 2020; Alvarez et al., 2020; Ferguson et al., 2020), was never challenged by the mainstream Greek media or by the political parties in the Greek parliament. The adverse effects of the prolonged lockdown were also downplayed in the public sphere of Greece. Nevertheless, prospective and longitudinal studies have demonstrated the negative effects of the lockdown in the mental health of people, which include stress symptoms, confusion, anger and depression. The loss of jobs and the economic damage due to the lockdown creates also serious socio-economic distress with long-lasting effects. People that confront financial loss and are unable to work are at risk of psychological disorders several months after the lockdown is over (Brooks et al., 2020). Other studies have found that the psychological distress resulting from repeated media exposure to the outbreak, affects adversely not only the mental but also the physical health of the viewers. In the UK, USA and Italy there was a sharp rise in the number of seriously ill people dying at home of a cardiac arrest because they were reluctant to call for an ambulance (Spinney, 2020). The ubiquitous media exposure can lead people to perceive coronavirus threat as higher in risk compared to more common threats such as influenza (Garfin et al., 2020).

6. Acceptance of the NPI in Greece and opinions and attitudes of the general population.

Having the above in mind, a survey was conducted to measure the acceptance by the population of the restrictive measures taken in Greece during the COVID-19 outbreak. Despite the drawbacks of the survey, which were mentioned in the methodology section, the results of the survey are presented with the conviction that they give a general notion of how different socio-demographic groups perceived restrictive measures and in what degree these measures affected the personal life of Greeks.

The first deduction of the survey is that restrictive measures in the face of the COVID-19outbreak, deteriorated the quality of life in Greece (figures 3 and 4 and tables 3 and 4). As the question posed was quite vague (*"By and large how would you grade the quality of your life before and during the restrictive measures?"*), the answers do not measure any specific topic, but they give an overall idea of how much the personal lives of Greeks were affected by the restrictive measures. The deterioration of the quality of life may result either from the loss of everyday activities like meeting up with friends in a social context, going for shopping, meeting up with close relatives (the grandparents were cut off from their grandchildren and children for the fear of contacting the disease) or from a change in the occupational status of the respondent (many people stopped working and a great portion of them were uncertain whether they would work again) or from a combination of the above. As can be seen in tables 3 and 4 the expressed difference in the quality of life before and during quarantine and lockdown was statistically significant at any level of significance (p-value<0.001).

Figure 3: Quality of life **before** the restrictive measures.

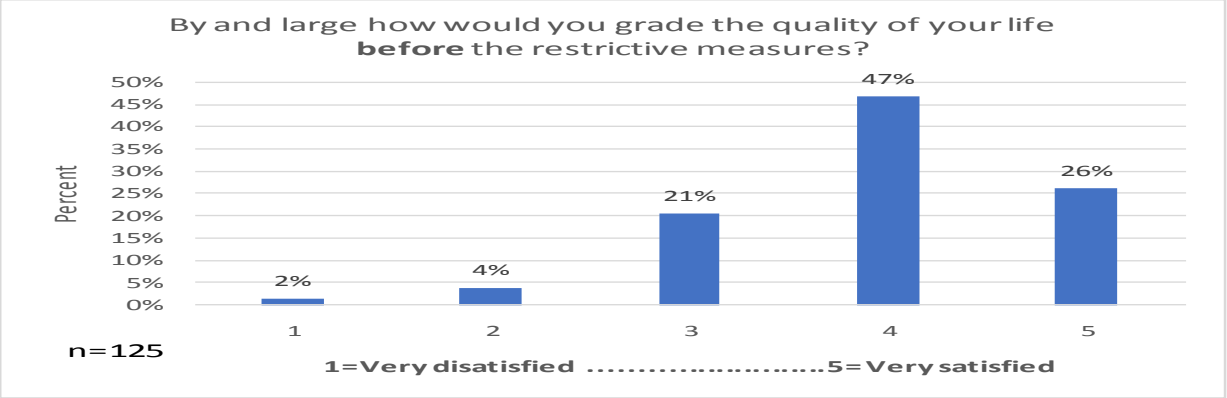


Figure 4: Quality of life **during** the restrictive measures.

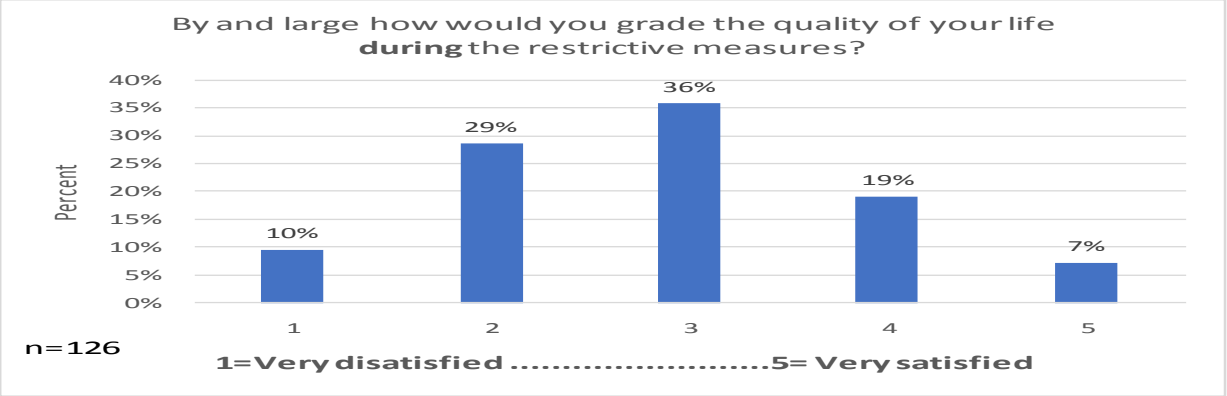


Table 3: Quality of life **before** and **during** restrictive measures. Descriptive statistics.

PairedSamplesStatistics

		Mean	N	Std. Deviation	Std. ErrorMean
Pair 1	Satisfaction from life **before** the restrictive measures	3.93	125	0.881	0.079
	Satisfaction from life **during** the restrictive measures	2.84	125	1.050	0.094

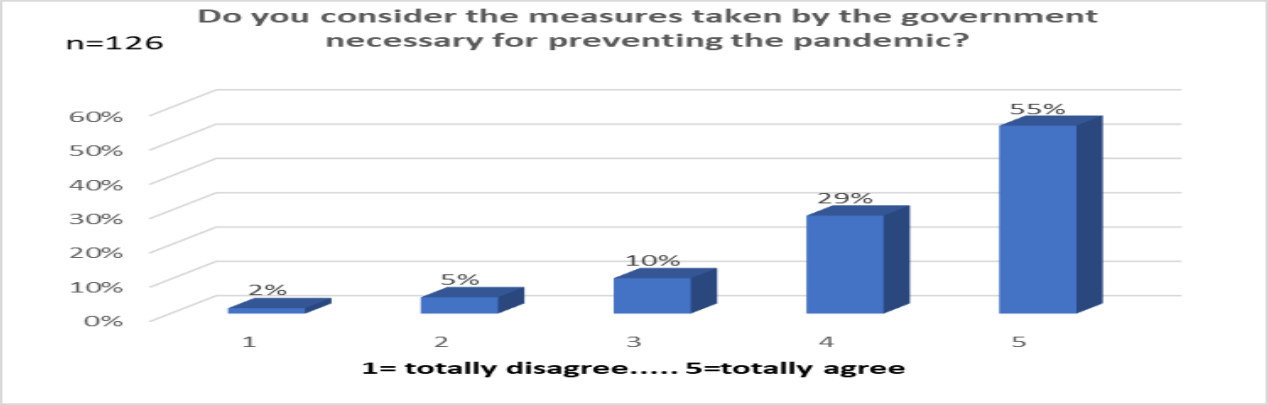
Table 4: Statistical significance of the difference in the quality of life **before** and **during** restrictive measures.

PairedSamplesTest

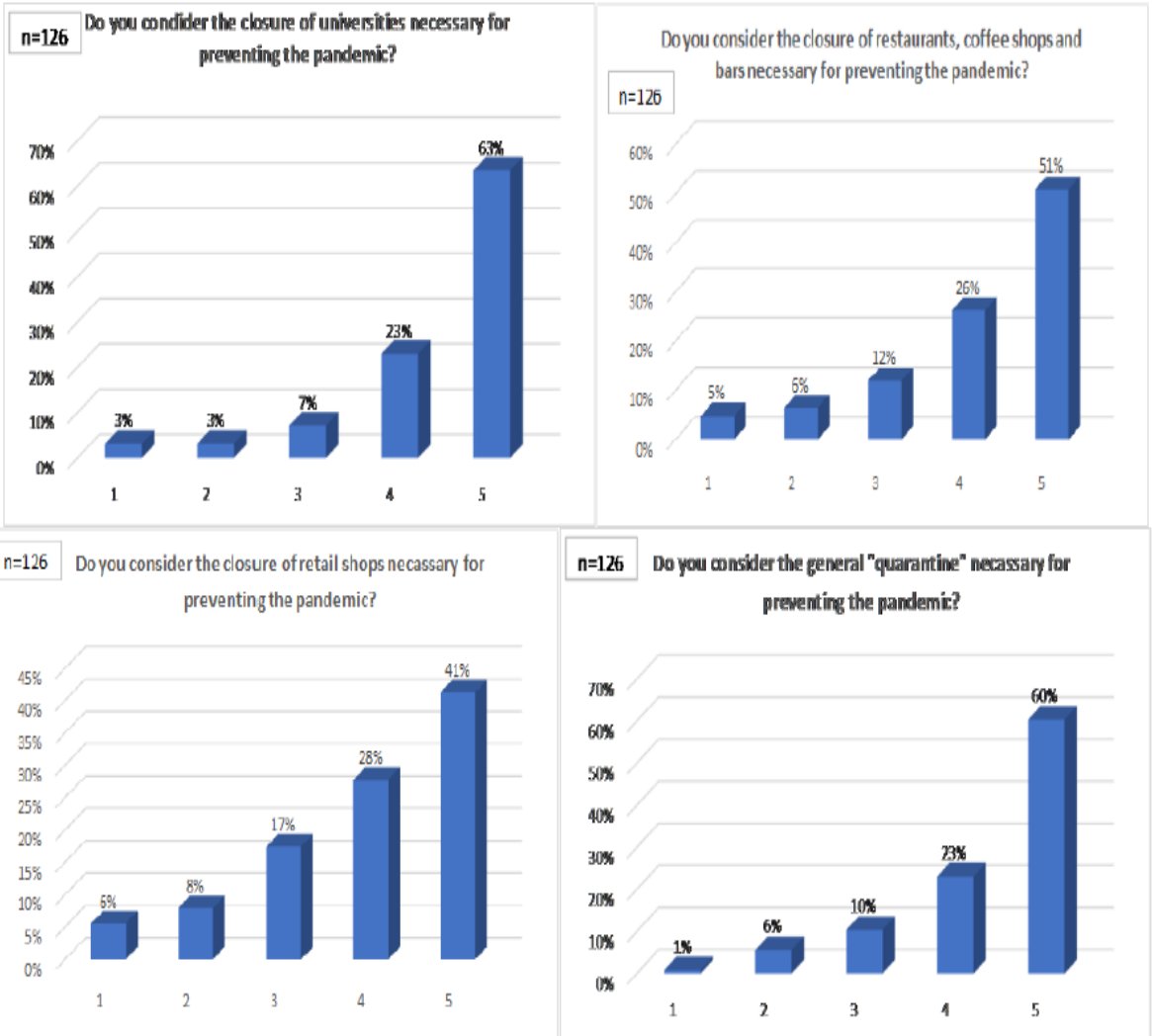
		PairedDifferences			t	df	Sig. (2-tailed)
			95% Confidence Interval of the Difference				
		MeanDifference	Lower	Upper			
Pair 1	Satisfaction from life **before** the restrictive measures - Satisfaction from life **during** the restricive measures	1.088	0.865	1.311	9.675	124	0.000

Nevertheless, despite the deterioration of the quality of life, the measures in general were accepted without disagreement by the majority of Greeks (84% in figure 5[5]).

Figure 5: Acceptance of the measures taken by the government in general.



Figures 6: Acceptance of specific measures taken by the government.



1=Totally disagree ……

[5]Adding those who answered 4 (rather agree) and 5 (totally agree) together.

It is interesting that the most welcomed measure (with which 86% of the respondents agreed) was the closure of universities (figure 6), most likely because of the widespread belief back then that children play an important role in transmitting the SARS-CoV-2, as is the case with the influenza epidemics. This was the impression that the government's "experts" promoted in order to close schools of all levels. Later, it became clear that children play a small role to the transmission of the new coronavirus, while in most of the cases adult family members are those who infect children (Fretheim A., 2020).

The measure with the smaller acceptability from the public was the closure of retail shops. As figure 6 shows 69% of the respondents agreed (partially or totally) with this measure, while the rest 31% are either ambivalent or clearly disagree.

Although the great majority of the respondents seem to agree with all the measures taken by the government, there is a difference in the acceptance of these measures by age of the respondent. Young people (18-29 years old) are less accordant with the closure of restaurants, coffee shops and bars than older people (table 5).On the other hand, older people (30+) show greater disagreement as far as the closure of retail shops are concerned than the young ones. Disagreements in those two issues are the only statistically significant differences between the young and the older. In the rest of the measures (university closures, general "quarantine", the measures in general) there was no statistically significant difference in their acceptance by age.

Table 5: Acceptance of closing down restaurants, coffee shops and bars by age.

	Age_group	N	Mean	Std. Deviation	Std. ErrorMean
closure of restaurants, coffee shops and bars necessary for preventing the pandemic	15-29	41	3.78	1.333	0.208
	30+	85	4.28	1.007	0.109

Independent samples t-test (equal variances assumed): p-value<0.05

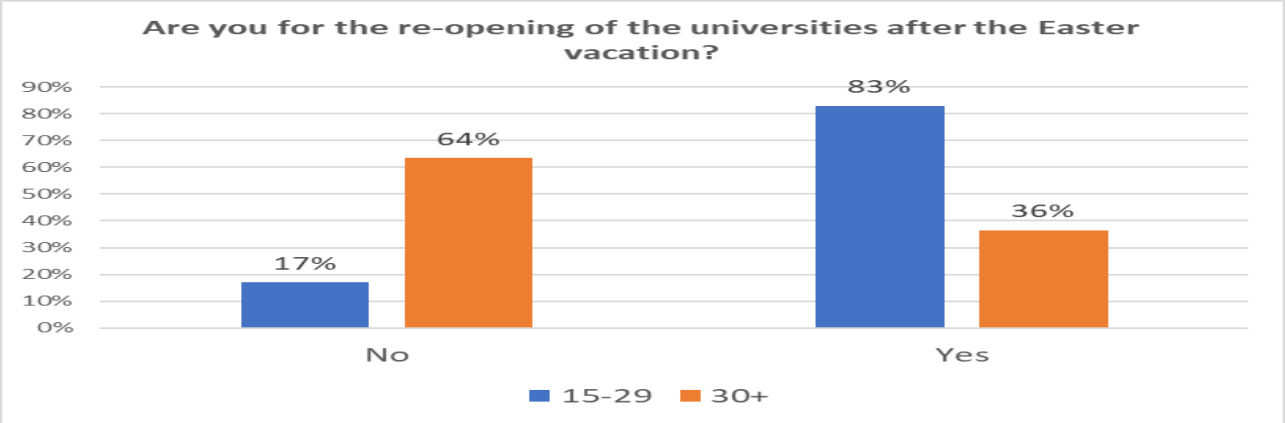
Table 6: Acceptance of closing down retail shops by age.

Age_group	Age_group	N	Mean	Std. Deviation	Std. ErrorMean
closure of retailer shops necessary for preventing the pandemic	15-29	41	4.20	1.054	0.165
	30+	85	3.78	1.228	0.133

Independent samples t-test (equal variances assumed): p-value<0.1

The age as a differentiating factor on attitudes towards preventive measures during pandemic is more obvious in the following question: "*Are you for the re-opening of the universities after Easter vacation?*" Although the majority of the young (18-29 years old) agreed that the closure of universities was necessary for preventing the pandemic, 83% of them wished that the universities would open after Easter vacation. On the other hand, among the older ones (30+ years of age) only 36% wanted the opening of the universities (figure 7).

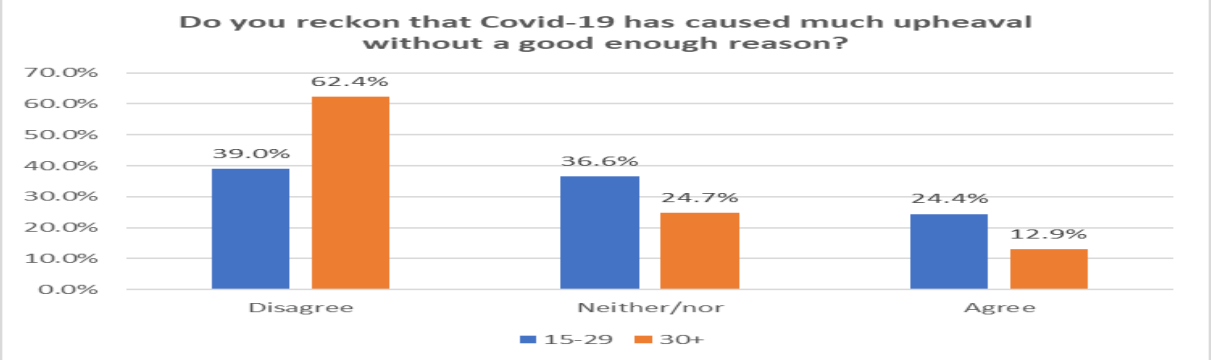
Figure 7: Attitudes towards re-opening the universities by age.



n=126; d.f.=1; χ^2=23.9; p-value<0.001

Less intonated, but still statistically significant, is the difference between young and older people in their opinion on the social disturbance caused by the COVID-19 outbreak (figure 8). Only 39% of the young disagreed with the statement that COVID-19 has caused much ado about nothing, while 36.6% are ambivalent and 24.4% agree. As far as the older ones are concerned, most of them (62.4%) consider that the upheaval caused by the coronavirus outbreak was justifiable.

Figure 8: Answers to the question "Do you reckon that COVID-19 has caused much upheaval without a good enough reason?" by age

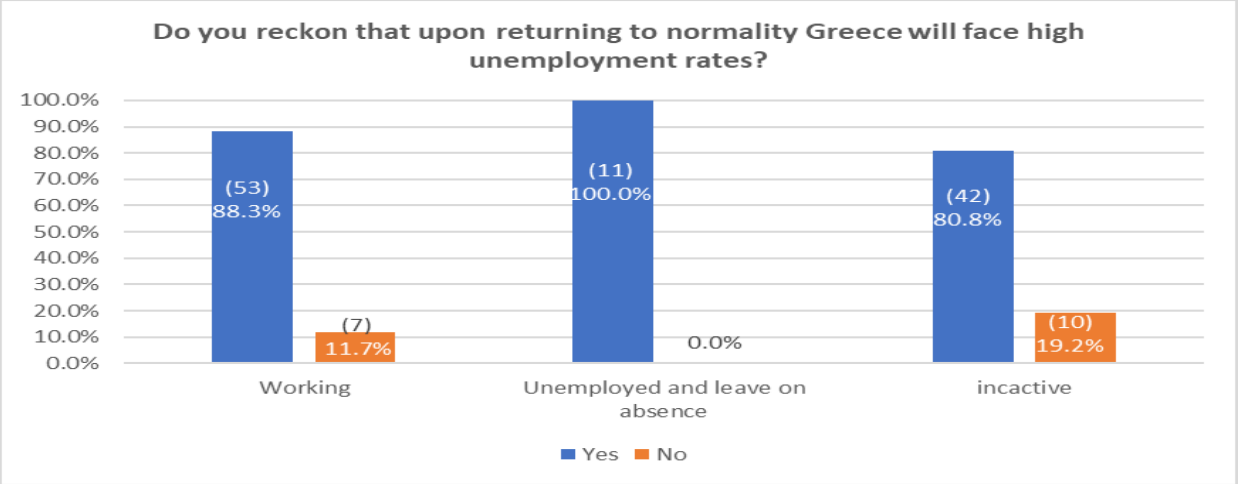


n=126; d.f.=2; χ^2=6.3; p-value<0.05

A second socio-demographic variable that was found to play significant role in the acceptance of the restrictive measures imposed during the epidemic (albeit the statistical significance was in the 0.2 level of significance) was the employment status. It is reasonable to expect that those who lost their jobs because of the lockdown or those who were already unemployed before the lockdown, and even the employees in the private sector whose job was suspended because of the lockdown, would be very pessimistic as far as employment perspectives in Greece are concerned. All people who belong to one of these three categories (unemployed before/unemployed because of/leave on absence because of the lockdown) stated that Greece will face high unemployment rates upon returning to normality (figure 9). A little more optimistic were those who did not lose their jobs during the COVID-19 outbreak (mainly public servants, businessmen, traders and some artisans). Even more optimistic were the economically inactive, that is mainly students and pensioners, the employment status of which was not directly affected by the lockdown. However, in their great majority (81%) even

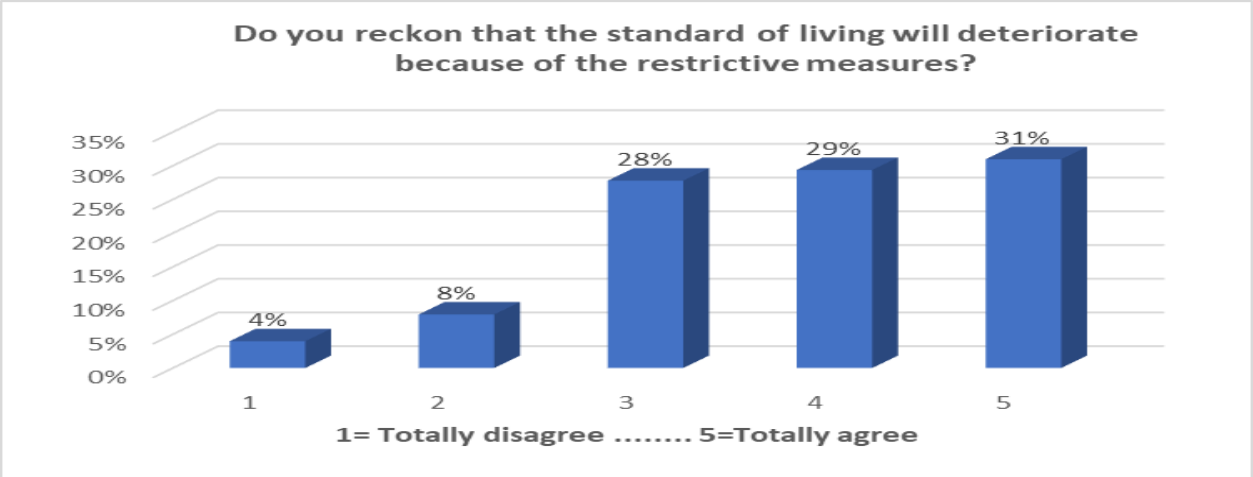
the economically inactive believe that the unemployment rates will be higher after returning to normality.

Figure 9: Opinions about unemployment by occupational status.



n=126; d.f.=2; χ^2=3.3; p-value<0.2

Figure 10: Opinions on the standard of living after the lockdown.



n=126

Finally, 60% of the respondents reckon that the standard of living of the average Greek will deteriorate because of the measures taken during the COVID-19 outbreak (figure 10). The rest 40% are other ambivalent in their assessment (28%) or (a small percentage of 12%) did not consider that the standard of living will get worse.

Apart from the multiple choice questionnaire, the respondents were asked to express their opinion about the measures taken by the Greek government with a free text. 91 out of 126 took the liberty to write a short text. Most of them agreed with the measures in general, but there were negative opinions as well.

The negative opinions focused on the authoritative nature of the measures and on the over-reaction by the media, which "affect our psychology in a negative way, while they should have focused on more agreeable matters". Another critic is that the incoming economic recession will affect the lives of many more people (than COVID-19 does) and in a greater extent. There was also a sense that the measures were taken "inthe blind", without having a scientifically established cause. There was also some critic for lack of checks in the entrance gates of the country (mainly airports) in the beginning of the pandemic.

7. Conclusion

A virulence ailment of the respiratory system, which started as a series of unidentified cases of pneumonia in China in late 2019, became a major issue of concern all over the world. For months in a row the fear of death became the main inspiration of the media, which were covering the issue in a 24/7 basis, amplifying the public health consequences in an unprecedented manner. However, the current pandemic bears no resemblance with the pandemics of the past in terms of lethality. The greatest pandemic of the 20th century was the "Spanish flu", the second and deadlier wave of which lasted approximately five months, from September 1918 to January 1919. Five months is also the period that COVID-19 sweeps the world from January 2020 to May 2020. The comparison is overwhelmingly unfair: 39 million deaths from the Spanish flu in a population of 1.8 billion (2% of the world's population) versus 370,000 deaths form COVID-19 in a population of 7.8 billion (barely 0.0045% of the world's population).

The measures taken for the two pandemics were similar, though there was no quarantine of the general population and there was no closure of all businesses in 1918-19, as it was the case in 2020. Media coverage was widespread in both pandemics[6]. The main difference was that in 1918-19 the only media available to the public was the newspapers, while in 2020 the public is over-exposed to a plenitude of information from newspapers, television, radio, the electronic press and social media in the internet. This excessive media exposure is proven to cause increased anxiety which, in conjunction with the psychological disorders stemming from the lockdown and quarantine, affect adversely the mental and physical health of the audience. By and large the ubiquitous media exposure can lead people to perceive virus threats as higher in risk than they actually are.

Nevertheless, there is a great difference in the perception of the threat that COVID-19 representsamong people by age and to a lesser extent by other socio-demographic variables. This different perception is mirrored in the different degree of acceptance of the measures taken by the government in Greece. Young adults (18-29 years of age) are less accordant with the restrictions posed by the state than those aged 30+. More particularly, they wanted, in their great majority, the opening of the Universities immediately after Eater vacations (that is after 46 days of their closure), in contrast with the older ones. They expressed the opinion (in a greater degree than the older ones) that the social disturbance caused by the COVID-19 outbreak was incommensurately great. And they approved in a lesser degree than the old ones the closure of premises that they usually hang out in their leisure time, that is coffee shops and bars.

Another socio-demographic variable that was found to differentiate opinions on the consequences of the restrictive measures was the employment status. People who lost their jobs or were suspended because of the lockdown or those who were already unemployed before the lockdown are very pessimistic as far as employment perspectives in Greece are concerned. Those that their occupational status was not affected by the measures taken during the pandemic are less pessimistic, though they also believe that Greece will face high unemployment rates upon returning to normality.

In conclusion, this paper shows that the new coronavirus pandemic constitutes a greater threat to the public health than the seasonal flu. Nevertheless, it bears no resemblance to the pandemics of the old demographic regime, which eliminated whole populations and turned the everyday living into a desperate and unequal fight for survival. It seems that, at least for Europe, the "Age of plague and pestilence" was terminated one hundred years ago with the Spanish flu. Today, we live in a radically different world than that of our great-grandfathers.

[6]In the case of the Spanish Flu extensive coverage by the media started from the fall of 1918, during the second wave of the flu.

In a world where people live longer and healthier lives and where they are most likely to survive from birth to childhood, to adulthood and to the old age, something that was not so likely in the near past. This longevity has brought about changes in the mentality and the attitude of people towards life. It gave people the self-confidence to make long-term plans about their lives. It gave societies also the sense that death is not part of everyday life. Yet, a pandemic that one hundred years ago would have passed as a minor incidence, threatens to ruin our certainties on the spur of the moment; and the reaction of the mass media, governments and the general public to this threat poses questions about the maturity of our civilization. Does longevity render people more conscious about the part they play in the cycle of life? Or, it is the familiarity of our great-grandfathers with the reality of death that gave them a sense of relativity and self-knowledge without disillusions?

8. References

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The Unexplained East-West Dichotomy in COVID-19 Incidence in Europe: Exploring the R1b Y-DNA Haplogroup Hypothesis

Abstract:
The extremely uneven incidence and death rates of the COVID-19 epidemic across the European continent presents a striking dichotomy between Western and Eastern Europe. Although many hypotheses have been proposed, the reasons for these differences remain largely unexplained. In this analysis we probe the hypothesis of the role of a genetic factor, by examining the correlation between the frequency of the R1b Y-haplogroup in the general population of 38 European countries and the corresponding death rates attributed to COVID-19 (as of May 25, 2020). The R1b Y-DNA haplogroup is the dominant haplogroup among the Western European peoples, while its frequency is significantly lower among the peoples of Central and Eastern Europe. The strong positive correlation between the two variables is observed in the maps and the relevant scatter plot and is also attested by the value of Pearson's correlation coefficient (r=0,768). However, even a statistically significant correlation does not necessarily imply causation, and more specific research is certainly needed, to answer the question if the correlation found in our analysis is a causal one.

Keywords: Covid-19, Coronavirus, Epidemiology, R1b haplogroup

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1. Introduction

The Coronavirus disease (COVID-19) was first reported to the World Health Organisation (WHO) on December 31 2019. COVID-19 is an infectious agent with high transmissibility, yet with a moderate fatality rate. It was declared a global pandemic by the WHO on March 11th 2020, two months after its Wuhan outbreak, in China. Having diffused from that single point of origin on December 2019, COVID-19 has rapidly spread across nearly all the countries of the globe, by April.

The infection spread in Europe in the second half of January 2020, with only a few cases reported that month, in France, Germany, Italy, Spain and the United Kingdom. During the next two months, most of the European countries had detected the first 100 confirmed cases, and, by April, Europe became the major epicenter of the disease. In a short period after the mid-March declaration of the pandemic, most European governments introduced similar measures: drastic, countrywide containment measures, such as closure of schools and businesses, ban of nonessential travel and general lockdown, measures that have never been experienced before in these countries.

Despite the fact that strong containment measures were implemented in all the European countries –with the exception of Sweden- the cumulative COVID-19-related mortality rates present an extremely uneven distribution across Europe, ranging (as of May 25, 2020) from 81,2 per 100,000 residents in Belgium, to just 0,5 per 100,000 in Slovakia. In reality, this extremely uneven distribution clearly reflects a striking dichotomy between Western and Eastern Europe. Although many hypotheses have been proposed, the reasons for these differences remain largely unexplained. One of the possible determinants that has been examined for the possible correlation with the incidence, or the mortality rates of the disease, is the BCG vaccination policy (Singh & Gandharva 2020, Miller et al 2020). Other works have tried to assess the importance of environmental, socioeconomic, or even political factors, while a variety of socio-spatial factors, such as city-size (Stier et al 2020), urban population density (Barr & Tassier 2020), urbanisation rate, population density, mean household size, settlement characteristics etc (Sigler et al 2020) are also considered to be significant. However, even though most of these factors appear to contribute to variation in COVID-19-related mortality across Europe, none of them seems to have a determinant role that could explain the extremely uneven spread of the epidemic.

In this brief analysis we probe the hypothesis of the role of a genetic factor in the extremely uneven incidence rates of COVID-19 among European countries, by examining the correlation between the frequency of the R1b Y-haplogroup in the general population of each country and the COVID-19–related death rates reported in this country, as of May 25 2020.

A haplogroup is a group of similar haplotypes that share a common ancestor with a single-nucleotide polymorphism mutation. The R1b haplogroup belongs to the group of Y-chromosome (Y-DNA) haplogroups, which are past solely along the patrilineal line. It is the most common haplogroup in Western Europe, while it is also common in some parts of the Caucasus, of Russia of central Asia and of central Africa (Eupedia 2020). Its distribution across the European continent shows a clear divide between Western and Eastern Europe.

The reason for which we chose to compare the R1b frequency with the COVID-19 death rates, instead of the rates of incidence (reported cases), is that the data concerning the number of confirmed cases of the disease in Europe (and across the world) are not comparable. In fact, the statistics of "recorded cases" hugely differ among European countries, because testing strategies, reporting systems and data availability vary significantly across the continent, with the number of unreported cases believed to be considerable in some countries (Roy & Khalse 2020).

Our study included 38 countries, that is, all European countries with a population over 400,000, with the exception of Sweden. The reason for which small countries with a

population inferior to 400,000 were not taken into account is that there are no available data on the Y-DNA haplogroups of their population –or, the existing data are based on insufficient sample size. Sweden was omitted from the analysis because the incidence and/or mortality rates of the disease in this country should not be compared with those in the rest of the continent. The reason for this is that its government opted for a completely different strategy, of "herd immunity", invoking the Swedish Constitution, in which stay-at-home orders clearly correspond to a violation of the freedom of movement.

The R1b haplogroup population data used in our analysis are compiled by Eupedia (2017), while the COVID-19 death rate data are compiled by the European Centre for Disease Prevention and Control (2020) and the World Health Organization (2020).

2. Juxtaposing the R1b haplogroup frequency to COVID-19 death rates across Europe

The following Table 1 compares the R1b Y-haplogroup frequency to the COVID-19 death rates in the 38 European countries included in our analysis. The table is ordered in descending order of the R1b frequency, with the 11 countries where the R1b haplogroup is predominant at the top (Western Europe).

Table 1: Percentage of R1b haplogroup vs COVID-19 related deaths per 100,000 population, as of May 25 2020, in the European countries

		% of R1b haplogroup	Deaths per 100,000
1	Ireland	87	33,1
2	Spain	67	61,5
3	Belgium	63	81,2
4	Luxembourg	60	17,4
5	France	60	42,3
6	Portugal	60	12,8
7	UK	57	55,3
8	Netherlands	50	33,8
9	Switzerland	48	19,2
10	Germany	44	10
11	Italy	39	54,3
12	Denmark	34	9,7
13	Norway	24	4,4
14	Czechia	24	3
15	Kosovo	21	1,6
16	Austria	19	7,2
17	Hungary	19	5
18	Albania	18	1,1
19	Moldova	16	9
20	Slovenia	16	5,2
21	Greece	15	1,6
22	FYROM	14	5,4
23	Slovakia	13	0,5
24	Poland	12	2,6
25	Serbia	11	3,4
26	Montenegro	11	1,4
27	Bulgaria	11	1,9
28	Cyprus	11	1,4
29	Romania	10	6,1
30	Latvia	10	1,1
31	Croatia	8	2,4

32	**Russia**	**6**	**2,4**
33	**Belarus**	**6**	**2,1**
34	**Ukraine**	**5**	**1,5**
35	**Finland**	**4**	**5,6**
36	**Estonia**	**4**	**4,8**
37	**Lithuania**	**4**	**2,3**
38	**Bosnia-Herzegovina**	**4**	**4,4**

Sources: Eupedia (2017), European Centre for Disease Prevention and Control (2020), World Health Organization (2020)

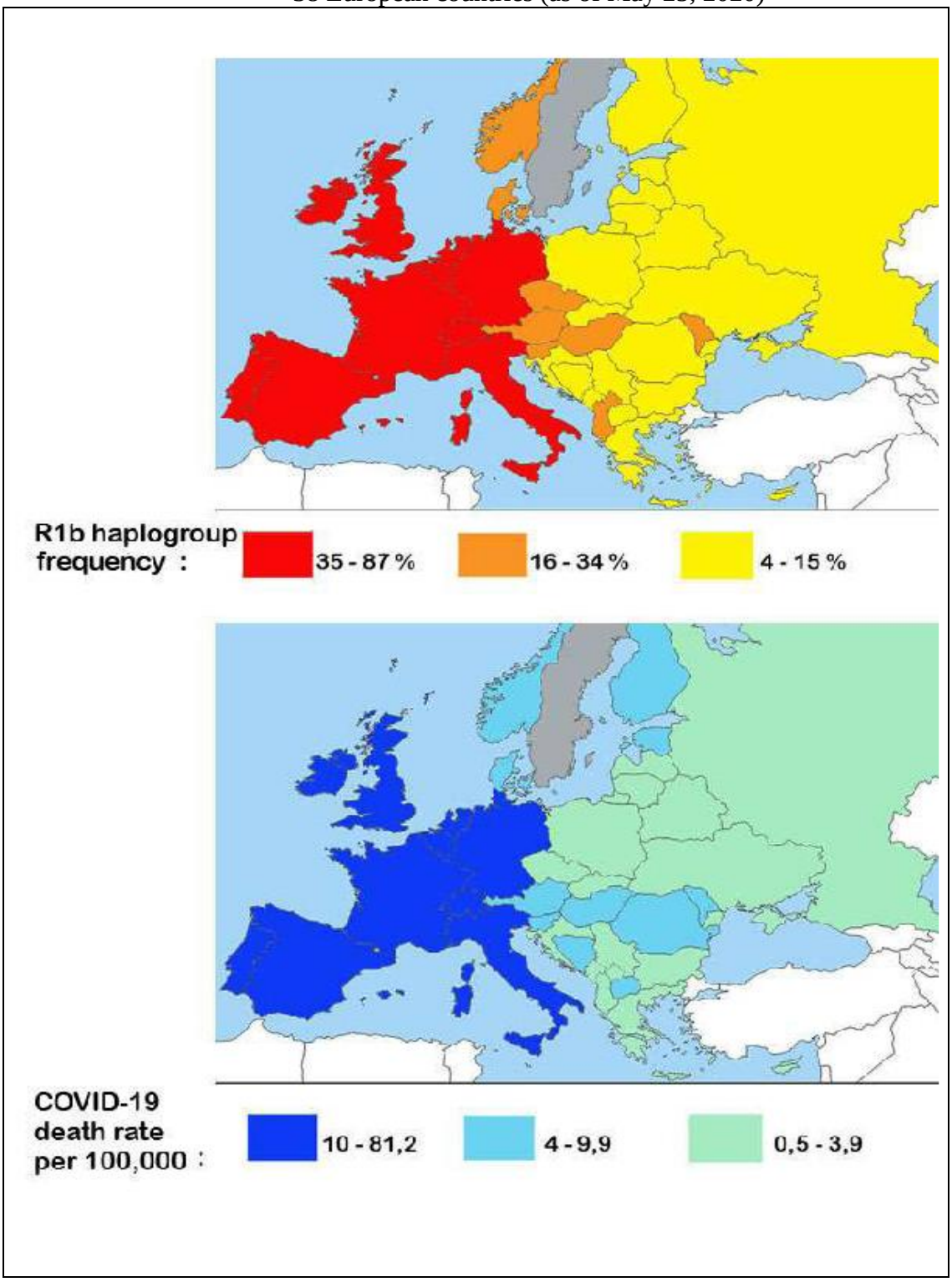
As the above Table 1 clearly demonstrates, the 11 Western European countries in which the R1b Y-DNA haplogroup is predominant (over 35% at the national scale) correspond to the exactly same group of 11 countries in which the recorded COVID-19-related death rates represent more than 10 per 100,000 inhabitants. These countries, which actually form the very core of what is called "Western Europe", are: Ireland, Spain, Belgium, Luxembourg, France, Portugal, United Kingdom, Netherlands, Switzerland, Germany and Italy. Puzzlingly, most of these countries, with the highest death-rates in the continent (and the world), are among the countries that have taken the most drastic, nationwide lockdown and stay-at-home measures, as it was the case for Spain, Portugal, Italy and Ireland (Lapatinas 2020).

The clear East-West dichotomy in the COVID-19 incidence is even more apparent in the two following maps, appearing in Figure 1. The two maps show that Europe is cut in two distinct parts: The first is formed by the above-mentioned block of the 11 West European countries. The second consists of the other 27 European countries, presenting both a lower R1b haplogroup frequency (<35%) and a lower COVID-19 death rate (<10 per 100,000), which also form a single, consistent block, covering all the rest of Europe, to the East of a virtual line joining the Adriatic Sea to the German-Danish border.

The juxtaposition of the two maps also brings out another interesting feature, concerning the "intermediate" groups of countries, in both cases: Most of the countries belonging to the intermediate group for the first variable (R1b haplogroup frequency between 16 and 34%) are also part of the intermediate group for the second variable (COVID-19 death rate between 4 and 9,9 per 100,000). This is the case for 6 countries, which (with the exception of Moldova) are situated at the interface of the two blocks, either in Scandinavia, or in Central Europe. These countries are Denmark, Norway, Austria, Hungary, Slovenia and Moldova.

Another interesting thing clearly featured in the second map of Figure 1 is that puzzingly, there seems to be no distinction in the incidence and in the death rates related to the strong geographical and climatic contrast between Northern Europe and Mediterranean Europe, as both blocks include countries from the North Sea to the Mediterranean, the divide being clearly and uniquely an East-West divide.

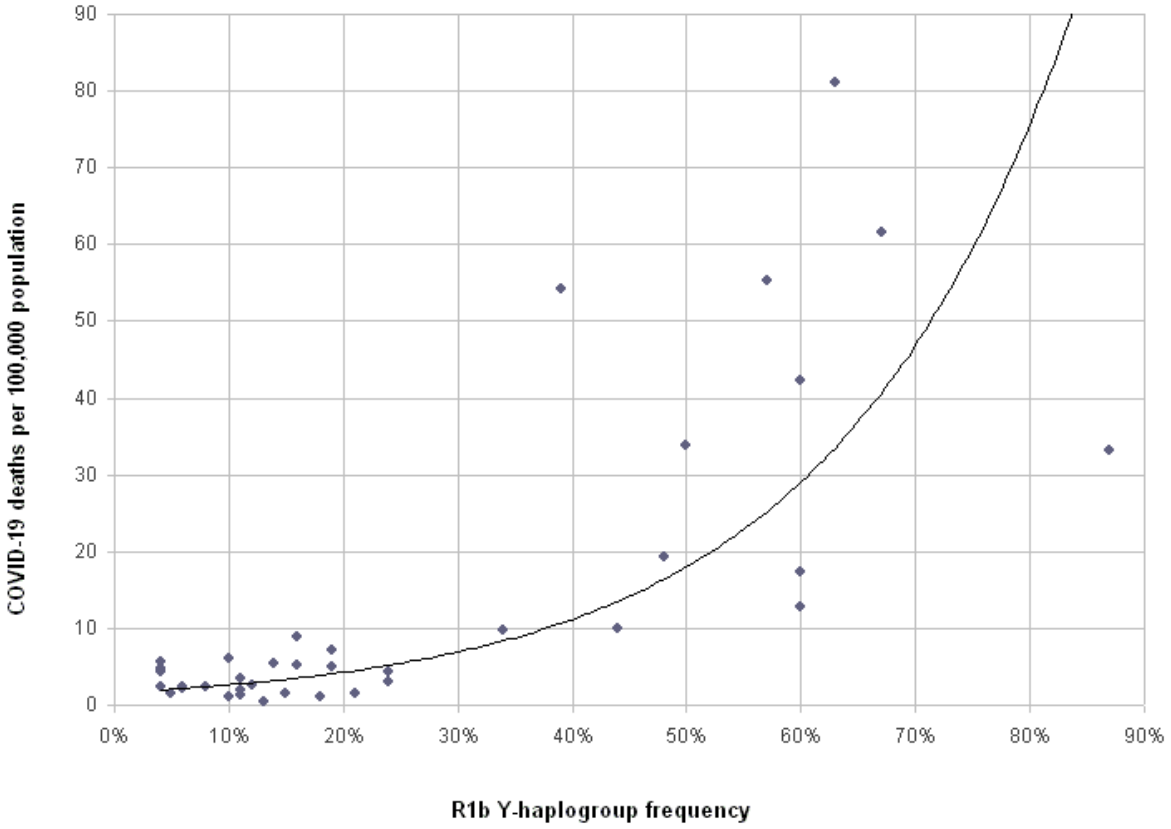
Figure 1: Maps of R1b haplogroup frequency and COVID-19 death rates in 38 European countries (as of May 25, 2020)



3. Testing the correlation between the R1b haplogroup frequency and COVID-19 death rates across Europe

The scatter plot of the R1b haplogroup frequency and COVID-19 death rates for the 38 European countries of our analysis (Figure 2), reveals a clear exponential correlation between the two variables, while the calculation of Pearson's correlation coefficient ($r = 0{,}768$) confirms that the positive correlation between them is particularly significant.

Figure 2: Plot of the R1b haplogroup frequency vs COVID-19 death rates in the 38 countries of Europe (as of May 25 2020)



4. Conclusions

In this brief analysis we tried to test the possible correlation between the frequency of the R1b Y-DNA haplogroup in the population of European countries and the COVID-19 related death rates across the continent. The motive of our approach was the pronounced variability in the incidence of the epidemic across Europe, and, particularly the unexplained East-West dichotomy observed in the statistics.

This extreme variability and this strong East-West dichotomy are all the more inexplicable since most of the physical, socio-spatial, socio-economical and other factors do not differ greatly across Europe (as they do around the globe) and, in some cases, when they do this is puzzlingly in the inverse direction than the expected. For example, all 11 countries of the "West-European group", with the highest death rates, are countries with particularly well-developed institutions, legal frameworks, welfare states and health systems, while in the opposite group can be found countries with considerably less-developed institutions, legal frameworks, welfare states and health systems, like Albania, Bosnia-Herzegovina, Moldova, Belarus and others. As we already pointed out in chapter 2, the same paradox is also found when we compare the severity of containment measures implemented among European countries with the different incidence of COVID-19: Most of the countries in the group of the 11 highly affected countries (in Western Europe) are among the countries that have implemented the most drastic lockdown measures, while in some of the 27 less affected countries the authorities have adopted significantly milder ranges of measures (with Belarus being the most extreme case). However, the efficacy of lockdown policies remains anyway an ongoing question, as totally contradictory works exist, either proving (Alfano & Ercolano 2020) or refuting (Meunier 2020 and Born et al. 2020) any evident impact of full lockdowns on the epidemic.

The findings of our analysis revealed that a possible association could effectively exist between genetic ancestry and the uneven geographical distribution of the COVID-19 epidemic – as attests the significant positive correlation established between the frequency of the Y-haplogroup (R1b) in the population and the death rates. We propose that this significant correlation could partially explain the important national differences in COVID-19 incidence in European countries. However, the findings should always be interpreted carefully, since statistical correlation does not necessarily imply causation. For this reason, more specific research is certainly needed, to answer the question if the significant correlation between the two variables found in our analysis is really causal, a research that would require population genetics driven studies of the epidemic incidence, in Europe and around the globe.

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The Socio-Economic Effects of Pandemics – Covid-19: A Study for Europe

Abstract:
The Covid-19 pandemic, the so-called as coronavirus pandemic, is an ongoing global pandemic of coronavirus disease (Covid-19), caused by severe acute syndrome coronavirus-2 (SARS-CoV-2). The coronavirus outbreak was first detected in China and has infected people in 185 countries. Its spread has left businesses around the world counting the costs.

The Covid-19 pandemic is far more than a health crisis. It is affecting societies and economies, while the impact of the pandemic will vary from country to country, it will most likely increase poverty and inequalities at a global scale. Assessing the impacts of the Covid-19 crisis on societies, economies and vulnerable groups is fundamental to inform and tailor the responses of governments and partners to recover from the crisis and ensure that no one is left behind in this effort.

This paper attempts to examine the main socio-economic effects from Covid-19 pandemic for European countries. In particular, the paper attempts to investigate the economic impact and the implications to growth process and socio-economic development. We find support for the existence of pandemic effects in several economic activities and sectors and moreover we find that these socio-economic effects are very significant.

Key-words: Pandemic, disease, covid-19, socio-economic impact, regional growth, development

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1. Introduction

There is widespread agreement among economists that the economic impact and the damage from the global Covid-19 novel coronavirus pandemic will have an important negative impact on the global economy. According to international forecasts, the estimations from the virus become a global pandemic, most major economies will lose at least 2.4 percent of the value their gross domestic product (GDP) over 2020. Alternatively, prior to Covid-19 the global pandemic GDP was estimated at around 86.6 trillion U.S. $ in 2019, that means 0.4 percent drop in economic growth amounts to almost 3.5 trillion U.S. $ in lost economic output. Moreover, there are a lot estimations for uncertainty about the impact of Covid-19 and the pandemic's human and socio-economic effects.

This paper attempts to examine the main socio-economic effects from Covid-19 pandemic for European countries. The paper attempts to investigate the economic impact and the implications to growth process and socio-economic development. We find support for the existence of pandemic effects in several sectors and moreover we find that these socio-economic effects are very significant.

2. The socio-economic impacts of the Covid-19 crisis

The new pandemic really affected the world economy and affected all the socio-economic indicators, such as, the growth process, employment, stock-exchange, the tourism and aviation sectors, social-security, health expenditures etc. In particular:

2.1 The worst scenario for the Global GDP growth: The projections for 2020 range between -8.8 per cent and 1 per cent. The forecast also predicts that there will be a depression around -5.0 % of GDP for economic activities for the Germany economy. According to Moody's, the forecast for G-20 countries will be around -0.5 %, while the depression of economic activities will be around -2.0 % for the USA and -2.2 % for Eurozone, respectively. The G-20 has adopted a new-attempt to establish a reconstruction plan of more than 5 trillion so to be able to give a recover and a new challenge in the financial crisis. There is also a prediction for zero growth in China. Moreover, the World Bank' prediction for GDP growth was approx. +0.1 for 2020, instead of the initial scenario-prediction of January that was estimated around +5.9 %.

- **The shock of world public-debt:** Most of the national and monetary authorities in the effort to recover and reconstruct their economies from the coronation pandemic have been approved an amount to 15 trillion $, that is equivalent to 17% of the world's 87 trillion GDP $. From this total figure, around of eight trillion $ concern measures that governments have taken to support businesses and employees, both in the form of increased spending and through loans and credit guarantees. According to IMF' estimation, the world public debt exceeding the limit of 257 trillion $. The debt for developed economies exceeds 180 trillion. $ 383% of GDP, while China's debt was almost close to 310% of GDP. The economic consequences from the pandemic of covid-19 are directly affected the industrialized countries and push them to overstate new borrowing. In the rest of Eurozone, however, debt has been increased rapidly. According to IMF estimations, in Greece the debt will increase in 2020 from 179% of GDP to 200%. In Italy, where debt was already high before the pandemic, it is expected to reach 135% to 155% of GDP this year, while in France and Spain the debt is expected to exceed 100%.

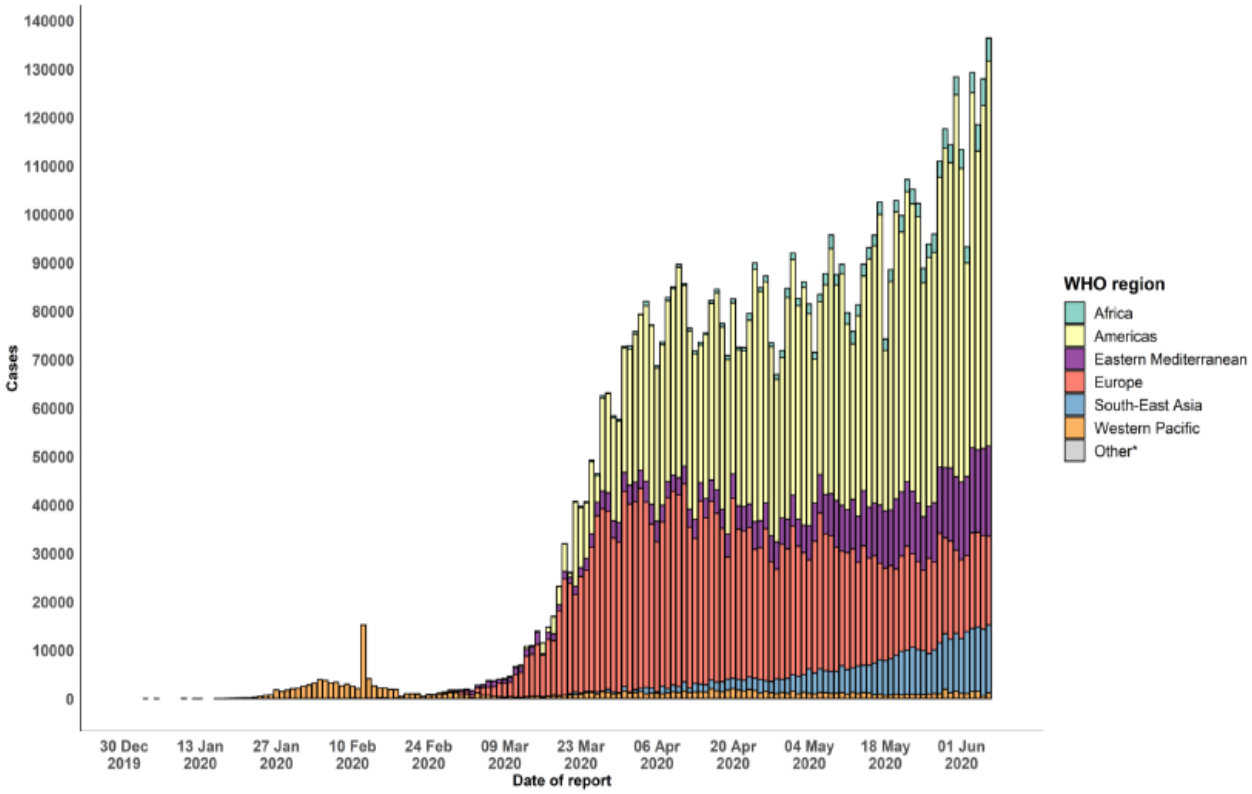
- **The collapsed of tourism sector:** Tourism, transport and shipping sectors are the most vulnerable sectors in the pandemic disease phenomenon. According to the estimations of World Tourism Organization (WTO), the number of tourists worldwide would decrease from 1 to 3% this year due to the pandemic that is equivalent with a reduction and losses of $ 30-50 billion from tourism sector spending. The pandemic od covid-19 will lead to a 20% to 30% reduction in tourist arrivals this year, while at the same time the revenue reduction is

estimated at $ 300-450 billion, an amount that corresponds to almost of one third of the revenue in 2019. In 2009, with the global economic crisis, international tourist arrivals drop by 4% while the SARS epidemic drop to just 0.4% in 2003, respectively. In particular, the worst scenario is for the tourism sector in Greece with an estimation for a recession around 7.9 % for 2020.

- **The economic-collapsed in aviation sector, the airlines are crashing:** According to the data from International Air Transport Association (IATA), airlines urgently need assistance more than $ 200 billion, due to measures to restrict traffic and close borders. Lufthansa, the German company is holding 700 of its 762 aircraft on the ground for a period of two months. The same follows and in other related -transportation sectors, for instance in France, for example, only 42 TGV trains are in circulation today, out of a total number of 700 trains. According to IATA, in Europe, there is a financial and liquidity problem in worldwide airlines with an estimation of losses exceed 55 billion €. According to IATA, European airlines recorded the largest decrease in revenue (-46%), compared to all individual airline markets in the world. For 2020, it is estimated that they will record a drop in revenue (RPKs) of 67 billion €.

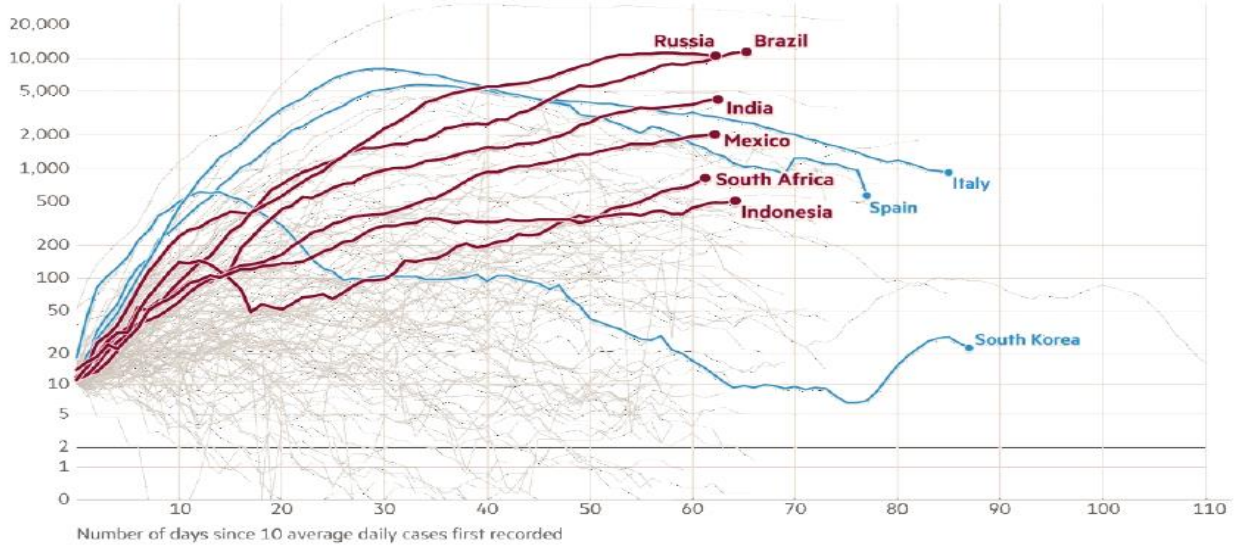
Figure 1 illustrates the confirmed epidemic curve of Covid-19 in a continent-regional level with data by World Health Organization for the time-period December 2019-June 2020. Moreover, Figure 2 illustrates the confirmed epidemic curve of Covid-19 for selected countries using data by Financial Times Database and the Database of European Center for Disease Prevention and Control.

Figure 1: Epidemic Curve of Confirmed of Covid-19 by Who Region, (Graph shows cases by date of case reporting in June 2, 2020)



Source: WHO, World Health Organization, Covid-19 reports.

Figure 2: Epidemic Curve of Confirmed of Covid-19 for Selected Countries



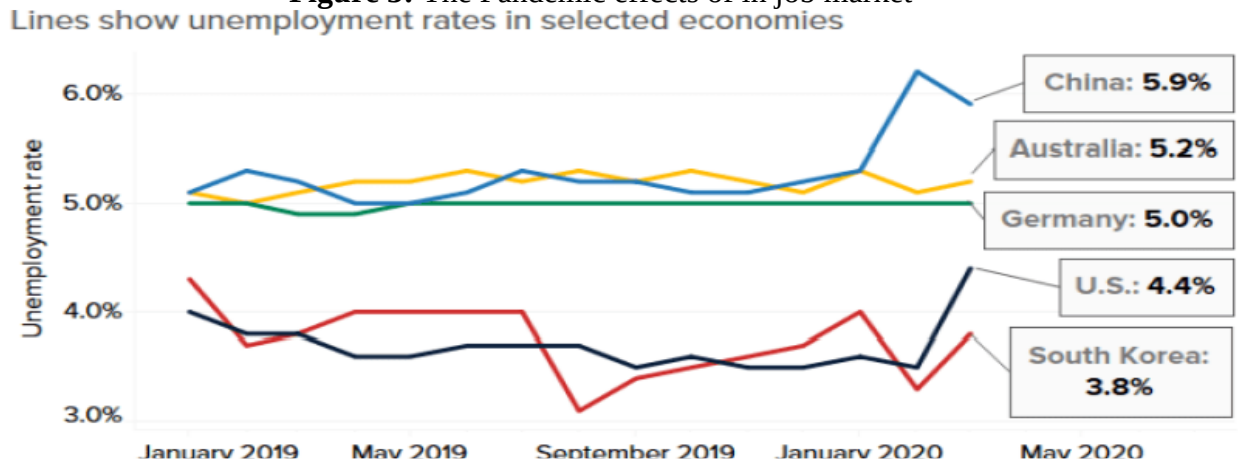
Source: FT analysis from European Center for Disease Prevention and Control for Covid-19.

2.2 The impact in unemployment

The pandemic shock directly affected and reinforces the unemployment and inequality problems. Moreover, in the other side of the world, the demand for the unemployment benefits exceeded over the 3 million for the week 15-21 March 2020. According to the United Nations-the Economic and Social Commission database, around 8.3 million people are in the poverty line for West-Asia and 11 million for Asia, respectively.

There is an important increase in unemployment levels due to pandemic effects. Many economists have warned that lockdown measures around the world will accelerate job losses — that's already showing up in unemployment numbers in several economies. Moreover, in the U.S.' economy, the unemployment rate of 4.4% in March was the highest since August 2017. Figure 3 illustrates the unemployment rate for a number of selected countries.

Figure 3: The Pandemic effects of in job market



Source: US Bureau of Labor Statistics, National Bureau Statistics of: China, Australian, South Korea, Deutsche Bundesbank.

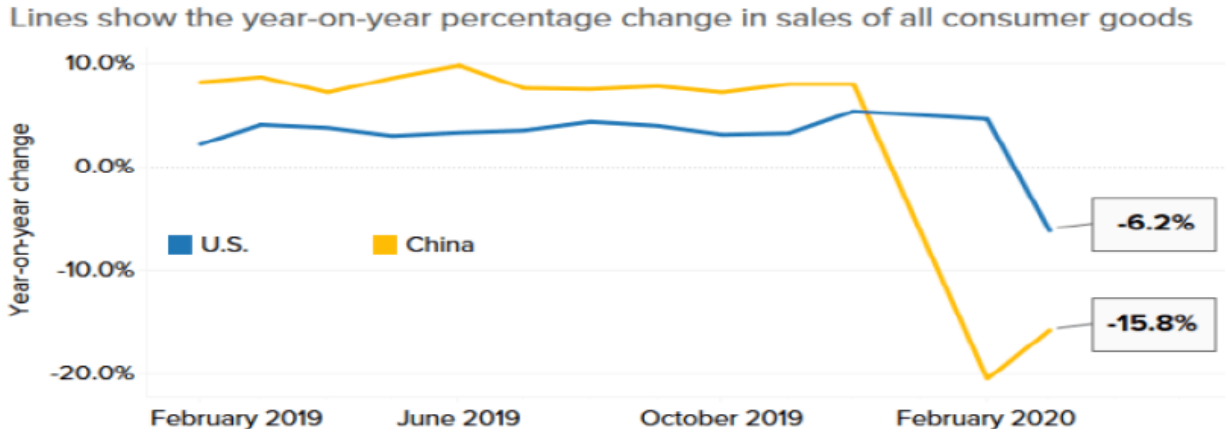
According to ILO, the impact from covid-19 on labor contends that the share of workers affected by temporary workplace closures has decreased from 81 per cent to 68 per cent over the last two weeks of May 2020, while the working hours are expected to decrease

in all regions, the Americas and European and Central Asia´ will be hit hardest with 12.4 per cent and 11.8 per cent, respectively.

2.3 The effects in services and industrial sectors

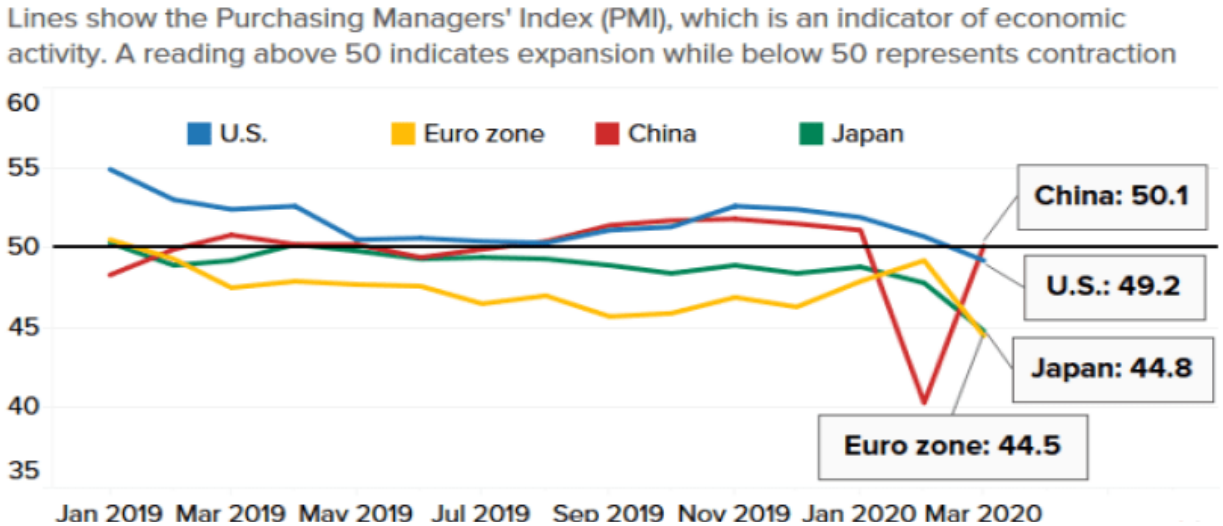
The services industry is a major source of growth and employment for many countries, including the U.S. and Chi na. Both countries reported sharp declines in retail sales due to lockdown measures. Figures 4 and 5 illustrate the effects of the retail sector for a number of selected countries and also the effects in manufacturing sector for a selected number of countries, respectively. The cumulative loss to global GDP over 2020 and 2021 from the pandemic crisis could be around 9 trillion $, greater than the economies of Japan and Germany together. Moreover, the world trade volumes are expected to drop between -32 per cent and -9 per cent in 2020, and the capital flows are now being diverted towards advanced economies.

Figure 4: The Pandemic effects of in retail market



Source: US Bureau of Labor Statistics, National Bureau Statistics of China.

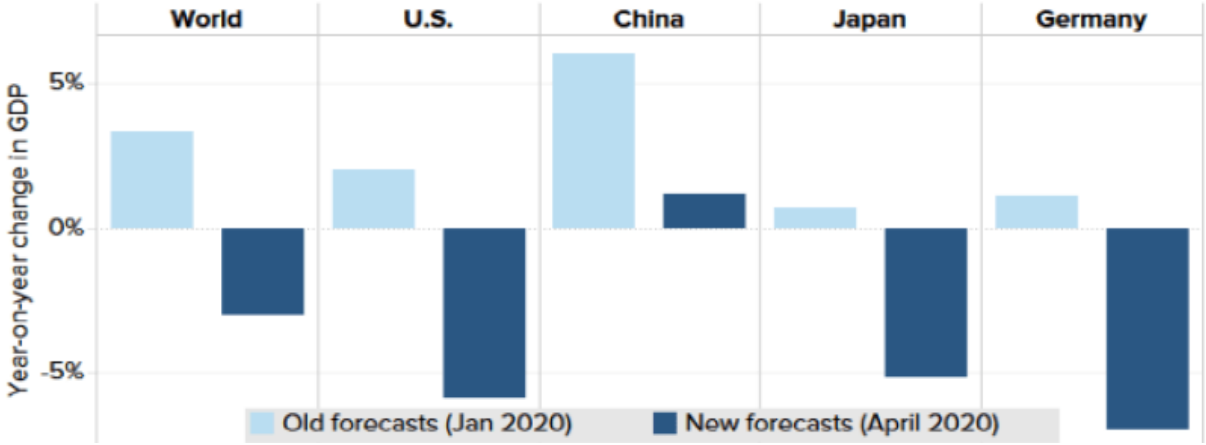
Figure 5: The Pandemic effects in manufacturing sector for selected economies



Source: US Bureau of Labor Statistics, National Bureau Statistics of China, Japan, Eurostat

Most of the countries imposed lockdown measures and a greater number of manufacturing firms were hit. In addition, a reduction in demand for goods exacerbated the challenges that manufacturers faced. The coronavirus pandemic's hit the economic activity has led many institutions to slash their forecasts for the global economy. Following the International Monetary Fund (IMF). Figure 6 illustrates the effects of pandemic for a number of selected economies.

Figure 6: The Pandemic economic-effects for selected economies, 2020



Source: IMF Database, World Economic Outlook, April 2020.

Data from the OECD Database on the export of goods suggest that trade for high-income and lower and upper middle-income countries has been directly affected by the crisis. Table 1 shows the exports of goods for high-income and upper middle-income countries

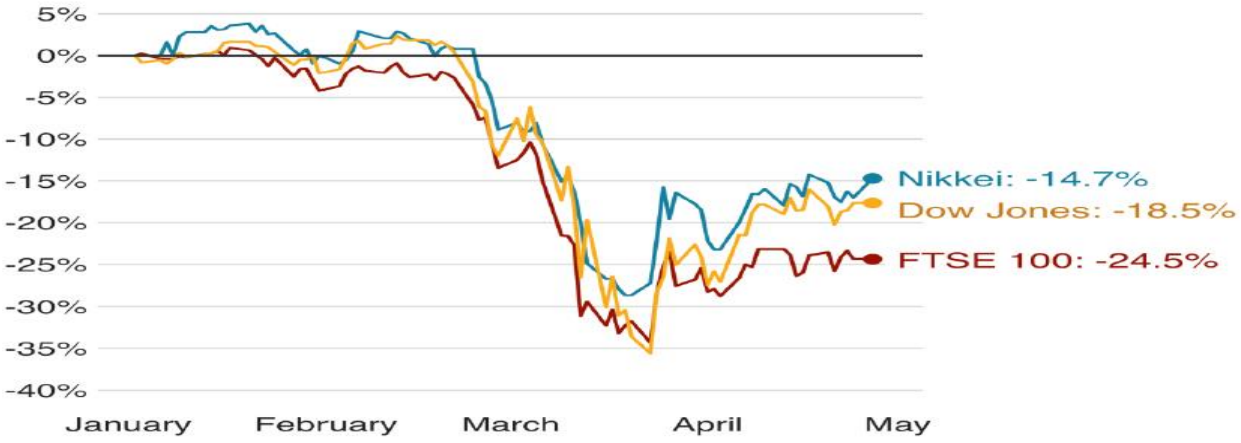
Table 1: Reduction in export of goods (%) for a sample of high-income and upper middle-income countries

	High Income Countries	Middle Income Countries
No. Countries	35	10
December 2019-March 2020	-9.0	-7.4
March 2019-March 2020	-11.5	-7.5

Source: OECD Data-Base

2.4 The impact on Financial-Markets: In financial markets there is a collapsed with the financial index of the Wall-Street to drop -27 %, whereas in European financial markets there was a collapsed around 30%. At the same time the oil price has dropped in historical trends over the last two decades. The IMF (International Monetary Fund) forecast is that is going to be the worst economic shock since the Great Depression of the 1930s. The International Finance Institute (IIF) notes that global government debt (bonds and loans) has risen to a new record high of 2.6 trillion $ in April 2020, instead of the previous record of 2.1 trillion $ in March 2020. Figure 7 illustrates the pandemic' effects in financial markets.

Figure 7: The effects of Covid-19 in Financial Markets



Source: Bloomberg Database.

Moreover, in the United States, the price of a Brent-Crude barrel dropped for the first time in history. Demand for oil has all but dried up as lockdowns across the world have kept people inside and decline the world' production. The crude oil price had already been affected due to coronavirus that has driven the price down further. Brent crude is the benchmark used by Europe and the rest of the world. Its price dipped below $20, to the lowest level seen in 18 years. The OPEC and other countries have now agreed to cut production, the world still has more crude oil than it can use. Figure 8 illustrates the effects of covid-19 in oil-prices.

Figure 8: The effects of Covid-19 in Oil-Prices (Brent-Crude, US $ per barrel)

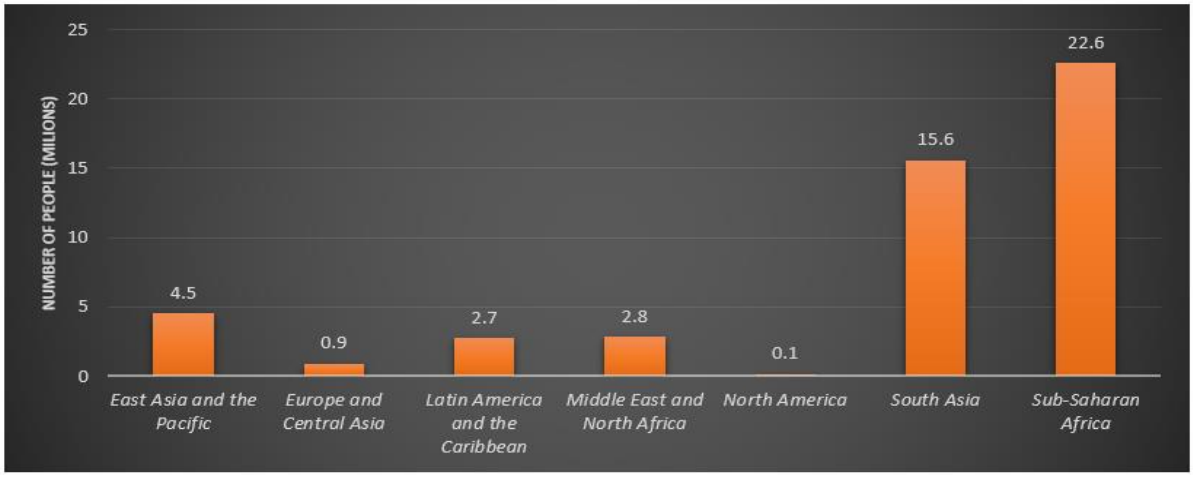
Source: Bloomberg Database.

2.5 The effects in global poverty

Assuming a drop in global GDP based on the IMF estimate, the expected increase in the share of people living in extreme poverty will range from 0.8 per cent to 1.5 percentage points. This is equivalent to an increase of between 50 million to 70 million people compared with the original estimates for 2020. Other figures using different GDP growth projections and poverty baselines indicate an increase of nearly 420 million additional people living in extreme poverty.

As Figure 9 illustrates, the regional distribution of the expected increase in extreme poverty is heavily skewed towards sub-Saharan Africa and South Asia, with nearly 50 per cent of those pushed below the poverty line living in sub-Saharan Africa.

Figure 9: Poverty line as a result of COVID-19 by regions
Projected increase in the number of people below the US$ 1.90 PPP



Source: UNIDO Database

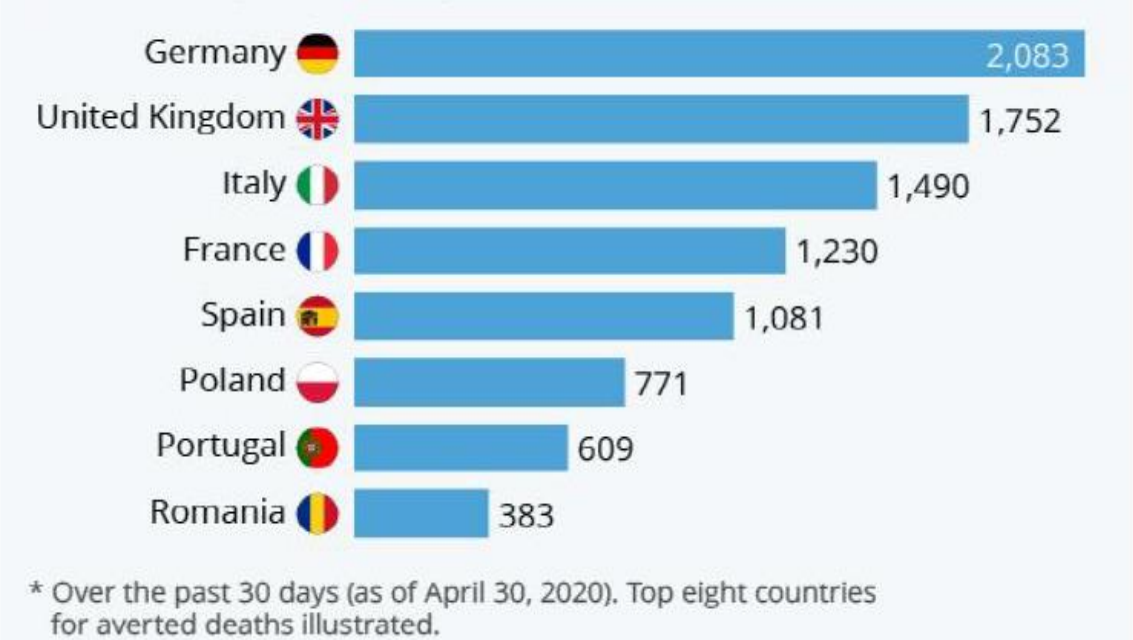
2.6 The Positive Effects

At the beginning of pandemic in January, the share of zoom was 68 $, while in June it exceeded 15 $ the American video calling company Zoom is among the winners of the crisis, on a planet that communicate and work via the internet.

Furthermore, among the "winners" belong the distribution companies of ready meals, super-markets and other similar companies for distribution items at home. For instance, Amazon has announced the hiring of 100,000 employees for its warehouses in the United States.

However, another important result of Covid-19 crisis is that continues to reduce the energy demand and CO2 emission continue to fall. Figure 10 illustrates number of deaths avoided due to lower air-pollution exposure for a selected number of countries.

Figure 10: Estimated number of deaths avoided due to lower air-pollution exposure



Source: Statista

3. The European socio-economic impact

This pandemic covid-19 crisis has already shown that it is different from the others. The International Monetary Fund estimates a deep recession, with a 7.5% contraction in the Eurozone's GDP in 2020. Following, the solution that was adopted in similar situations of economic-crisis by Milton Friedman, the term "helicopter throwing of money" refers to another non-conventional monetary policy measure, where the central bank should prints money and distributes it directly to citizens. The idea has to do with increasing consumer spending, giving extra impetus to economic recovery during a recession.

On this crisis, the worst economic impact and the negative socio-economic performance is more apparently for the Eurozone member states in 2020 and except Greece, Italy will perform -9.5%, Spain -9.4% and France -8.2%, respectively. The EU economy will decline by 7.5% and the Eurozone economy by 7.75% that is a negative record in EU economic-history. The recovery in 2021 is estimated to be strong 6.1% for the EU and 6.3% for the Eurozone.

Monetary authorities and national governments activating the most powerful "economic weapons" throwing a lot of money into the economy in order to be able to support businesses and employees, knowing that these measures, combined with recession and reduced tax revenue, lead to bigger "deficits" in budgets.

Like the previous crises of the last decade, the pandemic coviid-19 is testing the EU's cohesion and in particular the free movement of people and the free movement of goods.

The European South countries aiming to succeed greater solidarity, it is necessary to prevent fragmentation and ultimately the collapse of the single market, and is apparently the unequal ability of European member states to support their private sector and consequently this leads to an unequal competition.

The European Commission's forecasts that there is an extent of the damage to the Eurozone member states and this leading to widen the socio- economic-gap among member states, however Germany appearing in a more favor position from other European member states. The European South states are expected to have a recession of more than 9%, with Greece in the worst position expecting a recession of 9.7%, however in the other side, the German economy does not expected to decline by more than 6. 5%.

The European northern countries are simply in a better position. It's worth note that Germany has already received its share of the lion, or 52% of the Commission's approvals, to provide state aid. On this aspect, German government aiming to support the businesses with an initial capital of 100 billion euros. For instance, the German government will be funded by the new € 150 billion loan decided by Berlin as part of a 460 billion-euro bailout package to boost the German economy. Furthermore, it will support the Deutsche Bank that is the state-owned railway management company with a state aid of 6.9 to 8.4 billion euros. Similarly, the Adidas sportswear industry, which agreed to receive a 2.4 billion-euro loan from a state-owned bank. Finally, the German tourist giant TUI received a loan of 1.8 billion euros and also it will provide a 550m-euro loan to the low-cost airline Condor.

3.1 The EU' Agenda

According to European Commission (2020), the EU' Parliament has adopted new measures mobilising €3 billion of targeted support for health care systems in EU regions that have been hit the hardest by the corona crisis.

New EU program EU4Health aims to strengthen Europe's health systems to respond better to future major cross-border crises, such as the Covid-19 pandemic.

According to European Commission (2020), the three main priorities of EU4Health:

- Protection of people from serious cross-border health threats
- Improved availability of medicines

- Stronger health systems
- EU grants €314 million to innovative companies to combat the virus and support recovery. The Commission announced today that it has awarded nearly €166 million, via the European Innovation Council (EIC) Accelerator Pilot, to 36 companies set to combat the coronavirus pandemic. In addition, over €148 million will be granted to another 36 companies set to contribute to the recovery plan for Europe, bringing the total investment from Horizon 2020, the EU's research and innovation program, to €314 million in this round.
- These initiatives serve to coordinate resource distribution and cross-border cooperation, with a focus on the most affected regions. It will help with the construction of field hospitals and coordinate and financially support the transportation of corona patients to hospitals with free capacity.

All the money will also be used to directly purchase and distribute medical supplies such as respirators, protective equipment and reusable masks. Other actions are possible, depending on the needs of EU countries. In the longer term, the funds will improve medical research and testing capacities in EU countries.

According to European Commission (2020), the funds come from all remaining available means in this year's budget.

- €2.7 billion will be put into the EU's Emergency Support Instrument
- €380 million will go to the *rescEU* reserve of medical equipment

3.2 Tackling cross-border health threats

According to European Commission (2020), the program aims to strengthen prevention, preparedness, surveillance and response in crisis times and improve coordination of emergency capacity. It aims to build reserves of medicines and medical supplies, healthcare staff and experts and provide technical assistance.

EU4Health will strengthen national systems by funding initiatives such as:

- Tailor made support and advice to countries
- Training for healthcare professionals for deployment across the EU
- Audits of member states' preparedness and response arrangements
- Clinical trials to speed up the development of medicines and vaccines
- Cross-border collaboration and partnerships
- Conducting studies, data collection and benchmarking

4. Summary Conclusions and Policy Implications

A virus named Severe Acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes coronavirus disease, the so-called Covid-19. The new virus, the Covid-19 has recently spread from the Wuhan City in Hubei province of China.

The impacts of the Covid-19 crisis on societies, economies and vulnerable groups is really important. The main sectors affected from coronavirus was the unemployment, the growth-process and the sectoral activities and the production, such as tourism, transports, manufacturing etc. In China, where the coronavirus first appeared, industrial production, sales and investment all fell in the first three months of the year, compared with the same period in 2019. China makes up a third of manufacturing globally, and is the world's largest exporter of goods. The world' production and the financial-markets (FTSE and the Dow Jones) dropped in the first three months of the year since 1987.

The IMF described the decline as the worst since the Great Depression of the 1930s.

Governments around the world have urged employees to work from home where possible. Shares in technology companies such as Zoom have shot up as more people rely on video conference calls and email to hold meetings or get tasks done.

Whether a consensus is beginning to evolve on the need to follow more inclusive and sustainable paths once the pandemic has been contained is not yet clear.

Moreover, governments' responses to the pandemic have focused primarily on the immediate health emergency and its economic effects, thus seeking to safeguard the provision of healthcare and support for individuals, households and businesses.

Yet there is a huge disparity across countries and regions in terms of their capacity to mobilize the necessary fiscal and financial resources.

In light of the uneven government capacities to respond to the Covid-19 crisis, calls for the international community to coordinate efforts and provide effective support measures, especially for least developed countries.

As some economies are starting to reopen after economic lockdowns and are gradually resuming manufacturing activities, it is undisputable that workers' health and safety guidelines are instrumental in preventing a second wave of contagion.

Many companies have been forced due to containment measures to develop new business models and ways to organize production to survive in the short term, and ensure long-term viability and growth. Such changes may eventually benefit from the support of science, technology and innovation (STI) policies through grants, credit and tax breaks, among other instruments.

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The Implications of Covid-19 in Education and Growth: A Study for Greece

Abstract:
There is a huge literature and several studies have confirmed the importance of investment in education as a determinant of economic growth. Education is also associated with various non-economic benefits and educational policy is quite important for development. Education and human capital accumulation are among the main determinants of employment and growth prospect. Education should be understood as a method of sharing and disseminating information. Today, world community is facing the unprecedented pandemic crisis of the COVID-19 disease with a lot of socio-economic implications in the world economy and society. This paper aims to analyze the educational policy and skills in the pandemic era and moreover to examine the role in growth-process and social-cohesion in Greece.

Keywords: Education, Innovation, Pandemics, COVID-19, Socio-Economic Effects, Human Capital, Economic Growth, Greece.

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1. Introduction

World community is facing the unprecedented pandemic crisis of the COVID-19 disease. The spread of the coronavirus, which started in China at the end of 2019, turned into a pandemic in March 2020. The spread of COVID-19 disease in the world population, since the spread of the SARS-CoV-2 coronavirus, is happening rapidly and furthermore with negative consequences for society.

The implications from the COVID-19 are quite important for the global economy and the world-society. The disease of COVID-19 implies a rapid reduction of economic activity, with multiple socio-economic effects, such as in the reduction of demand and supply in growth process, unemployment and recession of the economies. As history has repeatedly shown, the longer the recession in the economy lasts, the worse the effects of the social crisis will be.

However, the disease of COVID-19 has given the opportunity in society to increase some new skills based on innovations and new technologies with implications to e-commerce, education and new production models. Internet and World Wide Web are increasingly used as technological infrastructure in e-learning systems, as they allow the construction of open learning systems.

Education should be understood as a method of sharing and disseminating information. It deals not only with obtaining the right information in the right time, but also with full understanding and processing of the information in the given context. This paper aims to analyze the educational policy and skills in the pandemic era and moreover to examine the role in growth-process and social-cohesion in Greece.

2. The European Puzzle of Convergence

Endogenous growth theories on the other hand explain how rich economies (endowed with human capital and higher R&D activities) can sustain high rates of growth and generally predict divergence of regional growth, but less so with integration. Broadly speaking, one can identify two conflicting hypotheses in the theoretical literature on economic growth. The optimist one, claiming that technological improvements operate in such a way that, in the presence of free trade and relatively unrestrained market competition, economic convergence eventually takes place. The pessimist one, claiming that the nature of modern technologies is such that market forces, when left to themselves, lead almost unavoidably to inequality and divergence.

During last years, regional development and convergence of the lagging regions in European Union has been one of the main objectives of the European development strategy. Development problems are more intense in lagging regions which present major differences in level of prosperity, economic performance, output, productivity and employment, compared to other E.U. regions. These disparities arise due to structural deficiencies in factors, which restrain economic activities and overall development.

These territorial disparities affect the overall competitiveness of the E.U. economy. Covering costs of the consequences of disparities implies a sub-optimal allocation of resources, as well as a lower level of efficiency and economic competitiveness. Within this framework, the enhancement and convergence of growth and productivity are a major topic in the economic and social policy agenda of E.U. members, since governments seek to concentrate on problems not only related to growth, such as low employment growth, high unemployment, fiscal deficits and public debt, but also to regional disparities and convergence attainment.

The imbalances in the E.U., threatening the convergence path, are summarised in the following Table 1:

Table 1: Threats to E.U. regional convergence

Regional level	Threats
• at EU level	• high concentration of economic activity and population in the central metropolitan areas, which account for the major percentage of population, GDP and R&D expenditure.
• at national level	• persistence of pronounced imbalances between the main metropolitan areas and the rest of the country in terms of economic development
• at regional level	• persistence of territorial disparities beyond those measured by GDP or unemployment, such as, social exclusion, inadequate economic links and falling population.
• within regions and cities	• development of poverty and social exclusion in areas with often only limited availability of essential services.
• in areas constrained by geographical features (islands, sparsely populated areas, mountain areas)	• declining population and ageing, while accessibility continues to be a problem and the environment remains fragile and threatened.
• in outermost areas, with natural and geographical handicaps	• continuation of severe social and economic problems which are difficult to tackle because of their remoteness, isolation, topological features, climate, small size of market and dependence on a small number of products.

In policy terms, the objective is to help achieve a more balanced development by reducing disparities, avoiding regional imbalances, making policies more coherent, improving integration, and encouraging cooperation between states and regions (World Bank, 2018).

3. The implications in the world economy from COVID-19

The coronavirus pandemic could affect the world economy in the coming decades.

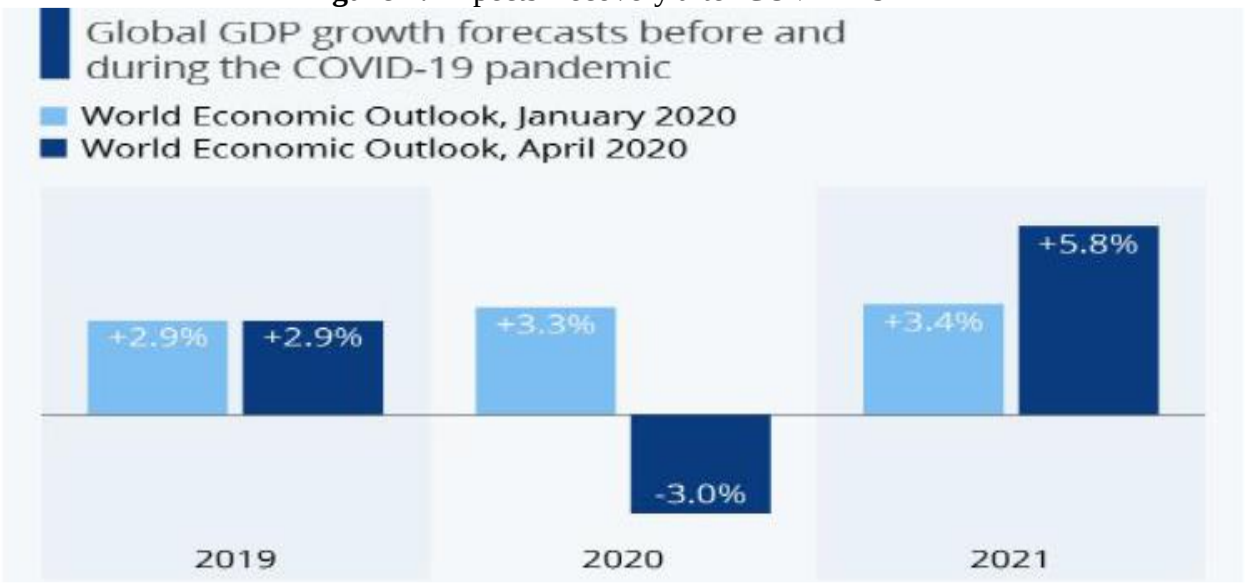
The pandemics affect economic and social life throughout the world. Pandemics are followed by extended periods - for many decades - where there will be fewer investment opportunities.

The World Labor Organization warned last month that nearly 25 million jobs would be lost if the virus was not screened.

For instance, in Asia, Japanese unemployment remained at 2.4%, but demand for unskilled workers fell sharply. Moreover, much emphasis will be placed on China, whose economy is returning to normal. Unemployment in China increased to a record 6.2% in February as businesses closed (World Bank).

According to the OECD data, the unemployment rate in developed economies will increase by 2.7 percentage points by the middle of this year, after starting this year around the lowest levels in four decades. Moreover, there will be an increase in the unemployment rate of 4.6% in the US and 8.3% in the Eurozone by the end of 2021. Figure 1 illustrates the global GDP growth during the pandemic COVID-19.

Figure 1: Expects Recovery after COVID-19



Source: IMF Database, 2020

Furthermore, in USA there is a new record in the applications for benefits, while the unemployment rate at 14% is already one of the highest in the developed world and according to estimations of US Statistics, the unemployment rate would soon reach a record 15%.

In Austria, the unemployment rate rose to 12%, the highest since the end of World War II. Whereas, in Britain, almost one million Britons applied for welfare benefits in two weeks, 10 times the normal rate. The country's statistical office has published a survey of companies, where 27% of them reduce staff in the short term.

A record number of companies in Germany, 470,000, applied for government wage support in March - a number that is likely to continue to rise - suggesting that so far about a fifth of the workforce could reduce working hours.

In France, companies also rushed to take advantage of state aid to keep employees on their payroll, receiving 84% of their salary from the state.

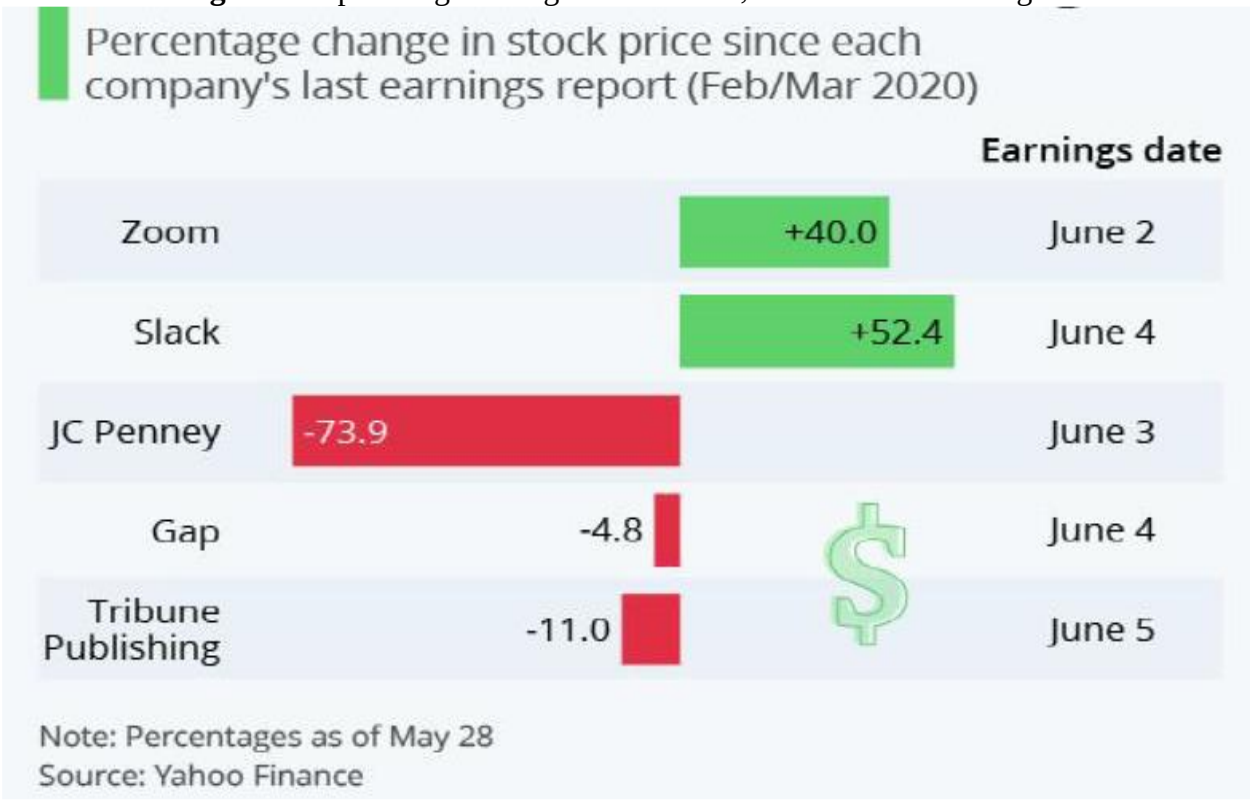
Data from Scandinavia already show that employment there is severely affected, with more than 800,000 people out of work, including more than 620,000 temporarily available in Finland and Norway, according to Bloomberg estimates

In Greece, in his scenario, he calculates the short-term economic consequences of a reduction of activity over 50% and up to 100% in various sectors.

The reason that Greece appears to have such a great loss is the particularly large contribution of tourism and related sectors, catering, etc. to the overall economic activity, they have too large a share in the formation of Greek GDP. There is also a negative effect in private consumption and investment. Furthermore, the unemployment rate is expected to reach 20% this year, due to the lockdown, a large drop is expected in imports and exports.

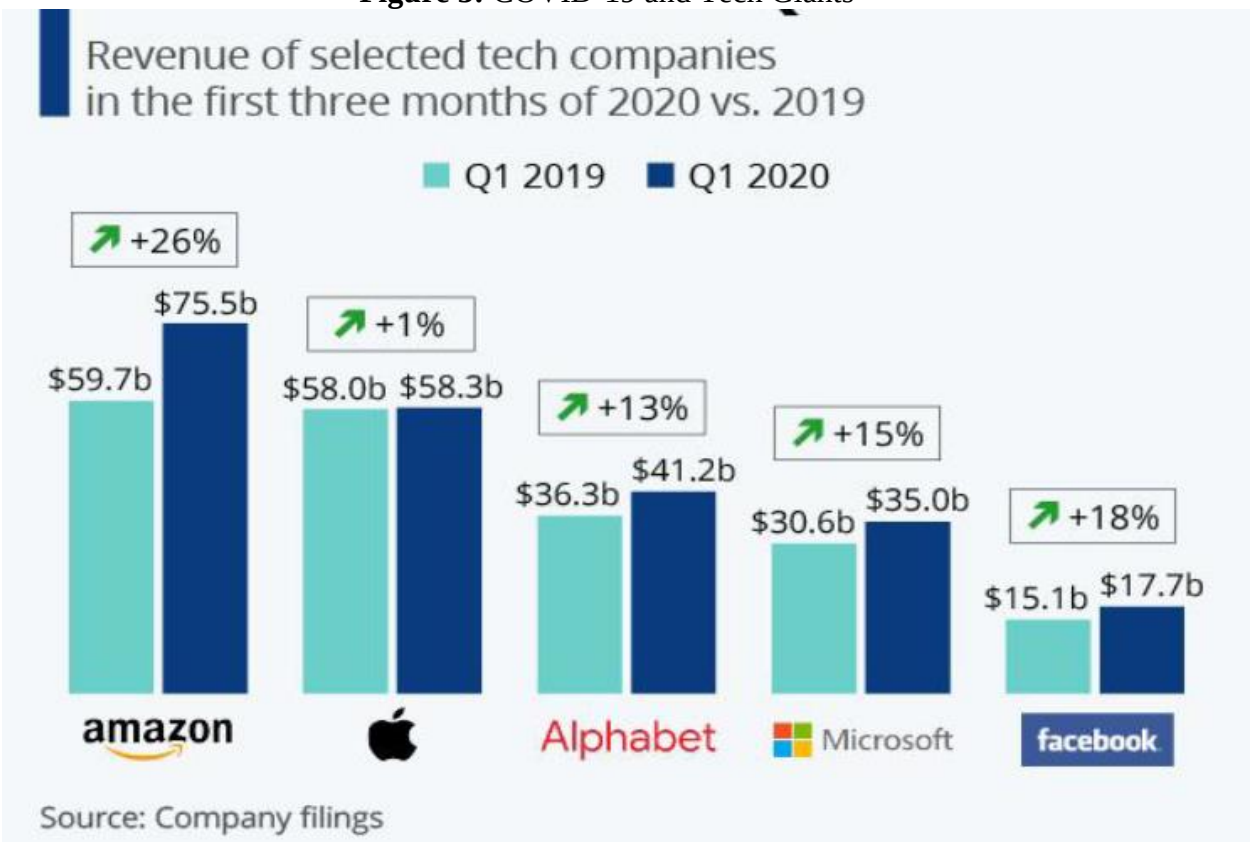
The OECD analysis states that in countries where travel and tourism are of great importance in shaping GDP, the effects will be more severe. However, the positive effects from pandemic COVID-19 affecting with the software and e-commerce-retail companies and software houses. Figure 2-4 illustrate earnings for software, retail and publishing, the technologies giant and the charts for zoom-download, respectively.

Figure 2: Upcoming Earnings for Software, Retail and Publishing



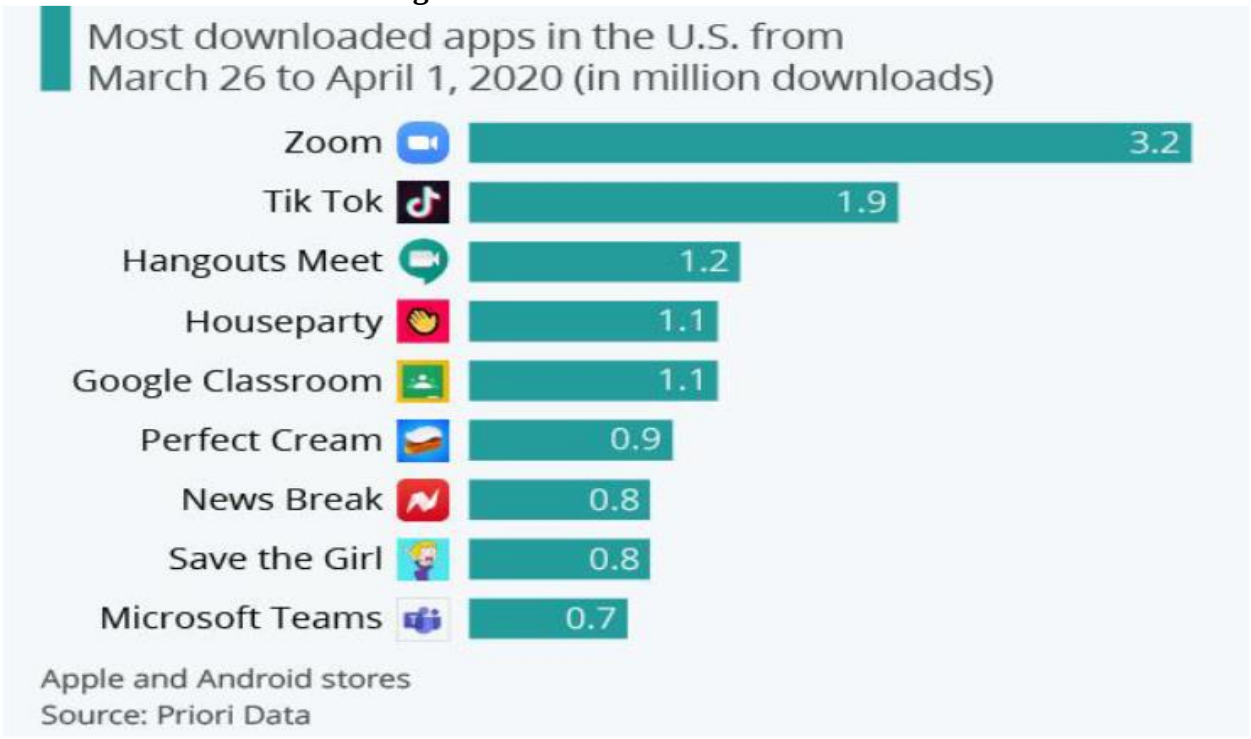
Source: Statista, 2020

Figure 3: COVID-19 and Tech Giants



Source: Statista, 2020

Figure 4: Zoom Download Charts



Source: Statista, 2020

4. The Socio-Economic effects in Greece

The pandemic effects have a great impact in the South region Mediterranean countries, such as Greece and Italy. In order to adjust the negative effects, the Greek government is aiming to apply a new reconstruction-plan based in the following main axes:

• Short-term employment subsidy through the SURE Program
• Issuance of loans through the European Investment Bank
• New first home loan subsidy framework
• New policies that will be implemented in specific sectors of the economy in the coming months (tourism, transport, etc.) and public liquidity interventions.

According to the Stability Program and the European' initiatives for 2021, there will be a support program for enhancement the employment and businesses by strengthening liquidity. The return to positive growth rates of 5.1% will come, according to what is mentioned in the Stability Program, to the strengthening of investments and private consumption (+ 4.2%) while an increase is estimated to be recorded in employment.

The main default effects from the pandemic of COVID-19 are:

The economic depression: The real GDP is estimated to reduce by 4.7% on an annual basis due to the sharp decline in trade (especially in service sector), due to the huge decline in economic activity and the decline f consumer demand. The deepest recession in the EU member states refers to Greece for this year. According to the European Commission's, the Greek economy, will expected to collapsed this year, with unemployment rate to count 19.9% and the budget deficit to count 6.4% of GDP by 2020. Moreover, a recovery is estimated in 2021, with an increase of 7.9% and a decline in unemployment to 16.8%, and also a decline in the budget deficit to 2.1% of GDP. The public debt will be estimated for this year to around 200% of GDP, with a decline to 182.6% of GDP in 2021.

- **In the consumption sector:** On the domestic demand side, private consumption is projected to decline around -4.1% year-on-year and towards 2.7 points with a negative contribution to GDP, due to revenue losses from business closures or operating companies with reduced levels of production, deferral of consumer spending and due to reduce in social

contact and compression of sales, with an exception of food, pharmaceutical / medical products and e-markets.

- **The tourism sector:** Tourism, transport, shipping will be the most vulnerable sectors in Greek economy. The worst scenario will be for the Greek Tourism. According to the Bank of Greece, tourism revenues in 2019 amounted to 18.2 billion euros. In 2019, incoming travel traffic increased by 4.1% and amounted to 31.3 million travelers, compared to 30.1 million travelers in 2018.
- **The public-fiscal sector:** The increased of new spending against the pandemic is expected to affect the general government 'primary balance well below the 3.5% GDP for the initial target of 2020.
- **The unemployment issue:** The unemployment rate is estimated to count 19.9%, instead of 17.3% of the labor force last year and expected to decline in 2021 to 16.4%.
- **The inflation rate:** The forecasts for inflation rate is expected to be 0.6% in 2021 from -0.3% in 2020, after a negative percentage for 2020 due to the pandemic and low energy prices.
- **The export sector:** The effects of COVID-19 are expected to have a negative effect on the external sector of the economy. The lockdown of transport, travel cancellations, the closed borders are expected to decline exports of goods and services around -19.2%, with tourism, transport and shipping sectors to be more affected, whereas, imports are expected to decline by-14.2%, due to decline of domestic demand and exports.

The G20-2020 summit considered that the economy will follow a "V" shape, i.e. it will have a sharp recession and will return soon, once all this is over. The negative effects come from both the supply side (i.e. reduced industrial production due to disruptions in global production chains) and the demand side (i.e. reduced demand for tourism and transport services). Public spending is increasing due to increased public health needs to deal with the pandemic

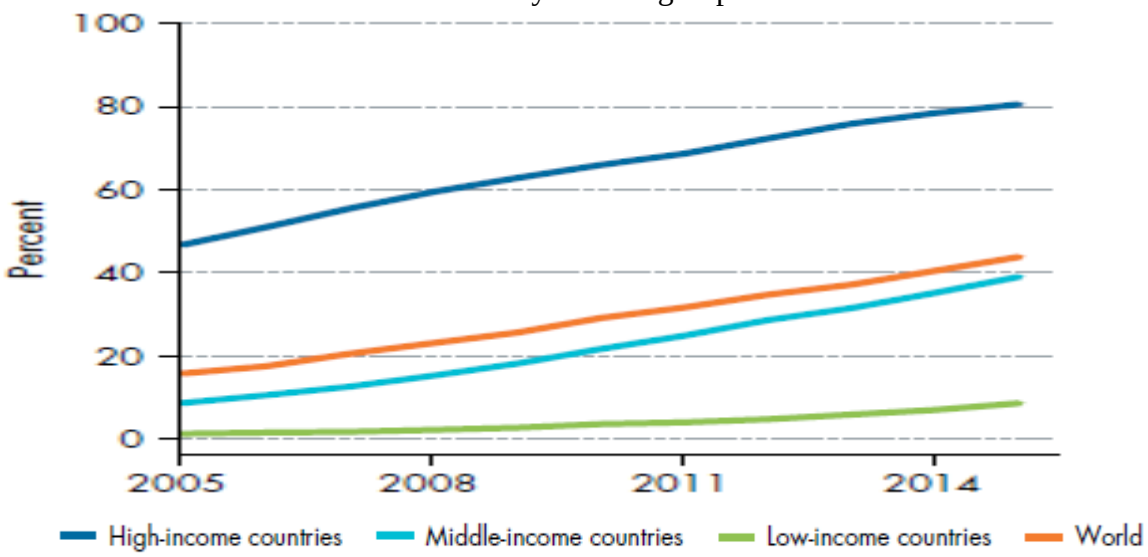
5. The pandemic effects in Education

The pandemic brought changes in many activities of life, work, family, relationships, etc., the epidemic of the new corona, brought among others distance learning. In all tele- the Change was fast and impressively accepted by the population.

The pandemic brought overnight e-learning to the home of every teacher and every student, where, under normal circumstances, long consultations and objections from teachers and students would have been expected.

The nature of work is changing. Within countries, jobs have been shifting across sectors—sometimes on a massive scale. Technology—including digital technology—is central to these changes. Digital technologies penetrate most corners of the world, with one mobile phone subscription per person globally, and 4 in 10 persons connected to the internet.
Technology use has increased dramatically over the past decade—but remains low in many countries. Figure 4 illustrates the percentage of population who have access and who use the internet (2005–15), by country income group

Figure 4: Percentage of population who have access and who use the internet (2005–15), by country income group



Source: World Bank, 2018

All of those skills that help individuals succeed in rapidly changing economies are built on the same foundations of literacy and numeracy. It may be tempting to divert resources from the development of foundational skills into the technological skills, higher-order cognitive skills, and socioemotional skills needed in the 21st century, which seem more novel and exciting. But these are complements to foundational skills, not substitutes for them—they can only be built on a solid foundation. Workers can search effectively for digital information or create digital content only if they have strong literacy skills (World Bank, 2018).

They can program new online applications only if they have confident numeracy skills. Socioemotional skills like grit, which are most malleable in childhood, can be practiced and strengthened in the service of gaining strong foundational skills. Higher-order cognitive skills involve consuming information using literacy and numeracy skills and combining it in new ways. Innovations in developing 21st-century skills are much needed, but these skills work best in conjunction with strong foundational abilities.

The pandemic disease has changed not only the production model of the world economy, but also the education model. The implementation of modern distance education in high schools and lyceums of Greece achieved the goal of the Ministry of Education, so students to stay in touch with the educational process, for the pandemic period.

The idea of being able to attend a university lecture online whenever you want ("on demand") is not new at all. It started at least in the early 2000s with innovative University initiatives such as the Columbia University Fathom Project and the University of Illinois Global Campus, which unfortunately failed and were abandoned a few years later.

Many companies have been forced due to containment measures to develop new business models and ways to organize production to survive in the short term, ensuring long-term viability and growth. Such changes may eventually benefit from the support of science, technology and innovation policies through grants, credit and tax breaks, among other instruments. Yet, as innovation features as one of the key drivers of economic growth, it is expected that policies should also contribute to fostering economic recovery in the medium-to long run by enabling economic restructuring, productive diversification and entry/repositioning in what is expected to be a changed landscape of global value chains once the pandemic has been controlled.

Table 2: Pandemic and E-Learning in Greece

(A). Schools

The following elements were recorded in modern education:

- 9,462,802 student participations in total in digital classrooms
- 766,458 student participations in digital classes daily
- 112,872 teachers have created their personal digital classroom
- 532,251 digital classes have been created cumulatively
- up to 40,957 digital classes per day
- 36,091,106 minutes of modern distance education courses.

In asynchronous education:

- Student participation in e-class platforms: 744.973 / e-me: 369.531
- Participation of teachers in the e-class platforms: 115.618 / e-me: 75.259
- A total of more than 1,099,421 students and 193,062 teachers have registered in the Panhellenic School Network

Educational TV:

- 145,000 children aged 4-14 watched daily in April the educational television program established and implemented by the Ministry of Education, in collaboration with the Institute of Educational Policy and ERT.

(B). The Public Vocational School

- 96.3% of lifelong courses are already included in asynchronous distance learning.

(C). Universities

- 96.35% of the undergraduate courses are delivered through modern distance education.

Source: Own data elaboration

Table 2 illustrates the e-learning effects from the pandemic COVID-19 in Greece. The Greek education-strategy for Life-Long Learning programmes is directly related and affected from European policy and Lisbon strategy. The European Union support the study of Life-Long Learning educational programmes through European Funds, such as the European Social Fund (ESF). Summarising, the main effects from Life-Long Learning programmes can be focused at the following points:

- Improvement in the quality of education and support the promotion of social inclusion and rehabilitation.
- The Life-Long Learning programmes support the adults education and the enhancement of human resources and specialisation.
- Increase the level of human resources using the research and innovation technologies
- Improvement of the educational level and the professional training.

5. Summary Conclusions and Policy Implications

The pandemic disease has affected the world economy and the society. The Greek economy will lead to a recession of 13.3% as an effect of quarantine, while at the same time the country's debt is expected to count around 200 % of GDP. Following the estimations and the basic-scenario of the Ministry of National Economy, the recession is expected to rise to 4.7% this year in 2020, while for 2021 is expected a positive sign for 5.1%. Tourism, transport and distribution sectors are the main sectors that have been affected due to pandemic COVID-19. In addition, there is a negative effect for the primary surplus of general government that is estimated to count a primary deficit of 1.9%.

The economy is faced a triple shock, which is as follows:

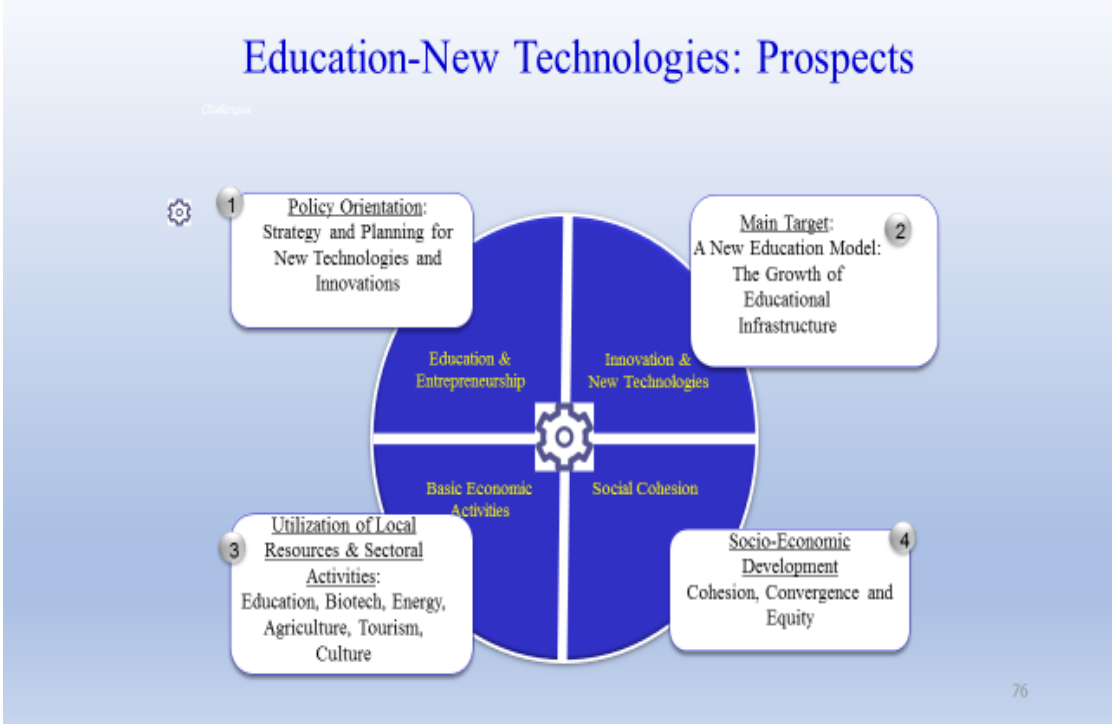
- A temporary, but very strong in the supply production-sector.

- A very strong demand shock due to lockdown, and consequently a huge reduction to income and to consumption.
- A strong shock of uncertainty, because neither the duration nor the intensity of the pandemic COVID-19 phenomenon is known.

The pandemic disease has also affected the education model. The pandemic brought overnight e-learning to the home of every teacher and every student (Beuermann, et al. 2015). The digitization of teaching and perhaps the entire academic process in general, brings the Greek university to the new digital age, solves many practical problems, reduces costs, facilitates access for all students from home fire, and even the participation of some that otherwise (characters, shyness,) would not participate, and overall and because of the above ultimately increases participation and even quality. Now the student who wants to attend will do so more easily and unhindered. No one can deny that technology has and will continue to have effects that can transform higher education with implications for its structure that are now difficult to predict. The pandemic has already changed higher education. The potential of new learning technologies is promising.

Figure 5 illustrates the basic pillars for growth and cohesion based in education and new technologies.

Figure 5: Education and Development: New Prospects



Source: Own Elaboration

Life-long learning programs aim at:

- The improvement of the education provided and the capabilities of the young people for getting integrated within the social and productive web/network
- The promotion of the equality of opportunities
- The fight against social exclusion
- The sensitization on environmental matters
- The development and promotion of gender equality

The basic fields of action for the for life learning are:

- Benefit of new basic knowledge and dexterities for all
- Increase of investments in the human resources

- Growth of innovations with regard to the teaching and the learning
- Evaluation of education
- Revision of ways of Orientation and Advisory
- The education it comes more near the family

As it has already been mentioned, innovation and technology are important sources of regional competitiveness through facilitating cooperation between the various parties involved in both the public and private sectors (Claro etc. 2012). In particular, they can improve collective processes of learning and the creation, transfer and diffusion of knowledge and transfer, which are critical for innovation. Such cooperation and the networks that are formed help to translate knowledge into economic opportunity, while at the same time building the relationships between people and organizations which can act as a catalyst for innovation. Such actions should extend to all the policy areas relevant for economic, scientific and social development and should ideally establish a long-term policy horizon (Sternberg, 2000).

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